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Financial Potential of Czech Employees from the Perspective of Gender Statistics

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Abstract

In the third quarter of 2022, the average gross monthly nominal wage rose by 6.1 percent compared to last year, but in real terms it fell by 9.8 percent due to inflation. The decline is the same as in the previous quarter. Inflation and a real drop in average wages have already forced three quarters of employees significantly to reduce some expenses. Considering the current situation, the biggest savings relate to holidays, eating out in restaurants, culture or sports activities. In general, people save by limiting purchases of better or better quality products or services, as well as branded products. The aim of this paper is to capture the situation regarding the development of the wages of Czech men and women since the last financial and subsequently economic crisis, through a period of significant economic conjuncture, which was followed by the coronavirus crisis, ensued by the current energy crisis, which is largely related, among other things, to the war conflict in Ukraine. For this purpose, not only statistics measuring the level of wages in the individual years 2009–2021 were calculated, but for this purpose models of the entire wage distribution were constructed and their development in the monitored period was captured. The three-parameter lognormal curves became the basis of these models, the parameters of which were estimated by the maximum likelihood method ensuring the minimum variance of the obtained estimates. Predictions of the entire wage distributions of men and women were constructed for the period 2022–2026 in order to specify the expected development of wage distributions. As part of these predictions, exponential smoothing of time series was applied, which assigns the highest weight to the most recent observations, and the weights of individual observations decrease exponentially towards the past.

Key Words

wages of men and women, growth rate of wages, wage models, maximum likelihood method, exponential smoothing

JEL Classification: E24, E21, C55, C46

Introduction

Wage is remuneration for work in an employment paid on the pay date, usually monthly in arrears. It can consist of the following components: basic salary, wage compensations and performance components of wage. This is a monetary payment or payment of monetary value, which is a wage in kind, provided by the employer to the employee. Unlike a salary, a wage is paid only in the private sector. A salary is a monetary payment provided to an employee as a reward for his work for the employer, which is a public institution. This is the so-called public sector, which includes the state, region, municipality, state fund or funded organization, where salaries are paid from the budget of its founder, or an educational legal entity, etc. However, a salary is not a monetary payment provided to citizens of foreign countries with a place of work outside the territory of the Czech Republic, although they work for one of these employers. Salary can be only received on the basis of meeting the conditions of the salary schedule set by

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the state. Salary is generally paid from public budgets, wages is generally paid only from private money, as the opposite of salary.

The data for this research come from the official website of the Czech Statistical Office, and according to the terminology of this office, the concept of wages encompasses both wages in the private sphere and salaries in the public spere, which is also followed in this paper. The data covers the period 2009–2021.

There have been already arisen a large number of domestic and foreign studies on the topic of discrimination against women in the labour market (see for example Kolacek (2009) or Vravec and Bačík (2012)), but some of them do not realize the true meaning of the word of discrimination against women in the labour market. We can only talk about the discrimination against women in the labour market if the case that a woman works in the same workplace as a man and, under otherwise equal conditions (education, experience), she receives a lower wage than a man for the same amount of work performed of the same quality. For example, if a woman works in a lower job position than a man, her lower wage compared to a man is is justified and this is not wage discrimination. A numbers of publications, studies and papers deal with wage discrimination on the labour market from different perspectives, as it is still a timeless topic, see for example the publication Ahmed and McGillivray (2015), Gardeazabal and Ugidos (2005) or Mihăilă (2016) address the issue of gender discrimination on the labour market. The articles Hofer, Titelbach, Winter-Ebmer and Ahammer (2017) or Kampelmann and Rycx (2016) deal with the issue of discrimination against immigrants. There are also other possibilities for discrimination in the labor market, for example, the article Baldwin and Johnson (1994) deals with discrimination in the labour market of people with disabilities and the publication French, Mortensen and Timming (2019) deals with discrimination of tattooed people.

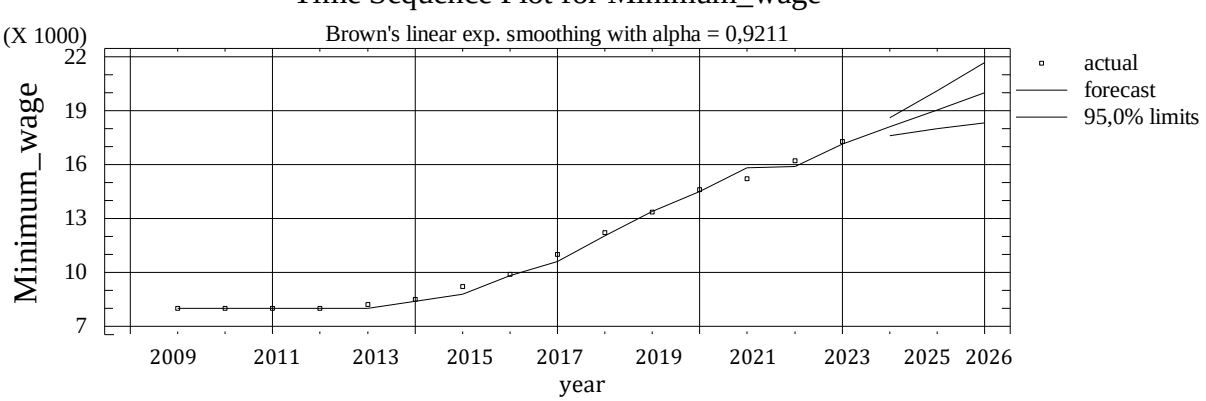
The beginnings of the last global financial crisis, which gradually turned into an global economic crisis, are dated to the autumn of 2008. The consequences of the onset of the global economic recession were fully manifested in 2009, when the Czech economy recorded 4.8 % decline. This contribution deals with the development of the nominal and real gross monthly wages of Czech men and women from the beginning of the global economic recession (the year 2009 is considered) through the period of economic boom to the crisis associated with the COVID-19 pandemic. The recalculation of the nominal wage to the real wage is based on 2009, and data including the average year-on-year inflation of the Czech Statistical Office was used for this adjustment. The aim of this study is to capture not only the development of measures of the level or variability of these wage distributions, but also to capture the development of entire wage distributions over time. An important purpose of this research is to forecast the development of the entire wage distribution for the period of 2022–2026.

1. Methods of Research

Three-parameter lognormal curves are used as wage distribution models, see Johnson, Kotz and Balakrishnan (1994), whose beginnings are the the amounts of nominal gross monthly wage in a corresponding year, and the remaining two parameters are estimated by the moment method. The essence of the moment method of parameter estimation is that the sample and relevant theoretical moments of the given probability distribution are equated. Common and central moments can be combined. Although this parameter

estimation method is very simple to use, it can be inaccurate. However, in the case of wage distributions, we are working with very large samples, and therefore the use of the moment method of parameter estimation is not a problem in terms of the robustness of the estimates, see Johnson, Kotz and Balakrishnan (1994).

Fig. 1: Development of the amounts of the minimum gross monthly wage in the period 2009–2023, including predictions for the period 2024–2026



Source: www.mpsv.cz; authors' own calculations

Tab. 1: Estimates of parameters of three-parametric lognormal curves representing models of wage distribution of men and women in the period 2009–2021, including forecasts for the period 2022–2026

Year	θ	Men		Women	
		μ	σ	μ	σ
2009	8000	9.138659	1.309962	9.050880	1.024768
2010	8000	9.259809	1.222847	9.081358	1.011859
2011	8000	9.200294	1.195681	9.108723	0.964880
2012	8000	9.187166	1.232109	9.078529	1.003095
2013	8208	9.265287	1.164720	9.122250	0.960314
2014	8500	9.274950	1.172857	9.120666	0.974824
2015	9200	9.299777	1.168430	9.113357	0.995346
2016	9900	9.331293	1.164547	9.137125	1.003885
2017	11000	9.398531	1.146628	9.208910	0.982908
2018	12200	9.466661	1.142156	9.291290	0.974152
2019	13350	9.565412	1.107947	9.398562	0.946221
2020	14600	9.579058	1.118147	9.452119	0.958268
2021	15200	9.647159	1.107681	9.562000	0.931002
2022	16200	9.739044	1.062350	9.659643	0.904550
2023	17300	9.794114	1.044197	9.732365	0.888579
2024	18100	9.868421	1.014787	9.824906	0.858732
2025	19050	9.932841	0.988119	9.902292	0.834699
2026	20000	9.997447	0.959089	9.976448	0.810139

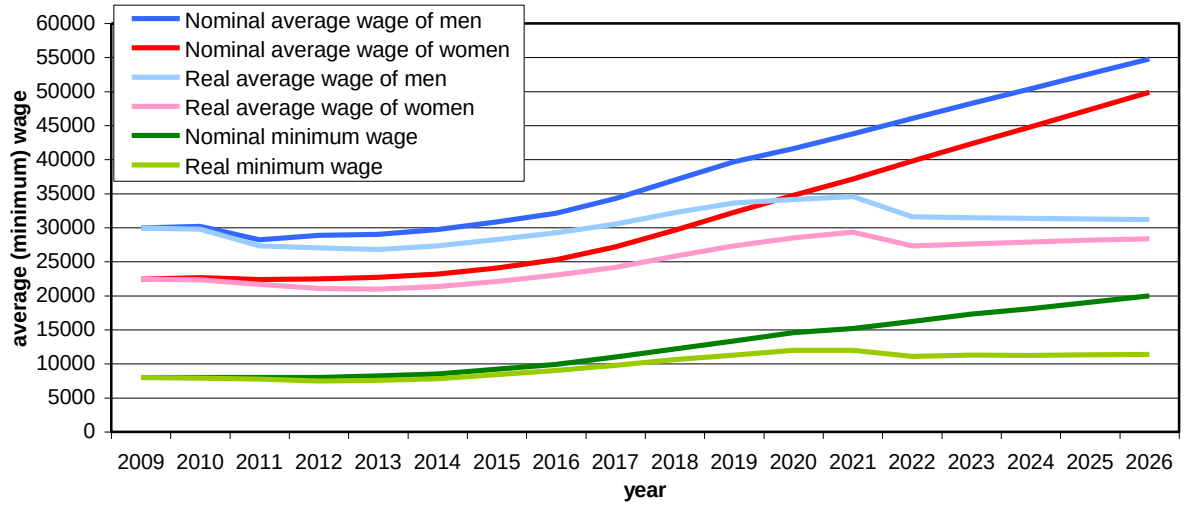
Source: author's own calculations

Forecasts of the development of the sample average and sample standard deviation for 2022–2026 are constructed using the exponential smoothing of time series, see Hyndman and Athanasopoulos (2021). In the case of the amount of the minimum wage, already known values for the years 2022 and 2023 are used, and for the period of 2024–2026, exponential smoothing of time series is again used. Exponential smoothing is standardly assigned to adaptive approaches to the trend component of the time series. Exponential smoothing provides more accurate results when constructing time series forecasts, as the most recent observations of the time series have the highest weight. A

modified least squares method is used to estimate the parameters of the time series trend, where individual squares in the minimized sum are assigned weights that decrease exponentially towards the past. The construction of predictions of the entire wage distribution is carried out using the moment method of parameter estimation based on the obtained forecasts of the sample average, sample standard deviation and the beginning of the three-parameter lognormal curves. Figure 1 demonstrates the construction of forecasts using exponential smoothing, in this case it is equal to the construction of forecasts of the development of minimum wage amounts for the years 2024–2026. The parameter estimates of the three-parametric lognormal curves constructed for the period of 2009–2021, including the estimates constructed on the basis of forecasts of the sample characteristics of wage distributions for the period of 2022–2026 (in the case of the minimum wage of 2024–2026) are shown in Table 1. The choice of a suitable type of exponential smoothing is made using interpolation criteria. When verifying the appropriateness of the chosen type of exponential smoothing, the standard procedures are followed (Durbin-Watson test, sample residual autocorrelation function, sample residual partial autocorrelation function, Theil mismatch coefficient as a representative of extrapolation criteria, test of homoscedasticity of forecast errors).

2. Results and Conclusion

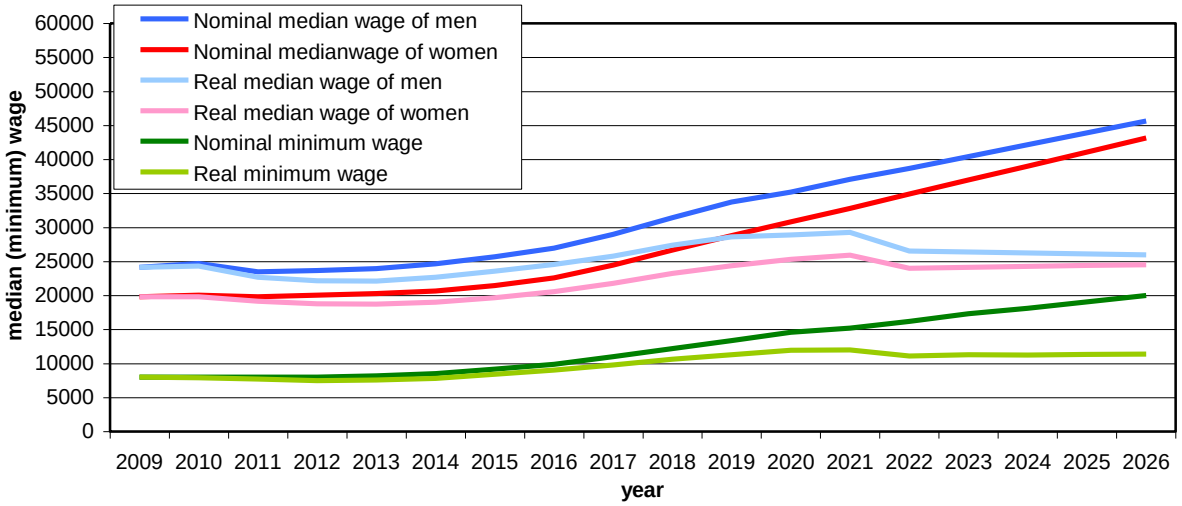
Fig. 2: Development of nominal and real average gross monthly wages of men and women and development of nominal and real gross monthly minimum wage (CZK)



Source: www.mpsv.cz; www.czso.cz; authors' own calculations

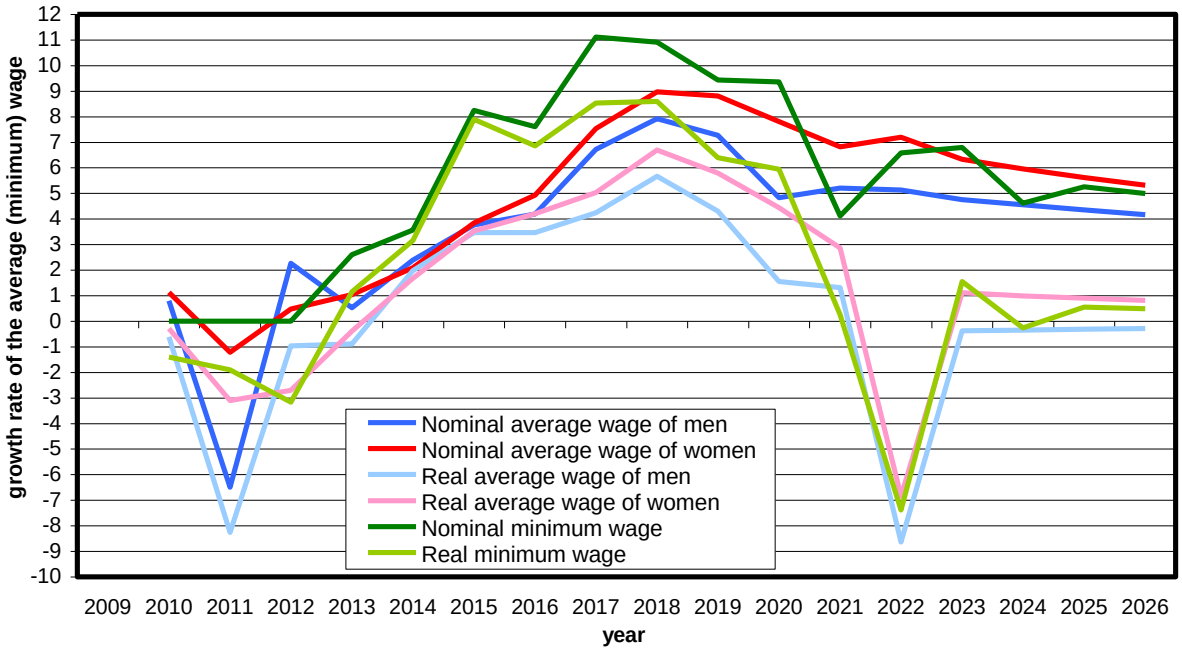
Figures 2 and 3 present the development of the nominal and real average and median gross monthly wages of men and women from 2009 to 2021, including predictions for the period 2022–2026. Real wages are relative to 2009. Figures 4 and 5 represent the development of the growth rate of these wages. Figures 2–5 show a significant drop in the level of nominal and real wages for men in 2011, but this drop was not so significant for women.

Fig. 3: Development of nominal and real median gross monthly wages of men and women and development of nominal and real gross monthly minimum wage (CZK)



Source: www.mpsv.cz; www.czso.cz; authors' own calculations

Fig. 4: Development of the growth rate of the nominal and real average gross monthly wages of men and women and development of the growth rate of the nominal and real gross monthly minimum wage (%)



Source: www.mpsv.cz; www.czso.cz; authors' own calculations

Wages reacted to the onset of the global economic crisis with some delay. These figures also show a significant decline in the level of real wages for both men and women in 2022, while nominal wages are still rising. This is the result of high inflation this year. Figures 6 and 7 show the development of whole model distributions of nominal wages for men and women in the period 2009–2021, including forecasts of the development for 2022–2026. We can observe a systematic development of these distributions over time.

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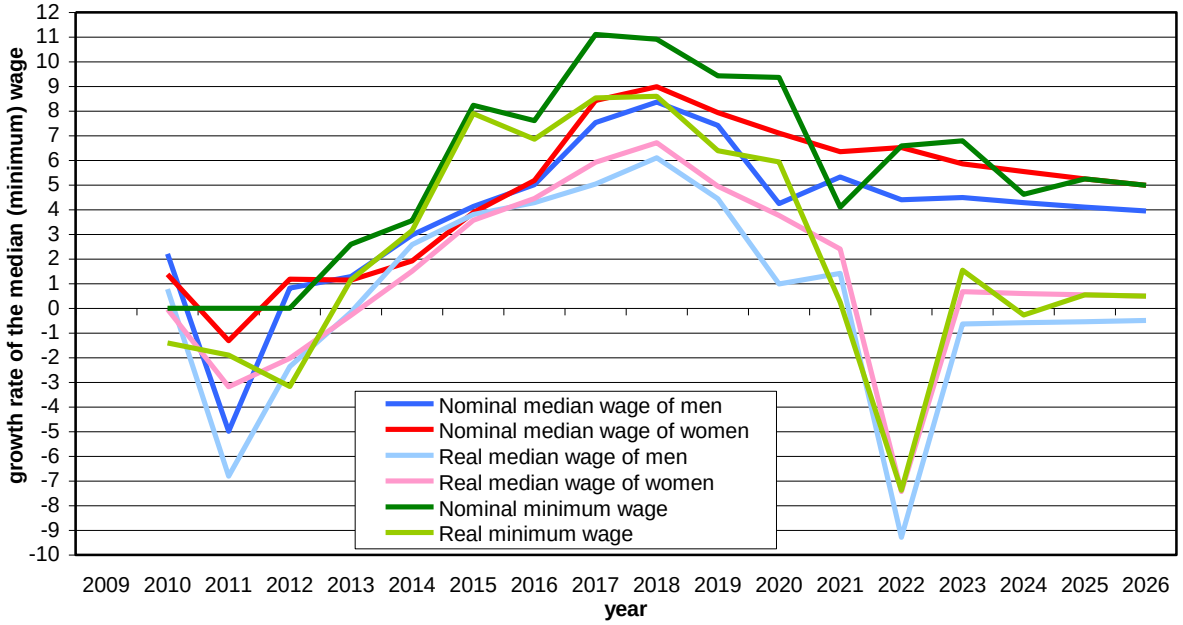
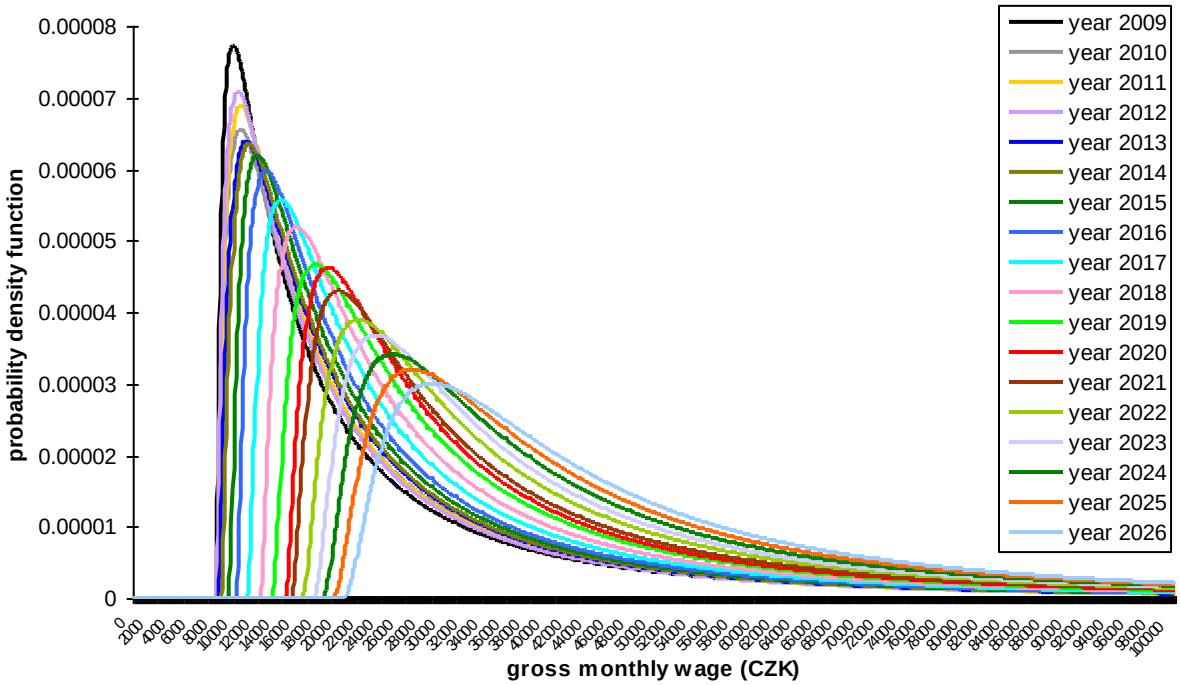
Fig. 5: Development of the growth rate of the nominal and real median gross monthly wages of men and women and development of the growth rate of the nominal and real gross monthly minimum wage (%)



Source: www.mpsv.cz; www.czso.cz; authors' own calculations

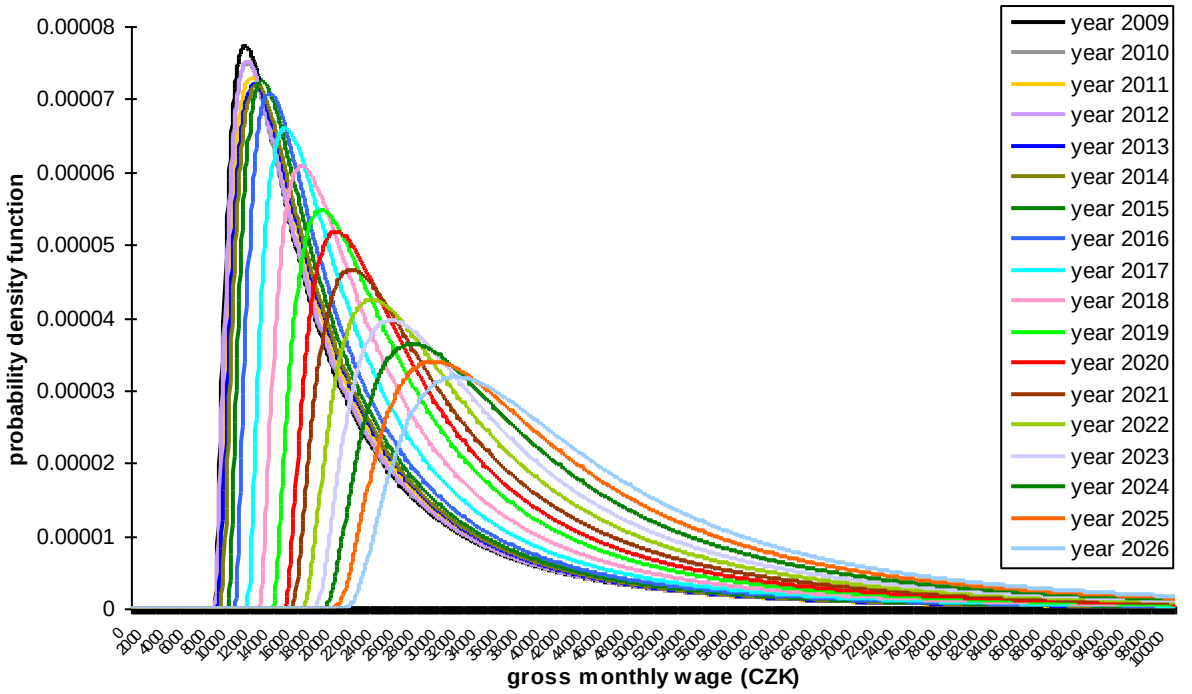
Fig. 6: Development of models of wage distribution for men in the period 2009–2021, including predictions of the development of these distributions for the period 2022–2026



Source: author's own calculations

Figure 8 offers some comparison of forecasts of the development of wage distributions between men and women. We observe a higher representation in higher wage intervals in the case of men compared to women.

Fig. 7: Development of models of wage distribution for women in the period 2009–2021, including predictions of the development of these distributions for the period 2022–2026

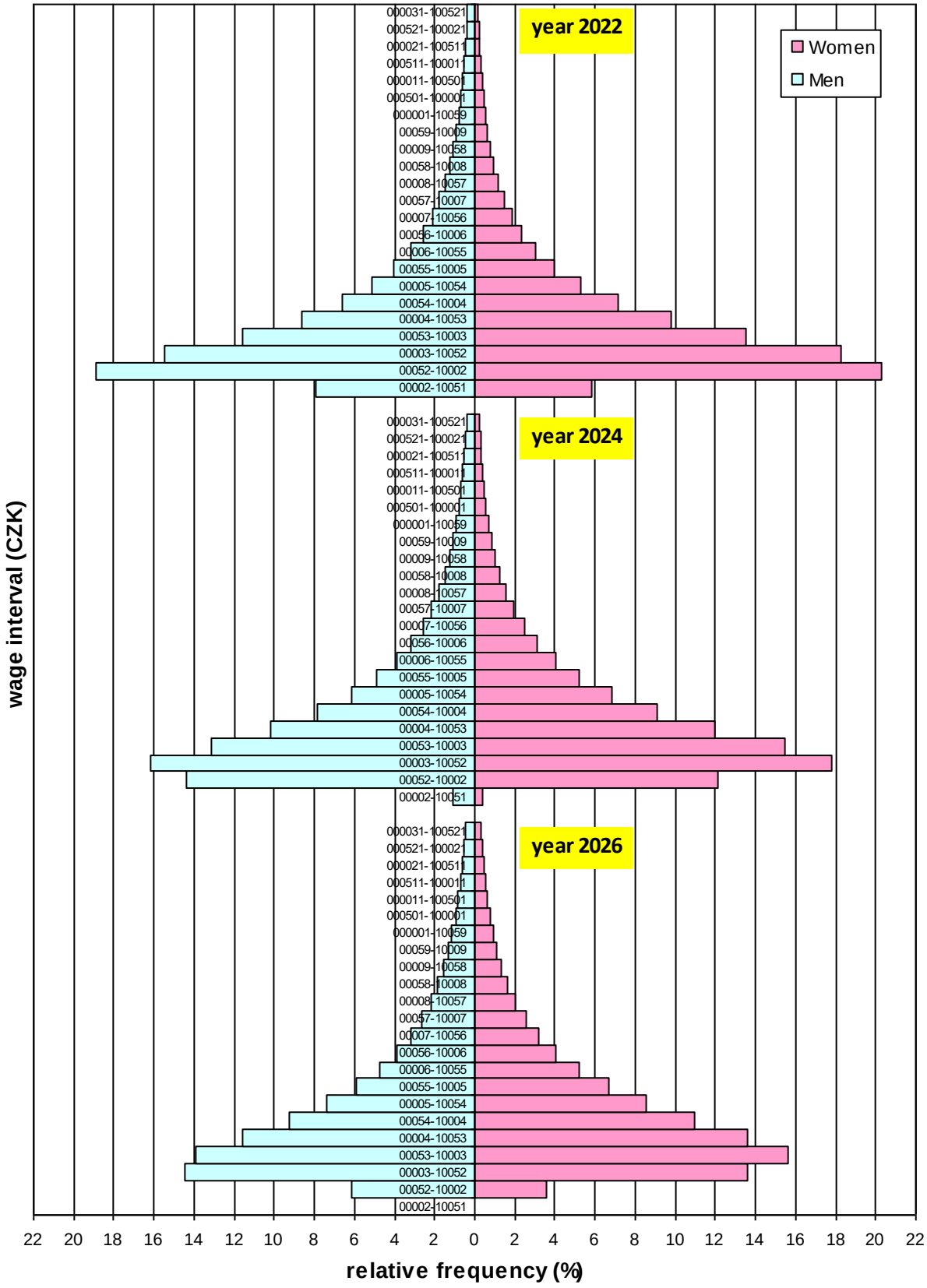


Source: author's own calculations

A wage or salary represents remuneration for work in an employment-legal relationship, which is paid retroactively on the pay date, usually monthly. Rewarding of employee is not only wage or salary, or other forms of monetary remuneration for work performed. In the modern concept, it includes remuneration as well as non-monetary forms such as promotion, formal recognition or employee benefits from the title of employment. These rewards that are provided and controlled by the establishment are called extrinsic rewards. However, intrinsic rewards are currently increasingly being promoted. They are related to the satisfaction of the worker, to the joy that work brings him, to feelings of usefulness and success, to informal recognition, praises, to social standing and a successful career. Intrinsic rewards are related to personality of worker, to his character. Remuneration for work performed may reflect the nature and importance of the work performed, the work performed itself, the worker's performance, his skills or rarity in the labour market. Despite the many forms of rewards, monetary rewards are still mainly used today. According to traditional neoclassical economics, a wage or salary is a reflection of a worker's productivity. Market forces permanently appreciate and reduce the price of different types of work and thus determine their value.

The issue of equality between men and women on the labour market is also addressed by Lisbon strategy that emphasizes the need to address the gender pay gap as well as to increase the employment of women. From this point, it can be seen that the issue of gender in the labour market is still topical and will be probably for a long time. The gender pay gap represents a serious social problem that has an impact on a large part of the population. Due to the higher average life expectancy of women, it is the cause of their poverty at an older age. Discrimination in the labour market is considered to be the main cause of this problem.

Fig. 8: Predicted development of men and women wage distributions until 2026



Source: author's own calculations

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Implementation of the Affordable and Clean Energy Sustainable Development Goals (SDG) in Visegrad Group (V4)

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Abstract

The problems related to the process of industrialisation such as biodiversity depletion, climate change and a worsening of health and living conditions, especially but not only in developing countries, intensify. Therefore, there is an increasing need to search for integrated solutions to make development more sustainable. The United Nations has acknowledged the problem and approved the "2030 Agenda for Sustainable Development". On 1st January 2016, the 17 Sustainable Development Goals (SDGs) of the Agenda officially came into force. These goals cover the three dimensions of sustainable development: economic growth, social inclusion and environmental protection(Salvia, Azul, Brandli, Wall, Filho, 2021). Energy is at the forefront of the development agenda. Recognizing energy's vital role in development and prosperity, the world has committed to Sustainable Development Goal 7 to Affordable and Clean Energy (Banerjee, Moreno, Primiani, Seong, Sinton, 2017). This presented study discusses problems related to the implementation of the Sustainable Development Goal 7: Affordable and Clean Energy, based on the example of the Visegrad Group (V4) countries. The introduction addresses the general characteristics of the V4 and attempts to define the concept of sustainable development, with particular emphasis on its complex nature and importance for future generations. The purpose of the research is to assess the diversity within the Visegrad Group countries in terms of affordable and Clean Energy. The study conducted in the article shows in that between 2009 and 2020, the Visegrad Group countries differed significantly due to all aspects of sustainable energy adopted by the European Union for monitoring sustainable development in the area of Affordable and Clean Energy.

Keywords

Visegrad, SDG, European Union, sustainability, sustainable development

JEL Classification: R5, P25

Introduction

The Visegrad Group (V4) is an informal regional form of cooperation between four countries from Central Europe: Poland, Czechia, Slovakia and Hungary. The group was established in 1991, when the presidents of Poland and Czechoslovakia and the prime minister of Hungary signed a joint declaration in the Hungarian town of Visegrad, defining the goals and conditions of mutual cooperation (Ministry of Science and Higher Education). Since 2004, all V4 countries have been members of the European Union. The Visegrad Group, on the other hand, provides them with a forum for exchanging experiences and developing common positions on issues important to the future of the region and the European Union as a whole. Priority areas of cooperation include the development of transport infrastructure and strengthening the region's energy security . At the basis of cooperation within the V4 was the conviction that it was necessary to fill

the political, economic and military gap that arose after the collapse of the Eastern Bloc and the USSR. It is assumed that the V4 should now become a regional policy tool to reorient communication and energy routes from east-west to north-south. The realization of such goals will promote EU cohesion and harmonization of its level of development. It can also be hoped that the Group will find a stable platform for cooperation in the energy and security arena, although often different perceptions of threats and different strategic interests can be a real obstacle here.

Basic information about V4 members is presented in the table below.

Table 1. Basic information about V4 members (2020)

Country	Population (mln)	GDP per capita at market prices (EUR)	Area thousand km^2
Czechia	10,7	20 120	78 866
Hungary	9,8	13 940	93 030
Poland	38,0	13 640	312 685
Slovakia	5,5	16 770	49 035
UE-27	447,0	26 370	4 476 000

Source: authors' own calculations, data from (Eurostat, 2020)

The area of V4 is more than 533,600 square kilometers. The area is inhabited by 64.0 million people. The largest country among those surveyed is Poland, with nearly 60% of the total V4 area. Poland is also the largest country in terms of population. Its population accounts for almost 60% of the population of the entire V4. The highest GDP per capita was in 2020 recorded in the Czech Republic, and the lowest in Poland. GDP per capita in the Czech Republic was nearly 47% higher than in Poland. However, the level of variation within the V4 Group in terms of GDP per capita, as measured by the index of variation, was relatively small. The V4 area accounts for nearly 12% of the area of the entire European Union, and the area is home to more than 14% of the EU population. GDP per capita in Hungary and Poland is nearly half that of the EU as a whole. The best situation is in the Czech Republic where it is lower by nearly 24%.

Sustainable development (Raszkowski, Bartniczak, 2019) can be defined, for the purposes of this study, as the process of transformations which ensures meeting the needs of the present generation, taking into account intergenerational justice (Starr, 2013), as a result of performing integrated activities in the social, economic, environmental, spatial, institutional and political dimensions (Johnston, Everard, Santillo, Robert, 2007).

Sustainable Development Goals (SDG) are monitored by indicators, which are grouped into 17 areas corresponding to the following objectives: Goal 1: No Poverty, Goal 2: Zero Hunger, Goal 3: Good Health and Well-being, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 6: Clean Water and Sanitation, Goal 7: Affordable and Clean Energy, Goal 8: Decent Work and Economic Growth, Goal 9: Industry, Innovation and Infrastructure, Goal 10: Reduced Inequality, Goal 11: Sustainable Cities and Communities, Goal 12: Responsible Consumption and Production, Goal 13: Climate Action, Goal 14: Life Below Water, Goal 15: Life on Land, Goal 16: Peace and Justice Strong Institutions and Goal 17: Partnerships to achieve the Goal. The defined sustainable development goals should be implemented at different levels of governance from local to international. A very important aspect is the monitoring of this process. It can be done for all of the above goals together, or detailed implementation can be done for one of them. The indicators of sustainable development can be defined as a statistical measure that gives an indication

on the sustainability of social, envi-ronmental and economic development. In the opinion of some researchers, indicators repre-sent the basic instrument for monitoring sustainable development, as they show this concept of development in a rational and measurable manner (Borys, 2005).

The purpose of the conducted research is to assess the spatial differentiation of the Visegrad Group countries in dynamic terms due to the level of realization of indicators in the area of Affordable and Clean Energy, and to identify the impact of the level of socio-economic development of the studied countries on sustainable development in this area. The study also attempts to show how the V4 countries compare with the European Union as a whole. The basis of the analysis was the indicators used to monitor Sustainable Development Goal (SDG) No. 7 Affordable and Clean Energy.

1. Materials and Methods

This study analyzes the indicators that characterize goal 7 Affordable and Clean Energy. The area is characterized by 7 indicators. There are: Primary energy consumption (1), Final energy consumption (2), Final energy consumption in households per capita (3), Energy productivity (4), Share of renewable energy in gross final energy consumption by sector (5), Energy import dependency by products (6), Population unable to keep home adequately warm by poverty status (7). Data from 2009-2020 are available for all of them. The definition of each indicator and its nature, stimulant or destimulant, is presented in Table 2.

Table 2. Sustainable development indicators from the Affordable and clean Energy selected for the analysis – Part 1

No.	Indicator	Definition	Indicator nature
X_1	Primary energy consumption (Million tonnes of oil equivalent)	The indicator measures the total energy needs of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). "Primary Energy Consumption" covers the energy consumption by end users such as industry, transport, households, services and agriculture, plus energy consumption of the energy sector itself for production and transformation of energies, losses occurring during the transformation of energies (e.g. the efficiency of electricity production from combustible fuels) and the transmission and distribution losses of energy).	D
X_2	Final energy consumption (Million tonnes of oil equivalent)	The indicator measures the energy end-use in a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). “Final energy consumption” only covers the energy consumed by end users, such as industry, transport, households, services and agriculture; it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy.	D
X_3	Final energy consumption in households per capita (Kilogram of oil equivalent (KGOE))	The indicator measures how much electricity and heat every citizen consumes at home excluding energy used for transportation. Since the indicator refers to final energy consumption, only energy used by end consumers is considered. The related consumption of the energy sector itself is excluded.	D

Table 2. Sustainable development indicators from the Affordable and clean Energy selected for the analysis – Part 2

No.	Indicator	Definition	Indicator nature
X_4	Energy productivity (1. Euro per kilogram of oil equivalent (KGOE))	The indicator measures the amount of economic output that is produced per unit of gross available energy. The gross available energy represents the quantity of energy products necessary to satisfy all demand of entities in the geographical area under consideration.The economic output is either given as in the unit of Euros in chain-linked volumes to the reference year 2010 at 2010 exchange rates or in the unit PPS (Purchasing Power Standard). The former is used to observe the evolution over time for a specific region while the latter allows comparing Member States in a given year.	S
X_5	Share of renewable energy in gross final energy consumption by sector (Renewable energy sources)	The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants.	S
X_6	Energy import dependency by products (Total)	The indicator shows the share of total energy needs of a country met by imports from other countries. It is calculated as net imports divided by the gross available energy. Energy dependence = (imports – exports) / gross available energy.	D
X_7	Population unable to keep home adequately warm by poverty status (Total)	The indicator measures the share of population who are unable to keep home adequately warm. Data for this indicator are being collected as part of the European Union Statistics on Income and Living Conditions (EU-SILC) to monitor the development of poverty and social inclusion in the EU. The data collection is based on a survey, which means that indicator values are self-reported.	D

Source: authors' own calculations, data from (Eurostat, 2020)

The statistical data necessary for the study came from the Eurostat database [3]. The empirical research used methods of descriptive statistics, dynamic analysis, methods of multivariate statistical analysis, with particular emphasis on methods of linear ordering. Empirical analysis was carried out according to the following steps of the research procedure:

1. Spatial-temporal comparative analysis of indicators from the area of Affordable and clean Energy (X1-X7) using basic parameters of descriptive statistics and indices of dynamics.

2. Selection of final research indicators used for the construction of synthetic measures of sustainability in the area of Affordable and clean Energy.

3. Normalize final indicators using a fixed benchmark.

4. The construction of synthetic measures of sustainability in the area of Affordable and clean Energy and linear ordering of the Visegrad countries.

5. Analysis of the dynamics of changes in the values of synthetic measures of sustainability in the area of Affordable and clean Energy for the studied countries.

6. The construction of Hellwig's synthetic measure (measure of economic development) (Zeliaś, 2000; Hellwig 1981).

To analyze the dynamics of changes in the values of synthetic sustainability measures in the area of Affordable and clean Energy, we used chained absolute increments (the absolute increase in the value of the synthetic measure compared to the previous period) and the average rate of change in the value of the synthetic measure (the average absolute increase in the value in the last survey period compared to the first period).

2. Results

The Primary energy consumption indicator (Million tons of oil equivalent) reached the highest value in all the years studied in Poland. In contrast, the lowest value was recorded in Slovakia. Year after year, the variation between countries is increasing, as evidenced by the increasing difference between the maximum and minimum values and the increase in the value of the volatility index. Comparing 2020 with 2009, it was possible to reduce the value of the index in all countries except Poland.

An analysis of the value of the Final energy consumption indicator (Million tons of oil equivalent) shows that the average value of this indicator increased during the period under study. The minimum value in all the years studied occurred in Slovakia and the maximum in Poland. The variation between countries has increased, as evidenced by an increase in the value of the coefficient of variation and an increase in the difference between the maximum and minimum values.

In the case of the indicator Final energy consumption in households per capita (Kilogram of oil equivalent (KGOE)), it can be observed that the minimum value throughout the period under study occurred in Slovakia. The maximum, on the other hand, occurred in the Czech Republic, except in 2011, where the highest value was recorded in Hungary. During the period under study, the variation between countries decreased. This is evidenced by the decreasing value of the coefficient of variation and the narrowing difference between the maximum and minimum values. Hungary is also the only country where the value of the index decreased in 2020 compared to 2009. It should also be noted that the average for the V4 countries in 2009-2018 is lower than the average for all EU countries. Only the last two surveyed have a different situation.

The average value of the Energy productivity index (1. Euro per kilogram of oil equivalent (KGOE)) has been increasing year after year. The highest value in all years was recorded in Slovakia, and the lowest in the Czech Republic. The exception is 2018 where the lowest value occurred in Poland. The variation between countries in the period under review was unchanged. The value of the indicator increased in all countries in 2020 compared to 2009. The average value for the V4 countries is lower than the average for all EU countries.

Analysis of the Share of renewable energy in gross final energy consumption by sector (Renewable energy sources) indicator showed the positive phenomenon of a steadily increasing share of this type of energy. This share has increased in all countries. The highest of nearly 8 percentage points was recorded in Slovakia. The highest value of the indicator occurred in 2009-2013 in Hungary, in 2014-2018 in the Czech Republic and in the following years in Slovakia. The lowest value occurred in Poland in 2009,2011 and 2014-2017. In Slovakia in 2010, 2012-2013 and 2018. In Hungary 2019-2020. A positive

phenomenon with regard to the analyzed indicator is the systematically decreasing differentiation.

The values of the Energy import dependency index (total) show a clear decrease in the variation between countries. The highest value in all years except 2020 was reached by the indicator in Slovakia. In 2020, the highest value was recorded in Hungary. The minimum value occurred in the Czech Republic (2009-2012 and 2017-2020) and in Poland in 2013-2016. A positive phenomenon is the lower average value for the V4 Group in all the years studied than the average for the European Union as a whole.

A positive phenomenon is the steadily decreasing value of the Population unable to keep home adequately warm by poverty status (Total). The average value in the period under study decreased by nearly 4.7 percentage points. It is also positive that the value of the indicator is falling steadily in all the countries studied. The decreasing variation between countries should also be assessed as positive.

The values of the various indicators during the period under study in the countries analyzed are shown in the figures below.

Fig 1. The value of individual indicators in the analyzed period (%) – Part 1

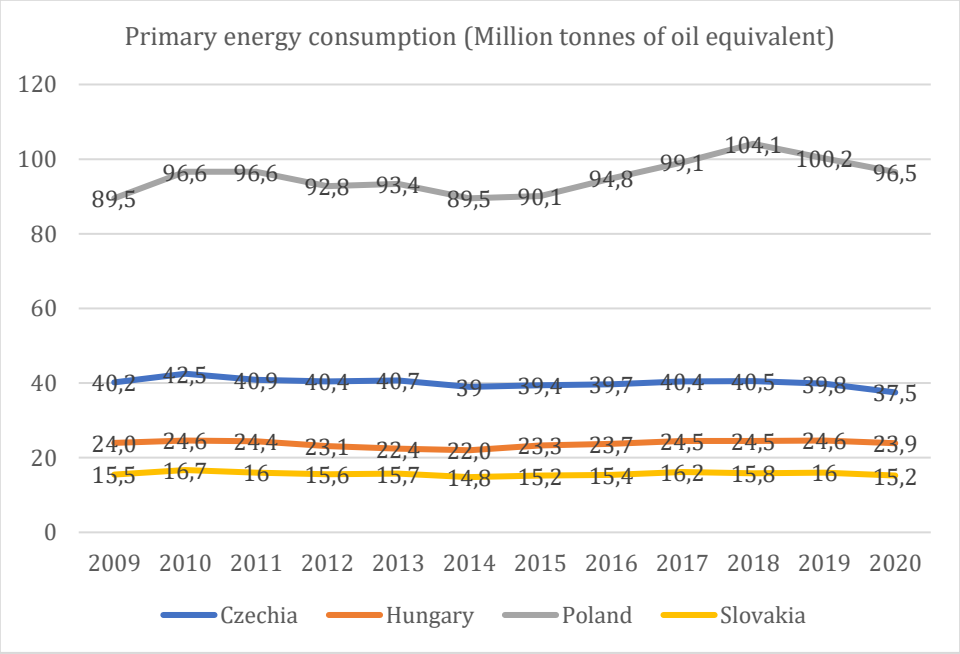
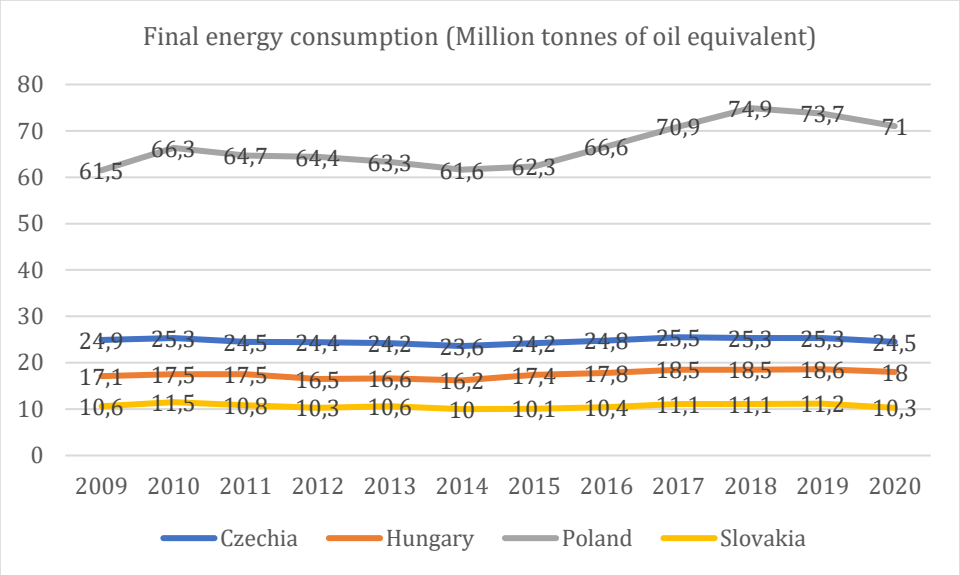
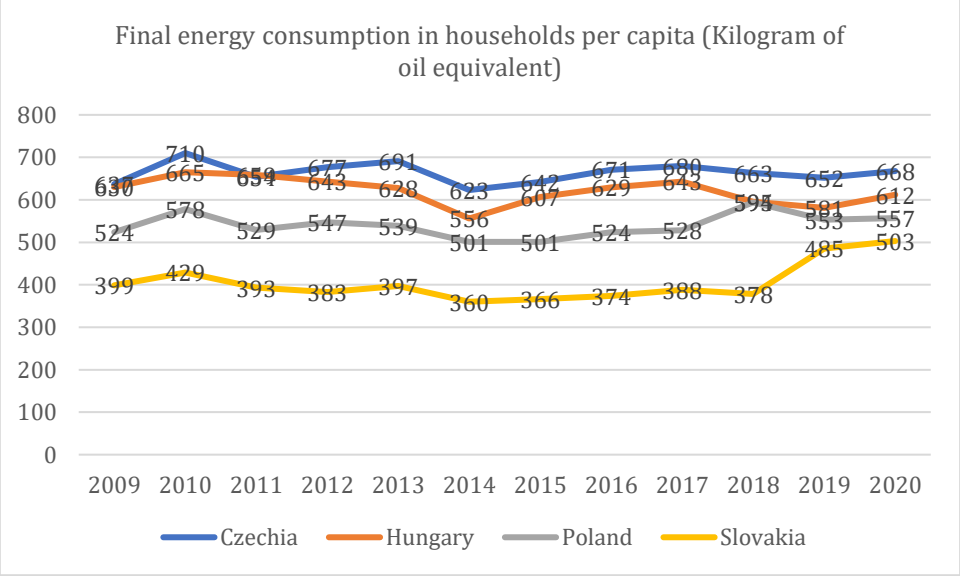


Fig 1. The value of individual indicators in the analyzed period (%)– Part 2





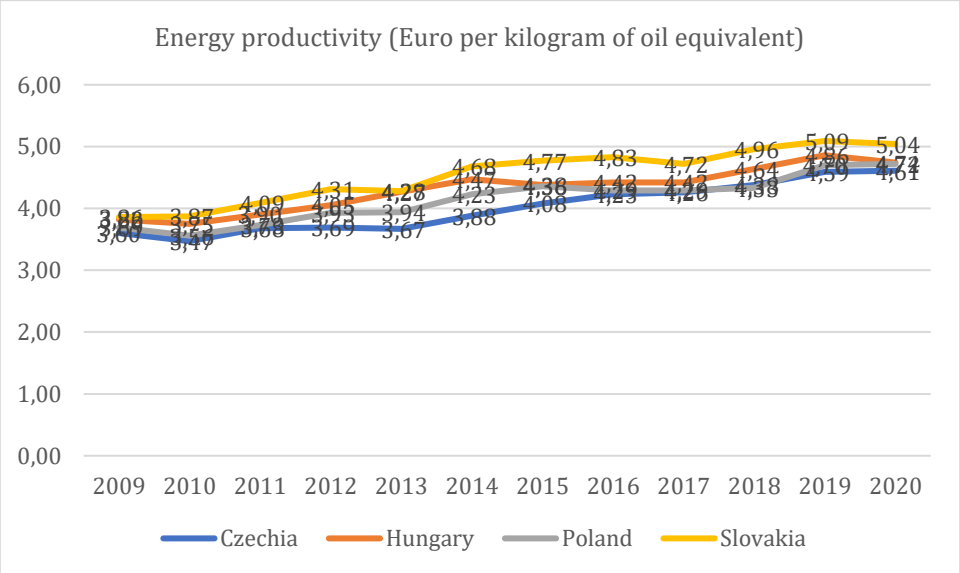
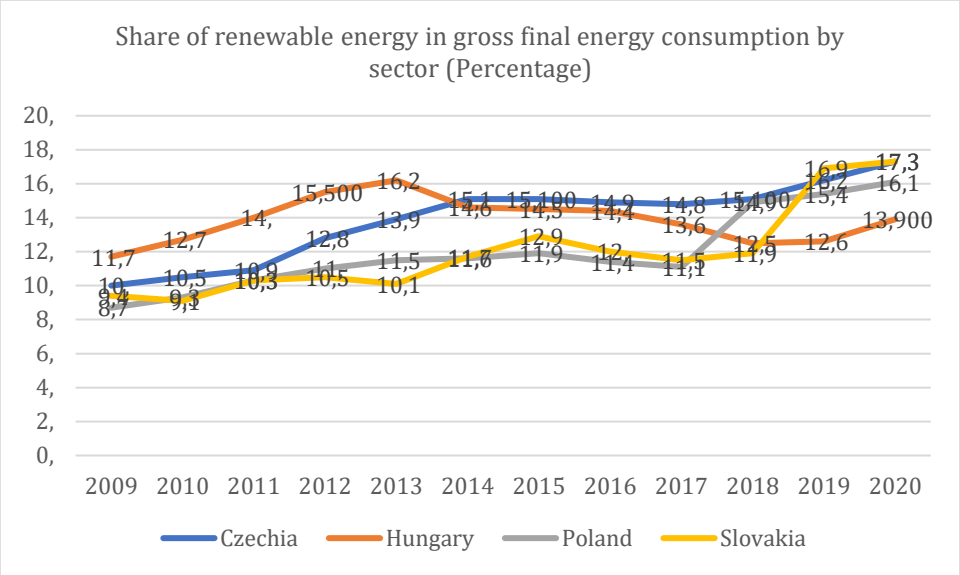
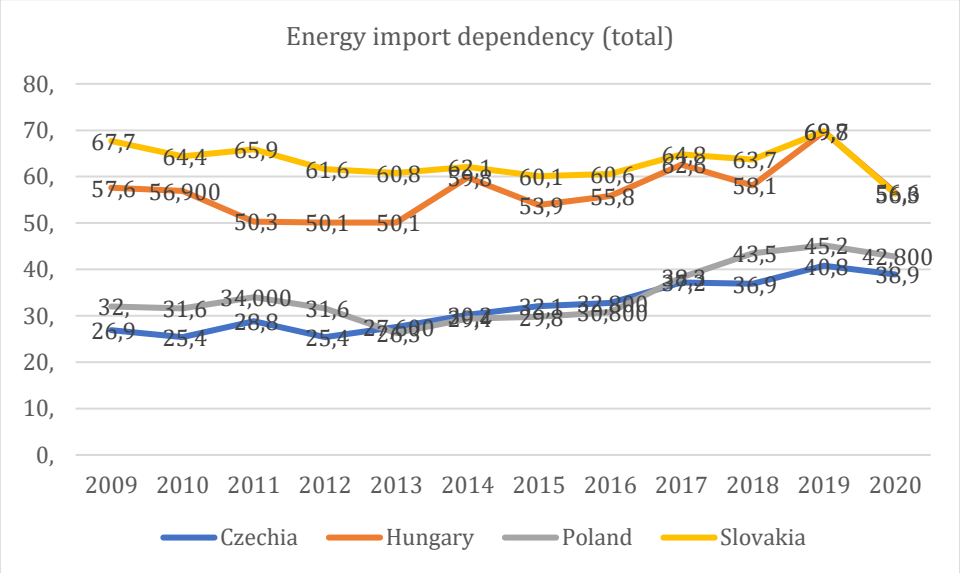
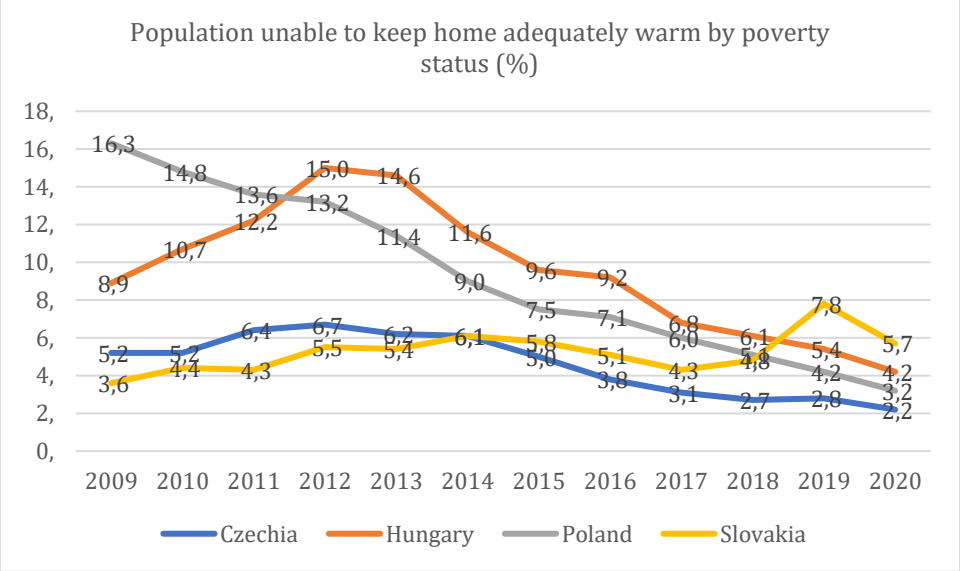


Fig 1. The value of individual indicators in the analyzed period (%) – Part 3





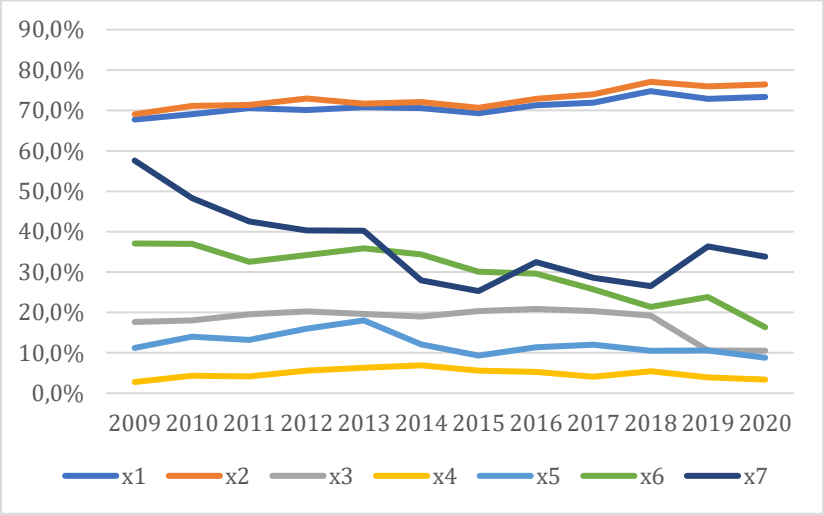


Source: authors' own calculations, data from (Eurostat, 2020)

Sustainability indicators in the area of Affordable and Clean Energy compiled in Table 2. were subjected to selection due to the required properties presented in Chapter 2 of this study. All indicators analyzed are measurable, interpretable. Five of them are destimulants and two were identified as stimulants. Statistical information for all indicators is available for the years 2009-2020.

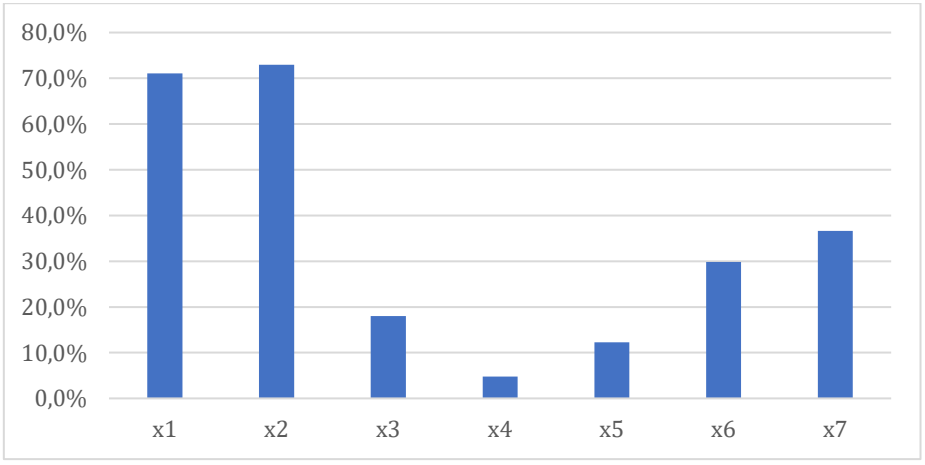
Fig. 2 shows the values of coefficients of variation for 7 indicators from the energy area in GV countries in 2009-2020 and Fig. 3 shows their average values. As can be observed, by far the highest variability throughout the analyzed period was characterized by indicators X2 (Final energy consumption (Million tons of oil equivalent)) and X1 (Primary energy consumption (Million tons of oil equivalent). The Visegrad Group countries showed the least average variation over the period under study due to x4: Energy productivity (Euro per kilogram of oil equivalent (KGOE), x5: Share of renewable energy in gross final energy consumption by sector (Renewable energy sources) and x3: Final energy consumption in households per capita (Kilogram of oil equivalent (KGOE).

Fig 2. Values of coefficients of variation for sustainability indicators in the area of Affordable and Clean Energy from 2009 to 2020 in the space of the Visegrad Group countries



Source: authors' own calculations, data from (Eurostat, 2020)

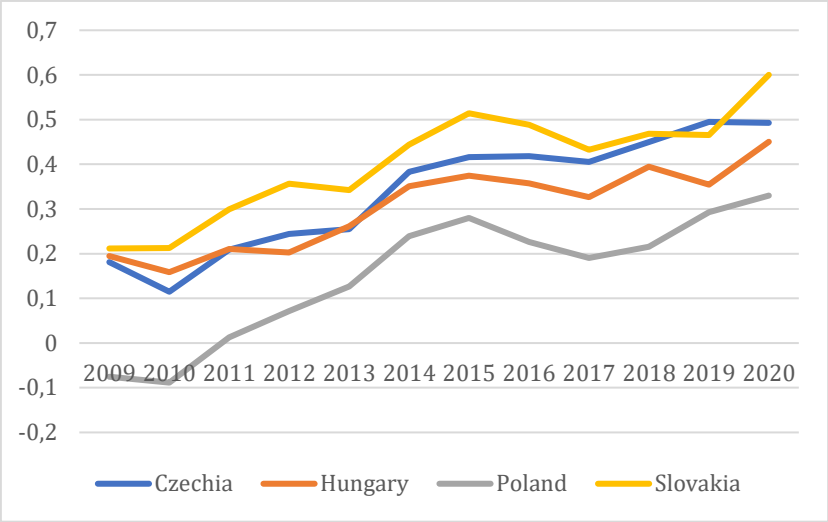
Fig 3. Average values of coefficients of variation for sustainability indicators in the area of Affordable and Clean Energy from 2009 to 2020 in the space of the Visegrad Group countries



Source: authors' own calculations, data from (Eurostat, 2020)

The final energy indicators were normalized (cf. Formula 2), as a result of which they became sustainability stimulators and, as such, formed the basis for the construction of the Affordable and Clean Energy synthetic sustainability metrics shown in Figure 4.

Fig 4. Values of synthetic measures of sustainability in the area of Affordable and Clean Energy in the Visegrad Group countries



Source: authors' own calculations, data from (Eurostat, 2020)

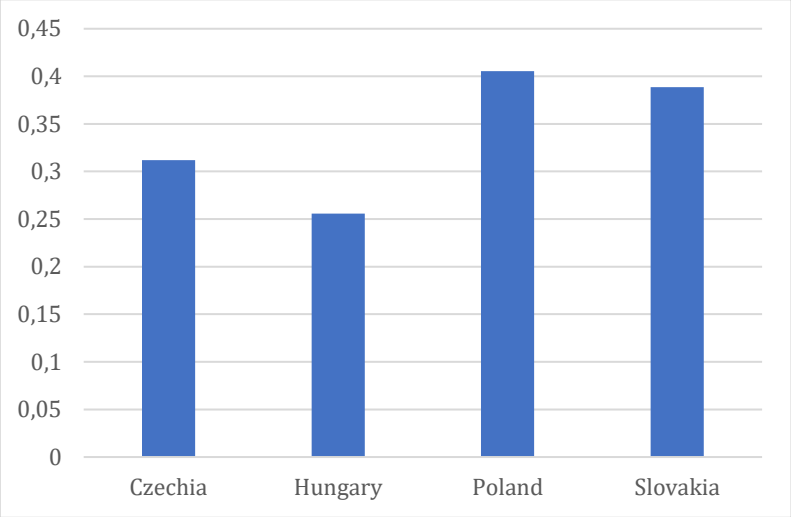
Table 3 and Figure 5 show the measures of the dynamics of change established for the Affordable and Clean Energy synthetic measures of sustainability.

Table 3. Values of absolute increments of chained synthetic measures of sustainability in the area of Affordable and Clean Energy for the Visegrad Group countries

Years	Absolute changes			
	Czechia	Hungary	Poland	Slovakia
2010/2009	-0,06599	-0,03608	-0,01305	0,000855
2011/2010	0,094209	0,051769	0,101431	0,086883
2012/2011	0,034815	-0,00767	0,058932	0,057012
2013/2012	0,011053	0,05834	0,055164	-0,01406
2014/2013	0,127907	0,089854	0,111866	0,101433
2015/2014	0,033508	0,023616	0,040965	0,070192
2016/2015	0,002074	-0,0172	-0,05373	-0,02522
2017/2016	-0,0131	-0,03069	-0,03534	-0,05645
2018/2017	0,044797	0,068008	0,024531	0,036376
2019/2018	0,044829	-0,04007	0,077522	-0,00335
2020/2019	-0,00224	0,09583	0,037174	0,134971

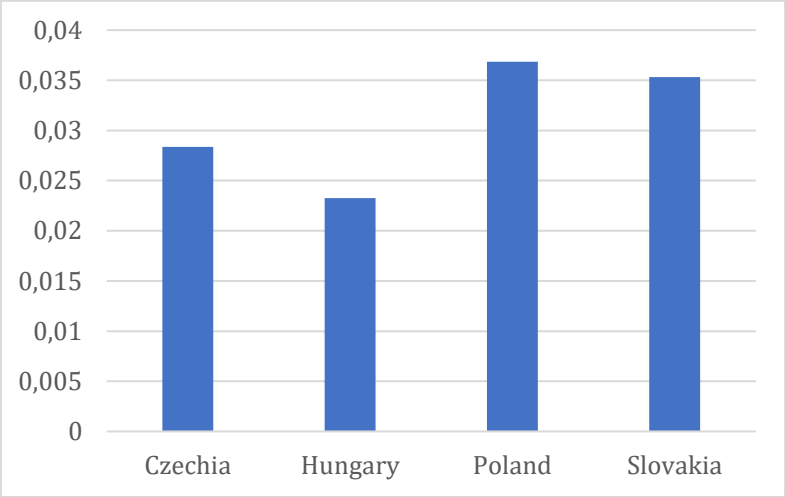
Source: authors' own calculations, data from (Eurostat, 2020)

Fig 5. Values of absolute growth and average rate of change of the development measure for the Visegrad Group countries



Source: authors' own calculations, data from (Eurostat, 2020)

Fig 6. Values of the average rate of change of the SSDNP measure for the Visegrad Group countries



Source: authors' own calculations, data from (Eurostat, 2020)

3. Discussion

The study shows that between 2009 and 2020, the Visegrad Group countries differed significantly due to all aspects of sustainable energy adopted by the European Union for monitoring sustainable development in the area of Affordable and Clean Energy (see Table 2). However, the intensity of variation among the countries studied was different in the space of energy indicators (X1 - X7), and it also changed over time (cf. Figure 2.). By far the greatest variation, with a minimal tendency to increase it, throughout the period under study was observed for Final energy consumption (Million tons of oil equivalent) - indicator X2 and Primary energy consumption (Million tons of oil equivalent) - indicator X1. The average value of the coefficient of variation from 2009 to 2020 was 73, 0% and 71.0% for these indicators, respectively. At the same time, for both of these indicators, the worst situation was in Poland, and the best in Slovakia. During the period under review, the average value of both indicators increased slightly.

The Visegrad Group countries had the smallest average variation due to Energy productivity (Euro per kilogram of oil equivalent). The average value of the index of variation was 4.8%. Also characterized by low variation was Share of renewable energy in gross final energy consumption by sector (Percentage). Indeed, its average value was 12.3%. There is also a noticeable tendency for the disparity between GV countries to further decrease due to the mentioned indicators.

In the period 2009-2020, a decreasing trend was observed in the differentiation of the studied countries due to Population unable to keep home adequately warm by poverty status (%). This was mainly due to the decisive improvement of the situation in Poland, where the value of the indicator decreased by nearly five times. Also, there was a decreasing trend in the variation of the Energy import dependency (total) indicator. The decrease in this case amounted to more than 20 percentage points.

A comprehensive assessment of the variation of sustainable development in the area of poverty in the Visegrad countries requires an analysis of both the level of development and the dynamics of its change. The level of sustainable development in the area of Affordable and Clean Energy in the 2009-2020 GV countries varied, but showed an increasing trend in each of the analyzed countries (see Figure 4). Slovakia proved to be the clear leader in the area under study. Consistent second place throughout the period under study was occupied by the Czech Republic, closely followed by Hungary. By far the worst situation was in Poland during the period under review.

An analysis of the chained absolute increments calculated for the synthetic measures of sustainability in the Affordable and Clean Energy area (see Table 3) shows that in none of the countries was there an annual uninterrupted absolute increase in the level of sustainability in the study area. In every GV country, there was a reduction in the level of sustainable development in a given year compared to the previous year between 2009 and 2020. This situation occurred three times in the Czech Republic and Poland, four times in Slovakia and five times in Hungary.

By far the largest absolute increase in the level of sustainability in the area of Affordable and Clean Energy in 2020 compared to 2009 was observed in Poland and Slovakia. The Czech Republic and Hungary had the highest absolute increase (see Figure 5). An analogous ordering of countries occurred due to the average annual growth of the level of sustainable development in the analyzed area in 2009-2020. If similar dynamics of changes in the level of development continue, in the following years one can expect an increase in the level of sustainable development with simultaneous equalization of disproportions occurring between the Visegrad Group countries in the analyzed area.

Conclusions

In conclusion, the research carried out is extremely valuable. Sustainable energy, renewable energy sources, moving away from fossil energy sources is one of the challenges of the modern world. Countries from Central and Eastern Europe, including the V4 members, are also facing this challenge. For these countries, such a transition is a very big challenge, due to the fact that in the past their entire energy mix was based on coal. For them, moving away from this energy source is quite a challenge.

On the other hand, in these countries, the concept of sustainable development is implemented at all levels of governance - from national to regional to local. An equally important aspect is the monitoring of the implementation of this development concept at international level. In this article, the chosen research area was the V4 countries.

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The analysis has led to a number of conclusions, both in scientific and practical terms. The research has shown that the V4 countries have done a tremendous amount of work towards meeting the challenges of Objective 7. In most aspects of the research, the countries do not differ significantly from each other. The largest country surveyed was Poland, where the situation differs from the other countries in several aspects. However, it should be stated that in the following years it will be necessary to monitor the progress of these countries in expressing the concept of sustainable development. Sustainable and clean energy is one of the areas where such an analysis needs to be made in particular.

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ROSI and Tools for Monetizing Sustainability (ESG) Measures

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Abstract
Environmental, social and governance impacts of expenditures are part of every management decision. Investments in sustainability and CSR comply with ESG factors. Following the approval of the CSRD Directive by the EC, ESG issues are set to grow. We want to explain to companies that the ROSI issue is significant concerning the above and that there are methods to help them monetize sustainability in the future. Mention is made of the 5-step methodology by The NY University Stern Center for Sustainable Business and the Impact-Weighted Accounts method by the Harvard Business School. Both are set in a study from the automotive industry. Sustainability is not only about the environmental, societal and economic aspects; companies must keep track of financial performance. Therefore, it is essential to implement tools for monetizing sustainability measures - the future of sustainable business is about to turn from being a necessary evil to being remunerative good.

Key Words
ROSI, *IWA*, *ESG*, *sustainability*, *SDGs*, *performance*, *economic value*

JEL Classification: M14, D25

Introduction – Sustainable Investing

As quoted by the United Nations World Commission on Environment and Development, "sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 2022). Due to increasing and more intense discussions on climate change and human rights, people have become progressively aware of companies' appropriate environmental, social and governance (ESG) behaviour. A study by *The Economist Intelligence Unit* (commissioned by *WWF*) proved that the number of consumers' Google searches for sustainable goods increased globally by 71 per cent from 2016 to 2020 (Kerle, 2022, p. 6). This trend is visible in developed countries and especially in emerging markets. The same study found that engagement and awareness have grown most notably in Asia (India (190%), Pakistan (88%) and Indonesia (53%)). *The Economist* calls this development "eco-wakening". Therefore companies are forced to satisfy the product criteria of sustainability to stay competitive. From the environmental point of view, the "private sector must keep sustainability efforts across all industries" (Kerle, 2022, p. 42) on a high level to preserve nature radically.

Investments in sustainability and CSR measures comply with so-called ESG factors. Environmental, social and governance impacts of expenditures are part of every short-term or strategic decision. Environmental impacts embrace carbon footprint, waste, water use and conservation, and the clean technology it uses and creates in its supply

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chain. The social investment pillar includes social issues, such as human rights, racial diversity within hiring and inclusion programs, employees' health and safety, and community engagement. From the governmental perspective, investments are evaluated by reference to executive compensation and diversity, shareholder rights, overall transparency and disclosure, anti-corruption, and corporate political contributions in the dimension of management and board (Strobierski, 2022).

Companies (regardless of the industry) must orientate towards this sustainable Good Governance approaches; for instance, prevention of corruption, money laundering or the commitment to the UN Principles for Responsible Investing (UN PRI Association, 2022; EURAMCO, 2022), which are the following:

1. "incorporating ESG issues into investment analysis and decision-making processes,
2. being active owners and incorporating ESG issues into the ownership policies and practices,
3. seeking appropriate disclosure on ESG issues by the entities in which we invest,
4. promoting acceptance and implementation of the Principles within the investment industry,
5. working together to enhance the effectiveness of implementing the Principles,
6. reporting on the activities and progress towards implementing the Principles" (Jeucken et al., 2020, p. 2).

Moreover, these principles match the "5 Qualities of SDG Leadership" of the *United Nations Global Compact*, which substantiate sustainable Corporate Governance through guidelines to fulfil the 17 SDGs. Concluding, an enterprise, regardless the size, should focus on "involving a strategic vision and contributing to the SDGs" (Quality 1: Intention) and be ambitious on both "long-term progress" and "shorter-term contributions to the SDGs" (Quality 2: Ambition). Withal it occurs as an essential aspect that the enterprises are consistent in every decision, action or communication they are responsible for (Quality 3: Consistency) to underpin reliability in society. A negative example of consistency would be Greenwashing; now, harmful actions are concealed by communication. Furthermore, the guidelines take a collaborative aspect into account: Corporations should establish partnerships with different stakeholders and institutions in the business environment, e.g. "civil society organizations, academia, investors, and local communities", which primarily supports the social pillar of sustainable investment. The last quality aspect of good SDG Leadership is that an enterprise must be accountable for every decision it takes, particularly for the impacts of corresponding actions. That is coherent with transparency towards every group of stakeholders and regarding their opinions and ideas (Quality 5: Accountability) (Casey and Marijs, 2017, p. 5).

Transparency and accountability lead directly to the issue of how corporations measure the efficiency of investments to be able to report it to share- and stakeholders.

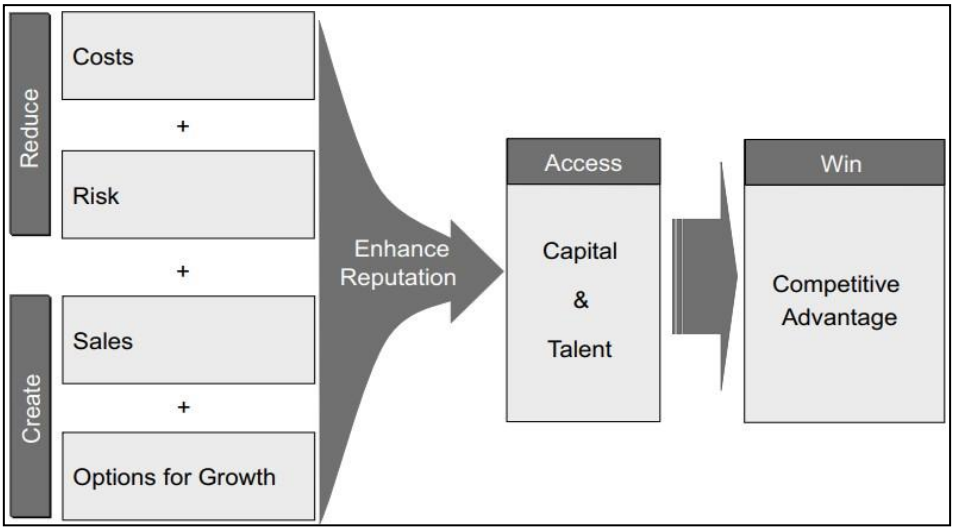
1. Methods of Research - Return on Sustainability (ROS)

In this paragraph, the measurability of sustainable investments and the methodology of two different but complementary approaches will be discussed and explained by reference to an example.

1.1 Kinds of return of sustainable investments

Measuring return on investment can focus on several aspects of business planning. The fact that reducing costs and decreasing risk – on the one hand – and "growing sales and options for future growths" (Hedstrom, 2018, p. 47) – on the other hand – result directly or indirectly in higher revenue and consequently in better productivity and return, makes the issue more complex than just focusing on a more significant number of sales (Fig. 1). Together, these areas have seen "sustainability reappears as a source or driver of value for business" (Van Holt et al., 2020, p. 3 399).

Fig. 1: The Original Business Case for Sustainability



Source: authors' own elaboration, data from (Hedstrom, 2018, p. 15)

A sustainable business model can reduce costs in various realms of the enterprise. First, expenses can be decreased by saving energy and efficient energy usage. Once there are strict standards for energy usage, which may even be programmed by Internet of Things (IoT) measuring sensors, operational costs can drastically be diminished. Further, alternative green energy sources like solar and wind help shrink energy costs. Although shifting to new energy sources typically correlates with a significant investment case, expenditures can be amortized within a timespan of only around ten years. Green energy returns are measurable by comparing energy bills before and after shifting to a new energy source or before and after installing a more efficient method for energy consumption (Zujewski, 2022).

Moreover, reducing costs is not only about energy but also about water management. Straightforward means are, in the first place, differentiating the usage of potable and grey water. For instance, on the one hand, the latter could be conserved and reused for watering plants so that the potable water is just for drinking. Other easy means could be installing auto on/off faucets in sinks or using drip technology to water plants to lower the expenses on water usage, which can be tracked by comparing the water bills. Further sections are waste management (by establishing awareness among staff) and fleet efficiency (by conscious driving and maintenance), which can lead to a decrease in costs and, thus, to an increase in the productivity of capital. The return of these practices again becomes visible in the bill respective. Finally, every corporation is to consider whether business travel is necessary and, if yes, what can be done to keep the carbon footprint as small as possible by choosing the proper means of transport or paying a carbon offset (Zujewski, 2022). These considerations will lead to more reasonable travel and an economization of good expenses.

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Besides cost reduction, risk reduction is the other "low-hanging fruit" (Hedstrom, 2018, p. 48) with a relatively long-term focus. It means adjusting the business strategy to current environmental and societal circumstances and anticipating future developments, e.g. regulations, resource scarcity and price volatility; furthermore, ensuring a consistently trustworthy supply chain. At the bottom line, both factors cohere with an accumulation of savings within the company, which can subsequently be reinvested in sustainability.

In addition, „sustainable attention and investment can work as revenue and (brand) growth guarantors" (Hedstrom, 2018, p. 16). Companies can adapt their products according to ESG values and CSR trends. That is achievable by sustainabilitization and glocalization of the product portfolio (Nicole, 2022). As a result of green and community-oriented behaviour, the brand value and reputation will be enhanced. That comes from the before-mentioned customer and investor demand for sustainable enterprises, which is underlined by BlackRock CEO Larry Fink (Sorkin, 2018):

"Society is demanding that companies, both public and private, serve a social purpose … To prosper over time, every company must not only deliver financial performance but also show how it makes a positive contribution to society. No public or private company can achieve its full potential without a sense of purpose."

Aside from increasing revenue and enhancing reputation, the "war for talent" (Hedstrom, 2018, p. 253) has been an eminent challenge for companies to face for years (compare Mitchell et al., 2022, p. 4: Global CEOs state „attract and retain talent" as top focus issue for 2022). According to a study by *The Conference Board,* CEOs give "emphasis on building more employee-centric cultures around innovation, skill development, leadership development, and agility" (Mitchell et al., 2022, p. 21). All these aspects represent investments into internal CSR measures and in sustainability, too (Gillai et al., 2021, p. 34), which hence results in a sustainable advantage over the competitors in the labour market, which again results in higher productivity due to more qualified talents (Fig. 1).

To emphasize the findings mentioned above, a statistic from the *Sustainable Procurement Barometer 2021* (Fig. 2) will prove the suitable environment, as leaders and non-leaders were asked to evaluate the impact and importance of sustainability initiatives on various business aspects. The highest consensus among leaders was on sustainability initiatives to "mitigate risk" (85 %) and "increase resilience" (70 %). Still, over half of the respondents (52 %) see "saving costs" as a return on sustainability, and almost half (44 %) could improve their "supply chain department and talent retention and acquisition" and thus productivity. Almost six out of ten leaders remarked on adaptions within the product portfolio, particularly new innovative products and services associated with a broader spread in (price) differentiation (high-range price segment).

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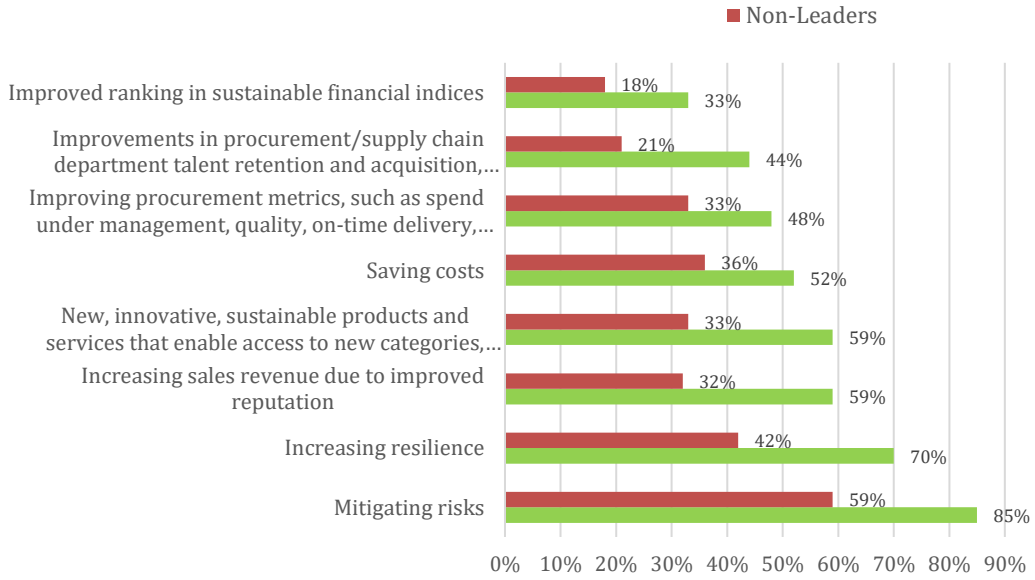
Fig. 2: Benefits of sustainable procurement: Leaders vs Non-Leaders



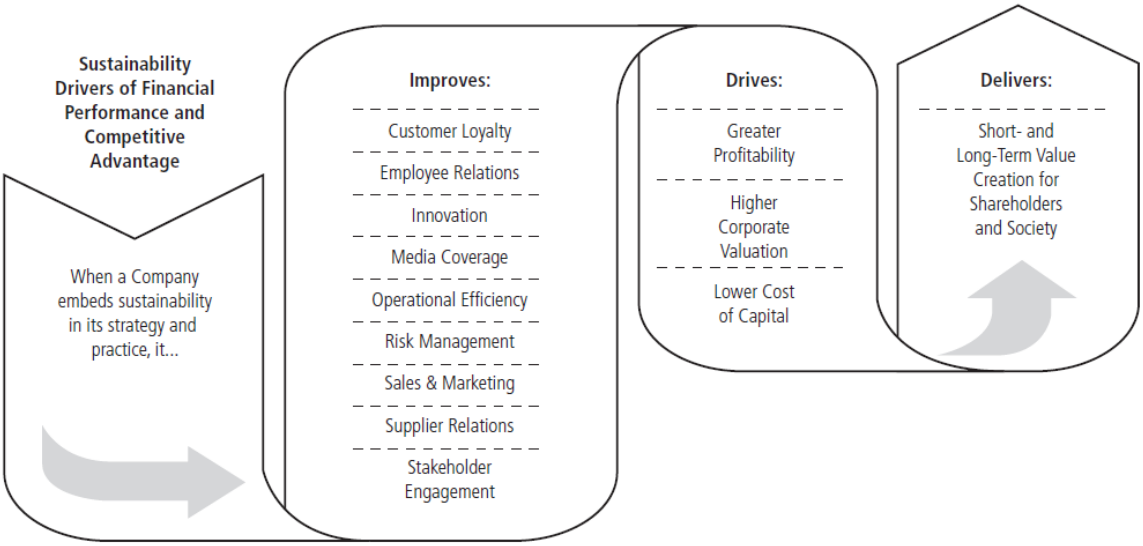
Source: authors' own elaboration, data from (Gillai et al., 2021)

1.2 Return on Sustainable Investments 5-step-methodology by NYU Stern CBS (ROSI™)

As discussed in the previous chapter, embedding "ESG risks and opportunities" into every single short- or long-term business process improves numerous components of management, e.g. risk management, talent management or innovations, which drive growth, profitability and corporate value. What is missing at this point is the quantification of the "business value & positive societal impact" (Whelan et al., 2021, p. 11), despite the several statistically discovered cohesion between corporate financial performance and sustainability activities. That is for example, Clark et al. (2015) explored that 90 % of sustainably developed enterprises have lower costs of capital, almost that many (88 %) experienced higher operational performance through "ESG practices" and to that the stock price performance of even 80 % was "positively influenced by good sustainability practices".

Therefore *The New York University Stern Center for Sustainable Business* has created a framework (Fig. 3) using which companies can "assess the full range of costs and benefits associated with proposed sustainability activities" (Whelan et al., 2021, p. 3). This methodology and instrument seem essential for creating transparency among stakeholders, especially for shareholders whose investment decision is dependent on reliable accounting of corporations.

Fig. 3: The Framework of Sustainability Drivers of Financial Performance & Competitive Advantage



Source: (Atz et al., 2021)

Before releasing this framework, it was not possible respective trivial to account for all costs or benefits of sustainability activities. On the one hand, operational efficiency can improve profitability through water and waste management, for example, which is indeed measurable; on the other hand, enterprises are not able to precisely measure the financial benefit of a better employee relationship because collecting data concerning relationship on employee engagement turns out to be difficultly gatherable. Hence *The NYU Stern Center for Sustainable Business* has conceptualized a solution that "explains why, when companies solve sustainability challenges, financial performance may change" by using factors according to Fig. 3 ("Improve"-column) (Atz et al., 2021, p. 307).

So, there was elaborated a methodology containing five steps to monetize the cost or benefits of sustainable (CSR) activities (see Fig. 4):

Fig. 4: 5-Step-Framework for Monetizing Sustainable Activities

1	Identify Material ESG Issues & Strategies
	Identify material sustainability challenges (referencing frameworks such as SASB and GRI) and how the business addresses associated risks and/or opportunities.
2	Assess Practices
	Determine which practices have been implemented to address sustainability strategies.
3	Define Benefits
	Define the types of economic benefits that could be expected from the changed practices through the ROSI mediating factors.
4	Quantify Benefits
	Estimate the magnitude of those benefits and when they could be realized.
5	Monetize
	Translate the benefits into economic value, stress test, and then forecast ROI.

Source: (Whelan et al., 2021; own depiction)

As described by Atz et al. (2021), it starts with collecting information about all measures undertaken by the company to tackle risks and opportunities, gathered with the aid of the

company's assessment, rankings, or sustainability report, as well as interviews with responsible persons. Step two deals with assessing what measures were implemented regarding sustainability strategies. Afterwards, the benefits are to evaluate and classify through the lens of mediating factors. This will lead assessors to conclude that one mediating factor might cause more than one benefit. For instance, deforestation-free palm oil might lead to more palm oil (due to investments in soil instead), thus higher productivity, employee satisfaction, positive news reports after the deforestation-free commitment, and less emitted greenhouse gases. Step four quantifies the costs and benefits associated with sustainability actions through gathered data (step 2) and divides them into the project- or company-specific. The costs of sustainable practices also need to be calculated when aiming for the net benefit. It may be helpful to include scenarios or sensitivity analyses to mitigate the inevitable uncertainty of future value projections of data, which can also be incomplete. Lastly, all benefits are converted into economic value. At this point, it does not matter *what* accounting measure the company uses; the only relevant aspect is that they show the benefits impact or impacted financial results. Feasible accounting options could be Earnings Before Interest and Taxes (EBIT) or the net present value contemplation (Atz et al., 2021, p. 309).

1.3 Impact-Weighted Accounts Project at Harvard Business School (IWA)

Besides the ROSI of the *NYU Stern Center for Sustainable Business,* the *Harvard Business School* established another methodology for monetizing the impact of sustainable initiatives so that decision-makers are not able to "ignore impacts on employees, customers, the environment and the broader society" (Serafeim et al., 2019, p. 5) anymore and so capitalism will be reimagined. Another reason is that "Environmental product declarations are barely understandable for non-expert readers" (Van Kampen, 2018). Therefore, a tool was designed to

1. help managers readily receive all relevant information concerning the societal and environmental impact of planned/undertaken sustainability practices,
2. deliver support for decision-makers regarding the (sustainable) process and investment planning.

Display ESG impacts on a monetary level so that reliability and transparency of corporate performance accounting are improved, which is also of great importance for stakeholders, especially investors (Serafeim et al., 2019, p. 5).

In detail, the framework of the tool takes three primary pillars into account:

- Environment (impact from organization´s operations on the environment)
- Product (impact on society and environment from product use)
- Employment (impact on organizations on their employees)

These three pillars are evaluated based on the following criteria (see Fig. 6).

Fig. 6: IWA impact criteria

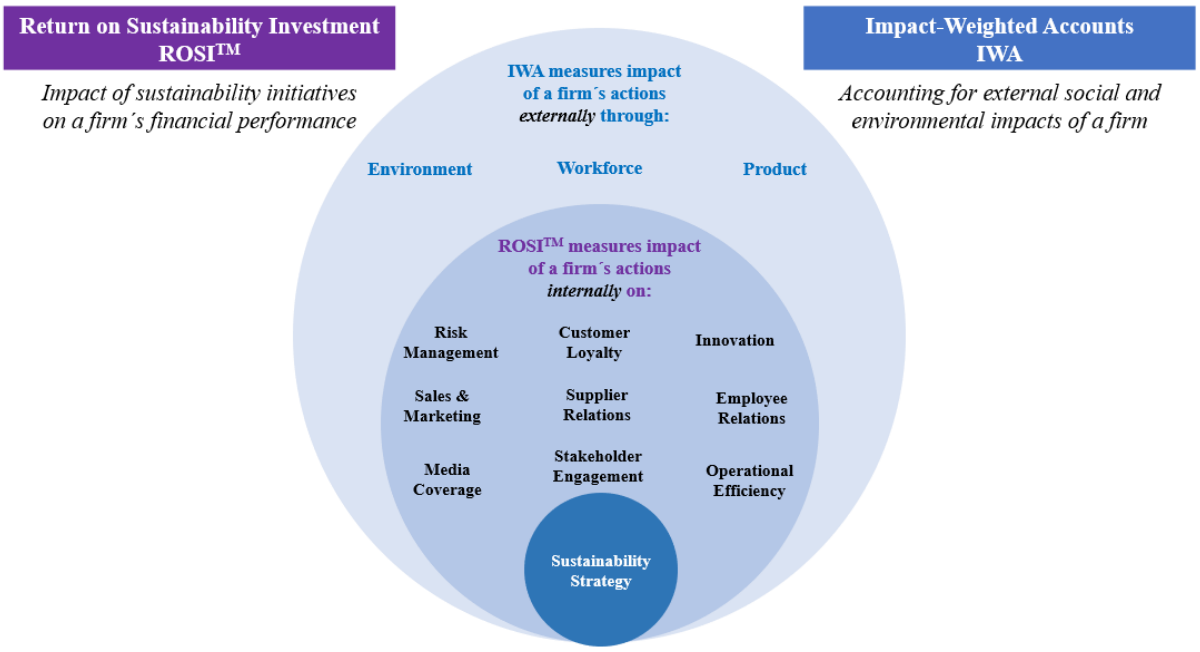
Environment	Employment	Product
Total GHG Emissions	Location	Affordability
Total Water Withdrawal	Diversity	Uderserved
Total Water Discharged	Wage quality	Health and Safety
Suplhur Oxide Emissions	Opportunity	Basic Need
Nitrogen Oxide Emissions	Career Advancement	Effectiveness
VOC Emissions	Health and Wellbeing	Optionality
Carbon Offsets		Environmental Usage
		Recyclability

Source: own elaboration

2. Results – Automotive Industry (ROSI™ vs. IWA)

To shift both approaches from theory to practice, a study examining the automotive industry describes influences on the (potential) financial performance as a consequence of several sustainable initiatives and strategies. The *Return on Sustainable Investing* methodology by *CSB* and the *Impact-Weighted Accounts* methodology by *Harvard Business School* were joined together. In the following Fig. 7, the complementarity of both approaches becomes visible. On the one hand (ROSI), the "impact of sustainability initiatives" (internal actions), and on the other hand (IWA), the "external social and environmental impacts" (external actions) are considered (Whelan et al., 2021).

Fig. 7: Complementarity of ROSI and IWA



Source: (Whelan et al., 2021)

The automotive industry is one of the most extensive worldwide, with high investment volume and intensity. Furthermore, the environmental impacts exceed those of many other industries because of material- and emission intensity. The impact of the supply

chain starts with the sourcing of raw materials for parts, such as bodywork (steel), interior (plastic) or battery (Lithium), continues with emissions while driving and ends with the disposal of the vehicle. Thus, there are many spots for implementing sustainable strategies.

The study researched the impact of three areas of sustainability in the industry: recalls, waste management and volatile organic compounds (VOC) emissions:

Whelan et al. (2021, p. 5 et seqq.) found that reducing the number of *recalls* influences the corporate financial performance; i.e. through internal sustainability initiatives, one company can save more than 550 million dollars. Those savings derivate from repair costs per recall, expenses related to increased quality control redesigned parts, and additional training. To that, lost revenue and legal & public relations costs represent two third of the total costs. Investments in sustainable innovations and better communication along the supply chain partners would reduce these unnecessary expenses. On top, the external observation (IWA) reveals that 675 million dollars could be spared through product health and safety investments, which would increase customer health, safety, and privacy.

The second research object was *waste management* in automotive corporations. It is stated that improving not only material but also water recycling processes (e.g. recycling of end-of-life vehicles), concomitant reducing cost from traditional waste disposal, result in savings of approximately 235 million dollars. By improving issues which influence externalities impacting customers and the environment, such as "recyclability and recoverability", up to 0,6 % of the revenue (or 995 million dollars) can be spared by automotive companies.

The third section with potential for sustainable development is *VOC emissions*. By internal sustainable initiatives, such as reducing solvent, using substitutes for solvent, and solvent waste treatment, 92 million dollars per company can economize. Moreover, worker compensation claims or lost productivity (due to health issues) means savings in the future. According to the IWA methodology monetizes the value for the cost of workplace injury and illness at 13.6 million dollars. Using investments in workplace improvements and cutting VOC emissions, a significant share of those expenses and environmental damage with a value of up to 122 million dollars could be eliminated (Whelan et al., 2021, p. 5 et seqq.).

3. Discussion

Managing to engage decision-makers at all levels of a company on sustainability matters is a common challenge for experts trying to improve environmental corporate performance. Sustainability professionals can use methods such as Life Cycle Assessment (LCA) to quantify the environmental impacts of their products or processes, or Material Flow Cost Accounting (MFCA) to quantify the true cost of the losses and in-efficiencies of their production systém. How can environmental impacts be effectively communicated to corporate decision makers? One potential solution is the monetisation of environmental impacts (i.e. converting impacts into monetary/financial terms).

Translating a portfolio of environmental pressures into standardised monetary terms allows for a simplified understanding of the areas of greatest relative importance. This is imperative in pinpointing where to focus efforts for effective decision-making.

Monetization is also increasingly being used by companies as an internal benchmarking tool.

Despite significant progress in the development and implementation of monetization methodology, the process can be complex and incorporate a range of uncertainties. The need for better standardization and guidance on monetizing environmental impacts has led to the development of an international standard, ISO 14008, "Monetary valuation of environmental impacts and related environmental aspects". This European Standard was approved by CEN (European Committee for Standardization) in 2020. It should enable the monetary valuation of all environmental impacts and related aspects. Still, at present, it is too early to judge how companies use this directive and what their practical experience is. It will be interesting to see whether companies will use the theoretical European standard ISO14008 or go the practical way and use the methods of The Center of Sustainable Business, or the Harvard Business School (ROSI™ and IWA).

Conclusion

Generally, companies worldwide must tackle challenges that a decade ago were not known to be that serious and relevant. Environmental, social, and governance factors nowadays are important in every niche of the economy, regardless of whether capital, product or employment market. As governments adopt laws and regulations to achieve Paris's climate agreement goals, private and legal persons are obliged to act according to them. Those regulations influence not only short-term decisions but also strategic business planning. Based on forced restrictions, decision-makers often assess sustainable practices and initiatives as necessary evils causing nothing but costs.

On the other side, customers nowadays demand sustainable products and services. Companies should conceptualize sustainable schemes and strategies to earn a better reputation and, consequently, competitive advantage and revenue.

In previous and recent years, enterprises were unaware of their sustainable behaviour's precise (financial) result on the markets (and thus stakeholders neither). Because of that, decision about the appropriate sustainable initiative was made out of the blue, which led to inefficient resource allocation. Though sustainability is not only about environmental, societal, and economic aspects, companies must keep track of financial performance.

Therefore, it is essential to implement tools for monetizing sustainability measures. The Center of Sustainable Business and the Harvard Business School are two institutions which created two complimentary methodologies which reveal the enormously positive effect on an enterprise's revenue rights ESG measures can have.

Finally, the future of sustainable business is about to turn from being a necessary evil to being remunerative good.

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China in Africa: A World-System Analysis

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Abstract
As China rises so does its involvement abroad, in particular in various African countries. The aim of this paper is to use the world-system theory advanced by Immanuel Wallerstein and apply it on the case of Chinese economic and geopolitical activities on the African continent. The analysis is thus based on the division of the world into core, semiperiphery and periphrey. These areas are divided on the basis of the sophistication of their production, which results in the creation of monopolies and quasi-monopolies. The paper shows the nature of trade between China and Africa, which confirms the basic pattern of relations in the hierarchy of international economic relations. Whereas China moved in the hierarchy from the periphery to the semiperiphery, Africa remains a periferal world region. The paper also shows Sudan and Taiwan as special cases that offer a different understanding of the Chinese foreign policy. The question with these two cases becomes whether China practices a single foreign policy and how human rights and their normative power influence Chienese policy. The conclusion normatively assess the consequences of Chinese policy for Africa. Overall the paper is written from a political-economic perspective and emphasizes the economic element in international relations bordering the subfield of geo-economics.

Key Words
China, Africa, world-system, semiperiphery, trade

JEL Classification: F63, B51

Introduction

„Chinese activity in Africa is increasing at an exponential rate“ (Taylor, 2006: 937), Ian Taylor argued already in 2006. Since then, the increase continued. Chinese involvement in Africa became a matter of journalistic concern in the West. The perception of the Western media is a mixture of astonishment caused by the Chinese rates of growth and huge numbers in all possible fields in forecasts on Chinese economy and fear from the threat that results from these numbers. One might call this perception realistic or mercantilistic.

Chinese involvement in Africa has many sides. One of the most important elements is the Chinese hunger for oil. According to Taylor “Chinese oil diplomacy in Africa has two main goals: in the short term, to secure oil supplies to help feed growing domestic demand back in China, and in the long term to position China as a global player in the international oil market.“ (Taylor, 2006: 938). Similarly Alden explains the relation between China and Africa by such a realistic motivation (Alden, 2005). The aim of this introduction by the way of quoting two of the most important figures from within the schlarship on Sino-African relation is to show the dominance of realism in this small subfield. Realism is an important theory in international relations and international political economy. It is often used to explain motivations of great powers or the way they behave in an anarchic system.

The goal of this paper is to deviate from realism. The paper uses an explanatory instrument that covers the world-economy as one system where China and Africa play its „pre-defined" role. While China escaped its peripheral position, it seems that it is doing so at the expense of other countries, that had similar role in the system. In the first part of this paper, I will briefly explain the methodology, which is based on the world-system theory elaborated by Immanuel Wallerstein (on China from this perspective see Li, 2005, Grell-Brisk, 2017). In the second part, my goal will be to show the results of the analysis, in particular how the current state of affairs between China and Africa fits this theory and I will try to point at some Chinese actions that may contradict this theory. The conclusion assesses the strength of Wallerstein's theory when applied to the case of Sino-African relations.

1. Methods of Research

This paper is theoretically anchored in Wallerstein's world-system theory and subsequently applies this theory to the case of Chinese involvement in Africa. In order to assess the involvement it uses secondary sources analyzing the involvement with the particular focus on trade data between the two entities. At the same time the paper diverts from the positivist world-system analysis and operates within the metatheoretically constructivist approach focusing on the normative power of human rights as a possible way to influence Chinese foreign policy.

To sufficiently explain the modern world-system theory, it is necessary to start with the meanings of the terms used by Wallerstein. „World-economy (Braudel's économie-monde) is a large geographic zone within which there is a division of labor and hence significant internal exchange of basic or essential goods as well as flows of capital and labor. A defining feature of a world-economy is that it is not bounded by a unitary political structure. Rather, there are many political units inside the world-economy, loosely tied together..." (Wallerstein, 2005: 23)

„Capitalism is not the mere existence of persons or firms producing for sale on the market with the intention of obtaining a profit. We are in a capitalist system only when the system gives priority to the endless accumulation of capital." (Wallerstein, 2005: 23-24)

„A world-economy and a capitalist system go together […] what holds them together is the efficacy of the division of labor. Capitalists need a large market but they also need a multiplicity of states so that they can give the advantages of working with states but also can circumvent states hostile to their interest, in favor of states friendly to their interests." (ibid)

Wallerstein continues by explaining that this system is nowhere near free market since such a market would „make impossible the endless accumulation of capital" (Wallerstein, 2005: 25) and that would bring profits to a minuscule level. Sellers always prefer monopoly that is usually very difficult to achieve. However, what is possible to achieve are quasi-monopolies or oligopolies, which bring sufficient profits. It is the strong state that is capable of protecting such quasi-monopolies. It does so very often by granting patents. Other ways to help quasi-monopolies are state restrictions on imports and exports (so-called protectionist measures), state subsidies and tax-benefits, states can prevent weaker states from creating counter-protectionist measures and states might be

willing to pay excessive prices for certain products. The last way is a regulation that hurts substantially small producers, but does not affect the large ones.

However, there are ways to bring down the quasi-monopolies. Wallerstein claims that these ways are „inbuilt anti-monopolistic features in a capitalist world-economy." (Wallerstein, 2005: 26) The losers will struggle politically to remove the advantages of the winners. Overtime, every quasi-monopoly is undone by the entry of further producers into the market. „Quasi-monopolies are thus selfliquidating." (Wallerstein, 2005: 27) However, when quasi-monopoly does cease to exist, it simply invest into another product that will bring sufficient profits. „The result is a cycle of leading products." (ibid)

Such leading products today included two decades ago according to Wallerstein aircraft production or genetic engineering. Before that leading products included steel, automobiles and computers (Wallerstein, 2005: 29).

Thanks to the nature of the capitalist world-economy the cycle of leading product is happening all around the world and is dividing the world-economy into the core, semi-periphery and periphery. The core-periphery division is a division according to the profitability of the production processes. The core-like products are the more profitable and thus the more monopolized ones. Consequently, the peripheral processes of production are truly competitive. The result is a constant flow of surplus value from periphery to core.

„The strong states, which contain a disproportionate share of core-like processes, tend to emphasize their role of protecting the quasi-monopolies of the core-like processes... The very weak states, which contain a disproportionate share of peripheral production processes, are usually unable to do very much to affect the axial division of labor, and in effect are largely forced to accept the lot that has been given them." (Wallerstein, 2005: 29)

The semiperipheral states, which have relatively even mix of production „put forward most aggressively and most publicly the so-called protectionist policies... They are eager recipients of the relocation of erstwhile leading products, which they define these days as achieving 'economic development'". (ibid) Therefore their direct competitors are not the core states, but other semiperipheral states that are „equally eager to be the recipients of relocation." (Wallerstein, 2005: 30)

In 2005 Wallerstein considered Soth Korea, Brasil and India to be semiperipehral countries. Such countries export e.g. steel, automobiles and pharmaceuticals to peripheral zones, but import more advanced products from core zones.

Obviously, there are four possibilities, a state can go either from the periphery to the semiperiphery or from semiperiphery to the core, or the opposite way, from the core to the semiperiphery or from the semiperiphery to the periphery. The countries listed by Wallerstein have moved from the peripheral status to the semiperipheral status and are struggling to produce more core-like products and become core states. For example the Asian states were in the sixties in a similar position to the states of western sub-saharan Africa. Today the Asian tigers are definitely in the semiperipheral category.

These countries try to export the former leading products to the whole world and especially to the peripheral areas and are still importing the leading products from the

core states. To win the fight against other semiperipheral states, they are supposed to use protectionist policies.

The next section applies this theory to the case of relations between China and Africa.

2. Results and Discussion

The part of the reality that I am trying to show is best described with plain economic facts. "In 1996 the value of China's trade with Africa was $4 billion [...] and in 2005 reached $39.7 billion." (Taylor, 2007). It was $282 billion in 2022 (Bociaga 2023). Import to China from Africa is happening mainly through raw materials and Africa is a great market for low-value consumer goods from China (see, eg, Oqubay – Lin, 2019, Large, 2021).

Apart from copper, bauxite, uranium, aluminum, manganese and iron ore, china is trying to import as much oil as possible. China National Petroleum Corporation (CNPC) and China Petrochemical Corporation (Sinopec) are both very active in acquiring "foreign energy resources via long-term contracts as well as purchasing overseas assets in the energy industry [...] In 2002 Sinopec signed a contract for $525 million to develop the Zarzaitine oilfield in Algeria. In 2003 CNCP purchased a number of Algerian rafineries for $350 million and signed a deal to explore for oil in two blocks..." (Taylor, 2006: 944)

The import of Chinese products is rising, especially that of arms. As one can read in Africa Research Bulletin: "China sold Ethiopia and its neighbor, Eritrea, an estimated $1 billion worth of weapons before and during their border war from 1998 and 2000." (Africa Research Bulletin, 2007: 17023) China also sold the government of Robert Mugabe in Zimbabwe fighter jets and military vehicles for $200 million and in may received for a shipment of small arms eight tons of Zimbabwean elephant ivory (ibid). China is second to Russia in arms exports to sub-Saharan Africa. Between 2010-2021, China exported more than $200 million worth of arms (Mosheni-Cheraghlou & Aladekoba, 2023: 12)

Chinese construction firms are also capable of outbidding their European competitors (Alden, 2005: 150). China actually seems to be moving its least profitable products, ie, typical periphery products to peripheral areas of the world-economy by investing in Africa. As Alden observes: "Using the special provision of the United States' African Growth and Opportunity Act and the EU's Cotonou Agreement, Chinese investors have established, in the textile and agro-industries, joint ventures whose aim is to export goods to the West at concessional rates" (ibid). China is also a crucial lender to African countries. This lending reached $132 billion in 2016 (Alden & Jiang 2019).

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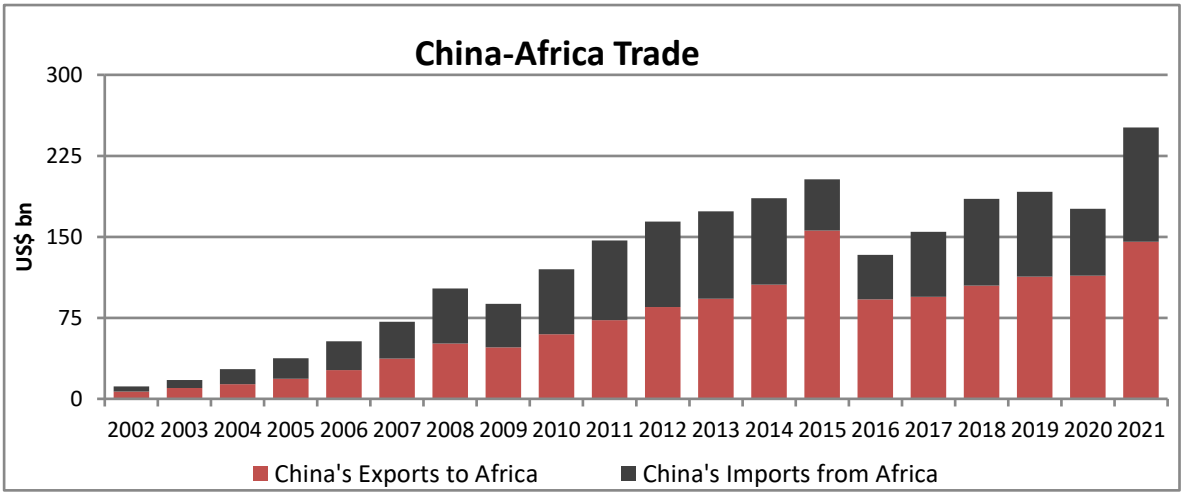
Fig. 1: China-Africa Trade



Data: CHINA-AFRICA TRADE [online], China Africa Research Initiative [cit. 30. 07. 2023]. Available at: http://www.sais-cari.org/data-china-africa-trade. Direct link: http://www.sais-cari.org/data-china-africa-trade

Tab. 1 China Africa Trade

Year	China`s Exports to Africa (USD bn)	China`s Imports from Africa (USD bn)	Sum (USD bn)
2002	7	5	12
2003	10	7	18
2004	14	14	27
2005	19	19	38
2006	27	27	53
2007	37	34	71
2008	51	51	102
2009	48	40	88
2010	60	60	120
2011	73	74	147
2012	85	79	164
2013	93	81	174
2014	106	80	186
2015	156	48	203
2016	92	41	133
2017	94	60	155
2018	105	80	185
2019	113	79	192
2020	114	62	176
2021	146	106	251

Source: DATA: CHINA-AFRICA TRADE

What one can see here is that, the theory is quite close to the reality. Africa serves China as a source of raw materials, just as peripheral areas served the core throughout the history. On the other hand, China exports to Africa advanced leading or former leading products. We can even observe China relocating its less profitable production to Africa.

One may see very realistic Chinese ambitions and Western concerns about Chinese involvement in Africa. It is precisely this that we see in Chinese behavior, that Alden and Taylor are describing. China is trying to secure African natural resources for itself without any moral concerns and at the same time is exporting without any moral concerns. This is Wallerstein's argument that "only a few are able to translate that advantage into a real shift in economic position (to that of a 'core power'). To do this, such a semiperipheral country must garner a heavy portion of the collective advantage of the semiperiphery as a whole to itself in particular." (Wallerstein 1974: 100-101) In case of China we are indeed speaking of a very heavy portion.

Consequently the realistic position of non-interference is in accordance with Wallerstein's theory. Also the policy of outbidding European companies is one of those state powers similar to patents, protectionist measures and state subsidies listed by Wallerstein. Therefore if China is giving a large loan ($2 billion) to Angola where IMF's conditions were simply not acceptable to the Angolan government in exchange for an agreement on crude oil supplies, it is only using the state powers to get the natural resources to move up from its semiperipheral position. Similarly, a government company China road and Bridge Corporation in Ethiopia is instructed to go to the margin of profit as low as 3% to outbid European companies, that in accordance with the capitalist logic of sufficient profits expects at least 15% of profits. Again Chinese government is using its powers (money) to win the struggle against the core powers.

If the world-system theory explains well the general pattern of the Sino-African relations, one may want to analyze special cases that disrupt this theory. Sudan and Taiwan are two such cases.

On the one hand, according to Alden: "Forced against its own anti-interventionist instinct to follow the AU lead and support a peacekeeping operation in western Sudan, and to accept the possibility of the Security Council curtailing its energy supplies, Chinese diplomacy towards Africa suffered a serious setback. The Sudan crisis has thus undermined the key rationales for China's engagement with Africa – energy security and African support for a traditionalist defense of state sovereignty." (Alden, 2005: 160)

However, there is a different view on this matter from Ian Taylor. He sees this more as the maximum that China could have done. China welcomed the peace agreements signed in 2005 and sent 200 troops for UNMIS. "Given that oil agreement signed by Khartoum will be respected, this is no surprise." (Taylor, 2006: 950)

Is it than that "Beijing has misjudged the power of human rights?" (Alden, 2005: 160) or the Darfur crisis proves that China is getting the most from Sudan by supporting the UN action? One diplomat from Benin said that "China has no friends, only interests" (ibid). The power or norms is rather difficult to judge in this case (on the power of human rights see, eg, Risse et al., 1999).

The case of Taiwan is different. China has been pursuing a policy of excluding the countries that recognized Taiwan from its trade policy. When in 1997 Chad recognized

Taipei and got $125 million loan from Taiwan, "Bejing brought an end to its diplomatic presence as well as its more limited development assistance." (Taylor, 2005: 155) Another case were Liberian rebels who after establishing diplomatic relations lost assistance from Beijing and their rivals gained support from China. However, this muscular policy of China is not that significant, since on most of the occasions, China is cooperating also with countries that recognized Taiwan, but not at the highest levels.

To a certain extent this state of affairs supports Wallerstein's theory. Taiwan is a US ally and by realizing policy against Taiwan, China is "fighting" against the core countries. On the other hand, China is cooperating with all African states, but with those states that recognized Taiwan the cooperation is not happening on the highest level, what does not really hurt the cooperation.

Conclusion

This paper analyzed the Sino-African relations from the world-system theory perspective and showed that despite few questionable events and relations, this theory is useful for the analyses of these relations. The question remains, what does it mean for the future of African countries and societies.

As already said by a Chinese diplomat from Benin: "we are a socialist-Marxist state and we have had 30 years of relations with the Peoples Republic of China and yet they by passed us to go to Gabon. This tells me that China has no friends only interests" (Alden, 2005: 160). Therefore it is not worth analyzing how does Chinese new policy of expansion help Africa but rather try to find how could states such as Ghana or Kenya use this expansion to help itself or in another words escape their peripheral status. The Chinese rise in terms of power is not changing the nature of the system and it would be hard to believe that China after becoming a core superpower will ever desire substantial systemic change. According to Wallerstein such a change might come, but only from the new social movements.

Strong China can fight the destructive policies of IMF and WB with alternative lending. China can lend money without conditions. However this naturally brings the same problems with repayment as any other lender has.

Similar problem arises, when there is no conditionality. One of the goal of the New Partnership for Africa's Development (NEPAD) is promotion of good governance, especially corruption free governance. China is hurting precisely this goal by offering its loans only for repayment in access to oil in repayment and by not expecting the money to be used effectively. Not only is there a danger of the recipients of the loans becoming unable to repay the loans, but also such loans may keep corrupted and authoritative governments in power.

One could call such an approach realistic as opposed to the years of cultural interventionism.

Will China become another France in Africa? If China supports authoritarian regimes, gives excessive loans to earn support in international forums, is it going to be of any use to the imporvement of the standard of living in countries such as Sudan?

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Transparent Internal Communication from Below and Above as a Part of the Total Quality Management Philosophy in Czech Organisations

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Abstract
The authors examine organisations' approach to internal communication from below and above as part of the philosophical approach of total quality management (TQM). The main objective of the research is to evaluate the implementation of selected forms of communication from below and above as a part of the TQM philosophy in the context of selected identifying variables of Czech organizations. To meet the main objective, a questionnaire survey of Czech organizations (n = 183) was conducted. The data were evaluated using statistical methods (chi-square test, Fisher-Freeman-Halton Exact Test) at the 0.05 significance level. The results show that the use of most of the examined forms of communication from below and above depends on the size of the organisation, and the most frequent combination of used forms of communication is personal meetings and oral communication with employees. Setting up effective communication within each organisation fulfils the principles of total quality management.

Key Words
management system, corporate social responsibility, sustainability, organizational climate, communication process

JEL Classification: D83, M14

Introduction

Internal communication from below and above is the cornerstone of prosperity (Stacho et al., 2021), sustainability (Vrabcová et al., 2022), and the application of social responsibility enables the organisation's existence. It resembles the Total Quality Management (TQM) philosophy, where the primary goal is to compete and excel (Jimoh et al., 2019). It is a formalised concept based on systematic quality management in all areas of the organisation's activities with the involvement of all employees and a well-defined role for management. Apart from the fact that most experts (Jimoh et al., 2019; Khalil and Muneenam, 2021) agree that typical features of TQM include a focus on continuous improvement, customer focus, a systems approach, a process approach, evidence-based management, defect-free as the basis of any system, benchmarking, etc., leadership, mutually beneficial partnerships and employee involvement are also part of (Chen et al., 2020). People are the foundation of an organisation at all levels, and their full involvement enables their skills to be used to benefit the organisation (Vrabcová et al., 2022). An organisation will only achieve sustainable success if it has a clear strategy,

strong leadership, loyal and motivated employees, flexible processes and partnerships to add value to the products provided to its customers.

In the questionnaire survey (n = 183), the following forms of grassroots communication were investigated, which emerged as the most significant from a literature search of articles in Scopus and Web of Science: direct communication with management (Stacho et al., 2021), communication through immediate supervisor (Prouska et al., 2023), communication through employee representatives or a trade union (Chikazhe and Nyakunuwa, 2022), communication through the HR officer (Stacho et al., 2021), in-house grievance system – e.g. filing a complaint, anonymous mailbox, etc. (Chawla et al., 2016), surveys of employee opinion (feedback), views and attitudes (Dolamore et al., 2021). According to research (Chikazhe and Nyakunuwa, 2022; Siahaan, 2022), it is advisable to implement a combination of communication with the direct supervisor and other forms. If employee feedback towards management is viewed positively, optimal communication can be expected among all employees regardless of their hierarchy. According to several studies, the forms of communication above include (Gilmartin et al., 2019; Heller and Rowlinson, 2020; Djurkovic et al., 2021), brainstorming, electronic communication, communication through employee representatives or union, online meetings, webinars, video conferencing, face-to-face team meetings, workshops, discussions, written communication addressed directly to employees, a dedicated SW evaluation and feedback process, and oral communication addressed directly to employees.

However, quality care, education for quality, and the need for quality in all its aspects must be part of education and education for other cultural and human values, which communication from above and below strongly contributes to (Chen et al., 2020). Successful organizations are aware of this fact. Therefore they highly value the knowledge and skills of their employees, and hand in hand with this trend, they continuously expand and deepen the opportunities for smooth non-conflict communication, partnerships, training programs for all management, quality assurance and improvement activities that they gradually organize for their employees. Every employee of an organisation is not only a member of the social subsystem of that organisation (Vrabcová and Urbancová, 2021) but also a consumer of goods and services, a member of a particular family related to certain schools, churches, branches, political parties, etc. It follows that if a manager wants to lead the workers entrusted to them effectively, they must understand them in the context of a comprehensive social system that goes far beyond the boundaries of a given organisation (Stacho et al., 2021). Of all the perspectives for assessing the importance of quality to an organisation, the most important can be perceiving quality as a source of profitability in business. However, the TQM philosophy assumes that employees must be seen as complex individuals, not just as a set of abilities, knowledge and skills. When workers come to work, they are influenced by various external factors. It is the manager's job to be aware of these factors within their capabilities and to be able to use them to accomplish tasks.

The main objective of the research is to evaluate the implementation of selected forms of communication from below and above as part of the TQM philosophy in the context of selected identifying variables of Czech organizations. To our knowledge, no other research has examined selected aspects of internal communication (especially from below and above) in the context of TQM philosophy. Several types of research do not differentiate between bottom-up and top-down communication when examining partial aspects of internal communication (Dolamore et al., 2021; Zito et al., 2021). The present research fills this critical knowledge gap.

1. Methods of Research

850 Czech organizations were surveyed from 06/2020 to 12/2020. The questionnaire was designed to comply with ethical rules and the anonymity requirement. The questionnaire was filled in mainly by managers of organisations, or in the case of small organisations, by owners. A questionnaire survey in Google Forms obtained data (n = 183), and the return rate of the questionnaire was about 22%. The primary identification questions of the questionnaire survey include the following variables:

- the business sector of the organization (4.4% fall under the primary sector, 41.5% fall under the secondary, and 54.1% under the tertiary);
- the organization´s size by the number of employees (26.2% fall under the category of fewer than 50 employees, 28.4% under the one with 51–249 employees, and 45.4% fall under the category of more than 250 employees);
- the majority ownership (45.4% have Czech owners and 54.6% have foreign owners);
- the annual turnover (38.3% fall under less than EUR 10 million, 37.7% under EUR 11–50 million, and 24% fall under EUR 50 million).

The Fisher-Freeman-Halton Exact Test and chi-square test were used to evaluate the data. More details about the methods can be found in Mehta and Patel (2013). The statistical analysis was employed using the statistical program IBM SPSS Statistics, v. 28, with a significance level 0.05 corrected according to the Bonferroni correction, taking into account the number of identification questions. The Results chapter presents the results based on synthesis, induction and deduction.

2. Results of the Research

The results of the questionnaire survey on bottom-up communication showed that a large majority of the organizations surveyed use direct communication with management and through the immediate supervisor (see Table 1). Respondents were allowed to indicate more than one possible answer.

Table 1: Relative frequency of use of grassroots communication

Communication from below	**Relative frequency (%)**
Direct communication with management	55.2
Communication through immediate superior	52.5
Communication via employee representatives (trade union)	34.4
Communication via HR officer	29.5
Intra-company complaint system (e.g. filing a complaint, anonymous mailbox, etc.)	22.4
Surveys of employee opinion (feedback), views and attitudes	23.5

Source: author's elaboration

The quantitative research was further emphasized by examining the dependencies (Fisher-Freeman-Halton Exact Test, chi-square test) of the implementation of communication from below and four selected identifying variables, namely the size of the

organization by the number of employees, the sector in which the organization is located, majority ownership and an annual turnover (see Table 2). The null hypothesis was tested with a significance level 0.05.

$H_0$1: The chosen form of communication from below does not depend on the chosen identifying variable.

Table 2: Examining the relationship between the implementation of communication from below and the four identifying variables (Fisher-Freeman-Halton Exact Test, chi-square test, α_{cor} = 0.0125)

Communication from below	***p-value*** **(size by number of employees)**	***p-value*** **(sector)**	***p-value*** **(majority ownership)**	***p-value*** **(annual turnover)**
Direct communication with management	**<0.001**	0.255	**0.006**	0.016
Communication through immediate superior	**0.002**	0.471	0.025	**0.005**
Communication via employee representatives (trade union)	0.026	0.252	**0.003**	0.040
Communication via HR officer	**<0.001**	0.154	**0.002**	**<0.001**
Intra-company complaint system	**0.009**	0.769	**0.002**	**<0.001**
Surveys of employee opinion (feedback), views and attitudes	**0.001**	0.067	0.115	0.057

Source: author's elaboration

Table 2 shows that the null hypothesis $H_0$1 is rejected at the adjusted significance level for all forms of communication examined except "Communication via employee representatives (trade union)" in the case of the identifying variable size of the organization by the number of employees and for most forms also in the case of majority ownership and annual turnover. On the other hand, the null hypothesis $H_0$1 of dependence of the form of communication from below in the case of the sector to which the organization belongs cannot be rejected.

Direct communication with management is the most common form of communication for small and medium-sized companies by number of employees (up to 250 employees). It is also more common in domestic organizations. Communication through the immediate supervisor or HR officer dominates large organisations with predominantly foreign ownership.

Table 3 below shows the frequency of organisations according to the total number of forms of communication from below, i.e. 59 organisations (32%) use only one form, and 68 organisations (37%) use two forms. It can be seen that 1–3 forms of communication from below are used by almost 86% of the entire organization.

Table 3: Integrated number of communications from below

Number of forms of communication from below	Relative frequency (%)	Cumulative relative frequency (%)
1	32.2	32.2
2	37.2	69.4
3	16.4	85.8
4	9.8	95.6
5	3.3	98.9
6	1.1	100.0

Source: author's elaboration

The following Table 4 reflects the extent of use of selected forms of communication from above. Respondents were allowed to indicate more than one possible answer.

Table 4: Relative frequency of use of communication from above

Communication from above	Relative frequency (%)
Oral communication, addressed directly to employees	72.1
Personal team meetings, working meetings, discussions	65.6
Electronic communication	61.2
Written communication, addressed directly to employees	41.0
Communication via employee representatives or trade union body	38.8
Online meetings, webinars, video conferences	35.0
Brainstorming, brainwriting	22.4
Dedicated feedback evaluation process in SW	5.5

Source: author's elaboration

As shown in Table 4, the overwhelming majority use oral communication directly to employees, personal team meetings, work meetings, discussions and, last but not least, electronic communication. In contrast, fewer respondents indicated a "Dedicated feedback evaluation process in SW" (less than 6% of respondents). The quantitative research was further emphasized by examining the dependencies (Fisher-Freeman-Halton Exact Test, chi-square test) of the implementation of communication from above and four selected identifying variables, namely the size of the organization by the number of employees, the sector in which the organization is located, majority ownership and an annual turnover (see Table 5). The null hypothesis was formulated at a 0.05 significance level.

$H_0$2: The chosen form of communication from above does not depend on the selected identifying variable.

Table 5: Investigating the relationship between the implementation of communication from above and the four identifying variables (Fisher-Freeman-Halton Exact Test, chi-square test α_{cor} = 0.0125)

Communication from above	***p-value*** **(size by number of employees)**	***p-value*** **(sector)**	***p-value*** **(majority ownership)**	***p-value*** **(annual turnover)**
Oral communication, addressed directly to employees	0.932	0.641	0.965	0.088
Personal team meetings, working meetings, discussions	0.207	0.279	0.09	0.127
Electronic communication	**0.001**	0.193	**<0.001**	**0.002**
Written communication, addressed directly to employees	**<0.001**	0.729	**0.002**	0.013
Communication via employee representatives or trade union	**0.003**	0.209	**<0.001**	**0.003**
Online meetings, webinars, video conferences	**<0.001**	0.102	**<0.001**	0.081
Brainstorming, brainwriting	0.605	0.769	0.355	0.837
Dedicated evaluation and feedback process in SW	0.285	0.579	1	0.388

Source: author's elaboration

The results in Table 5 show that we cannot reject the null hypothesis $H_0 2$ at the adjusted significance level for the identifying variable "sector". On the contrary, the form of communication, "Communication via employee representatives or trade union", "Electronic communication" was found to be dependent on the identifying variables organization size by the number of employees, majority ownership and annual turnover. For the selected identifying variables the relationship was also confirmed for the form "Written communication, addressed directly to employees" and "Online meetings, webinars, video conferences". We cannot reject the null hypothesis $H_0 2$ at the corrected level of significance for the forms of communication "Dedicated evaluation and feedback process in SW", "Oral communication, addressed directly to employees", and " Personal team meetings, working meetings, discussions" for all the observed identifying variables.

Although the most common form of communication in large organisations with 250 employees or more is "Electronic communication" (74%), the vast majority of large organisations also report "Personal team meetings, working meetings, discussions" (72%), which ensures personal contact between employees. As can be seen from Table 4 and Table 5, the most common form of communication from above is "Oral communication, addressed directly to employees", which is represented relatively evenly in all types of organizations and its widespread use is reported by both domestic and foreign organizations (both over 70%) in all size categories by the number of employees.

The number of organisations that use face-to-face meetings and oral communication as a form of communication is 50%. Seven organizations indicated using only these two

forms of communication from above. The cumulative relative frequencies of the forms of communication used from above are shown in Table 6.

Table 6: Integrated number of forms of communication from above

Number of forms of communication from above	Relative frequency (%)	Cumulative relative frequency (%)
1	16.4	16.4
2	16.9	33.3
3	18.6	51.9
4	17.5	69.4
5	20.8	90.2
6	7.7	97.8
7	1.6	99.5
8	0.5	100.0

Source: author's elaboration

The results in Table 6 show that 90% of the organizations surveyed use a maximum of 5 forms of communication from above. The majority of the surveyed organizations (52%) use a maximum of three forms of communication from above. It can be summarized that setting up quality internal communication helps set up total quality management in a given organization. It is a strategic factor in achieving process quality and increasing the organisation's competitive advantage. Organizational characteristics in practice significantly influence what types of communication are used and thus affect the TQM setup. The results of the research also show that the most common combinations of communication from below and above are "Direct communication with management", "Oral communication addressed directly to employees" (about 45% of organizations), and "Communication through immediate supervisor" again in combination with "Oral communication addressed directly to employees" (41% of organizations). This illustrates the central role of oral communication in organisations.

3. Discussion

Teamwork, cooperation, and quality circles are entirely unthinkable without the mutual communication of the employees of the organisation and their maximum awareness. Free and open communication means the free flow of information from the bottom up, from the top down and in all directions in the organisation. Free and open communication further means that mutual feedback can only work in an atmosphere of mutual trust, which is in line with Siahaan (2022) findings. The need for information is evident in the run-up to any organisational change, and the Covid-19 period was no exception, as confirmed by the research of Zito et al. (2021). Uncertainty tends to be a breeding ground for all sorts of rumours and is a source of employees' anxiety about their new tasks. The higher the uncertainty, the lower the quality and reliability of performance and the lower the productivity. Employees waste a lot of time trying to discover what is happening in the organisation and what is being prepared. Uncertainty and anxiety create the basis for completely irrational reactions. Communication and information are often selective or even reduced to assigning tasks to individual employees without the interrelationships and context in which they were to be implemented. Very often, employees only become aware of these problems immediately before or even after the implementation deadline.

Early information about the organization's goals and their upcoming concretization to individual workplaces creates essential motivation of employees and their creative cooperation, without which it is impossible to achieve quality and reliable performance of employees and hardly even quality production, which is in line with the TQM philosophy. The presented findings extend the research results of Djurkovic et al. (2021) in the area of labour productivity and also Stacho et al. (2021) in respecting organisational characteristics in TQM settings.

From the results of the literature search and quantitative research, some measures for successful communication can be recommended: Encourage open communication, be open to complaints, be decisive when giving instructions, be aware concerning workers and supervisors, remove stress and uncertainty from the workplace, be defined against verbal and physical aggression, respect the opinion of the partner, acknowledge mistakes, always start the work meeting in a friendly and positive way, let the partner speak, show sympathy for their views, address disagreements with questions, encourage every improvement, act in such a way that any mistakes are easily corrected. Further research will focus on selecting an appropriate method of communication to maximise knowledge and experience sharing amongst individual employees in the organisation.

Conclusion

Achieving effects in the organisation's activities and the associated high quality cannot be ensured by individual work but by an effective combination of skills and knowledge of individuals in the form of teamwork. The results show that using all forms of communication from below and above depends on organizational characteristics and, ultimately, the total quality management setup. The results showed that organizations should focus on using different communication methods to obtain quality feedback, based on which they can make the right decisions about the future direction of the organization and the setting of new goals. The theoretical contribution of the article is to demonstrate the importance of the choice of the type of communication in the total quality management setting. The practical contribution is presenting results from selected Czech organizations, which can be a best practice for other organizations. The limitation of the article is the relatively small sample of respondents. Still, nevertheless, the results are an essential picture of organisations' behaviour in the organisation's communication setting and the possibility of comparing organisations with each other.

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Critical Reflection on Selected Issues Connected with Economic Terminology

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Abstract

Clear and unambiguous categories and concepts defined in accordance with generally accepted epistemological principles are some of the cornerstones of each scientific discipline. The objective of this paper is to critically highlight selected problems related to the creation and use of categories and concepts and their symbols in economics. The paper describes in examples the inconsistent use of symbols (the income example), the unsystematic use of concepts (the labour force example) and, in particular, the creation and use of ambiguously defined categories or concepts in a situation where economic science already has an established concept for the reality concerned (the rent example). Adequate methods are chosen for an article of this type. The initial method is desk research, followed by analysis, deduction, induction and exploration. In addition to the actual critical description of the problems, an appropriate solution is proposed to the problem presented in each example. However, the paper also makes references to links with other economic disciplines and the current socio-economic reality. The purpose of the presented critical reflection on selected issues related to economic terminology is, on the one hand, to achieve greater understanding in scientific communication and, on the other hand, to facilitate educational impact, but also to find a common ground between academics and practitioners to the extent that social practice is intertwined with economic theory.

Key Words

economic concepts, inconsistency of symbols, inconsistent use of concepts, creation of misleading concepts

JEL Classification: A23, B49

Introduction

Each scientific discipline, economics included, relies on its own terminology. To achieve its goal of proving the conclusions reached, science definitely needs a set of unambiguous terms. Proving the validity of one's findings is as important as defining the object of one's investigation, both of them being ultimately the things that make science what it really is.

As a science, economics has existed since the eighteenth century, or since the emergence of the classical school of economics, leaving aside mercantilism that has existed since the sixteenth century. Indeed, it was mercantilism where terminology was identified as one of its weaknesses. The classical school of economics has made great strides in this respect, and yet some of the weaknesses have persisted until today, partly due to the incorrect use of terms and categories and the inconsistency of the symbols in economics.

In general, one can agree with the views of Nobel Prize-winning economist P. Krugman concerning the lamentable state of economic science, but also with the view of J. Cassidy highlighting the use of erroneous starting points based on outdated economic ideas as

mentioned by Daňhel and Ducháčková (2010, 596), who at once also consider, in the context of the paradigms of economics, the suggestive Hayekian question *"...whether it might be necessary to go back to the basics in economics*. *Back to the degree of determinism of the contemporary world, the elementary philosophical and methodological categories, starting with the most fundamental irrefutable Cartesian axiom: 'I think therefore I am'."*

Change manifests itself in all aspects of economy, and, by inference, economics. An evolutionary approach can reveal where the change comes from, how it occurs, but also where it will lead (Witt, 2003). About forty years ago, Hirschman (1985) critiqued the principle of parsimony in the economic approach to the description of (not only) economic processes and, it can be added, also of basic economic categories. The lack of consistency in the use of economic terms is also criticised by Špalek (2011) in the field of public economics.

Drawing upon Aristotle, category is the highest order of concepts. At the same time, this view does not contradict Kant's opinion, according to which categories represent certain classes under which concepts can be subsumed. The lasting validity of the need for correctness in the creation and use of terms in the context of epistemology and scientific communication is confirmed by Ochrana (2010), who calls for adherence to principles in the creation and use of terms and draws attention to possible ways of defining terms.

The aim of the paper is (i) to highlight the inconsistency of the use of symbols in modern economic theory and to propose a solution; still more importantly, (ii) the paper also seeks to point out the inappropriateness of the used terminology that does not fit into the terminological system of modern economic theory, and to propose a solution; but most importantly, (iii) the aim of the paper is to critique the inappropriate use of non-established terms, or economic categories without clearly defined content, which are preferred over established and well-defined terms, and to propose a solution to the problem.

1. Methods of Research

Desk research was chosen as the initial research method as it is based on the examination of existing sources with a view to gathering data to develop the line of thought under consideration. The advantage of this method is its considerable efficiency, especially given the necessary knowledge of the research question raised as formulated in the aim of the paper.

The structure of the paper's aim also accentuates the progression from the simple to the complex. The analysis of the creation and use of concepts and categories in economics, using a deductive approach, led to the selection of three examples in which problematic symbols and terminological issues were identified. Attention was also devoted to relevant links with other economic disciplines as well as the current socio-economic reality.

Explanation is used as a method in describing examples related to aims (ii) and (iii). Inductive reasoning was applied in the formulation of solutions to the problems raised.

2. Results of the Research

This part describes examples of the criticised suboptimalities, along with the problems they may cause, especially in scientific communication, but not only in it, and proposes solutions to these problems.

The problem of inconsistency of the symbols used.

Income, a quantity of fundamental importance in economics as a whole, used in macroeconomics and microeconomics alike, but also in other economic disciplines such as global economics. Should income be designated by Y (macroeconomics) or i (microeconomics).

This may seem like a pseudo-problem, but it is not. The global economy is based on macroeconomics; see, for instance, gross domestic product and its derivatives, or on consumption functions modified by foreign trade in open economies. On the other hand, the same global economy deals with the reality of international market structures generating income, a matter that is clearly microeconomic in its nature. The use of different symbols for one and the same economic phenomenon in the same discipline causes confusion.

Would it not be possible to use the same symbols for the same thing in both of the mutually inseparable parts of economics? Or are we going to have to wait another hundred years for the discrepancy to be removed, starting from the time when economics was no longer seen as macroeconomics alone, but merged with microeconomics to create the single economics? The answer to the question is clear. It is irrelevant what symbol we use for income, but there should only be one. The solution is therefore obvious.

Concepts in the terminological system of modern economic science.

One sample case that deserves to be mentioned here is the concept of labour force. The concept has a rich history, going back to the classical school of economics associated with Adam Smith and his seminal work An Inquiry into the Nature and Causes of the Wealth of Nations of 1776 (Smith, 2002), i. e. the 18th century.

Later on, the concept of labour force was central to the economics of Karl Marx, who took it from the classical school of economics and developed it into his own concept of the so-called exploitation of workers by “evil capitalists”. In its entirety, it was based on the fact that the wages of workers are determined by the price of the products they must consume and they have nothing to do with the price of whatever it is they produce for the company, which belongs to the entrepreneur, not them. Yet the difference between the prices of the necessary products whose consumption makes life possible for the workers and the prices of the products that the workers have created by their work (of course, after the other input costs are deducted) is an amount that belongs not to the employees—the workers—but to the entrepreneur, which Marx called the exploitation of workers. According to Marx, labour force is a person’s ability to work.

In fact, the concept of labour force does not fit into modern economics at all, as it has no equivalent in the two other sources of wealth, namely capital and land.[1] Yet, both Czech and foreign authors incorrectly consider the terms worker and labour power as synonyms (Bajgar and Janský, 2015; Wirojanagud et al, 2007). The equivalent of the concepts of capital and land is that of labour and those who do the labour are workers, not labour force.

Would any of us workers like to be referred to as labour force? Probably not; after all, we are human beings. So why do we do it? Is it out of nostalgia for the past? Whatever the reason is, the use of the term is inconsistent with other terms, and therefore incorrect in modern economics. The obvious recommendation is therefore to use the term worker consistently, just like the terms capital and land.

Creation and use of ambiguously defined terms.

But perhaps even more significant problems arise when new ambiguously defined terms and categories are invented and when terms are used that have been introduced in the past and no longer fit integrally into modern economics.

Such concepts include “windfall profit”. The very economic phenomenon was introduced solely for taxation purposes. As a term, windfall profit is not clearly defined. Let us ask ourselves a couple of questions: Does any profit that exceeds the average profit per unit of capital invested qualify as windfall profit? Is it a cross-industry phenomenon or does it exist only within any one industry? Is there a difference between windfall and unexpected profits? Of course, the list of such questions could go on and on, but what is certain is that none of them has been satisfactorily answered.

What the economic theory has clarified with regard to this problem is that profit arises as the difference between total income and total cost, with income being tied to the price of the product and the quantity produced. Proceeding on this footing, we will come to realise that the aforementioned price of the product and pricing constitute two extremely important concepts. At the same time, a dividing line must be drawn between production in manufacturing and in agriculture.

As a rule, the price of manufacturing products is made up of costs and normal profit. The question is what cost we are talking about. Is it the cost of producers who use the most obsolete technology, i.e. the highest cost per unit of output that we still need, or is it the cost of those producers who use the most advanced technology and achieve the lowest cost per unit? In manufacturing, it is neither of the two. There, it is the cost of the majority of producers producing the product under consideration. This works as long as supply is greater than demand, which naturally rectifies price increases by producers. The newly used phenomenon of windfall profit and the attempt to tax it are now mainly associated with electric power generation.

Let us ask ourselves whether it is precisely by factoring in the costs of most producers that the price is created, even for a product as important as electric power, which is

[1] Financial management sometimes operates with the term capital labour, but its content is different. Essentially, it denotes the scope of capital resources—both internal and external—that a firm has at its disposal, which cover its assets used for business. But that is a different matter altogether.

currently perceived as one of the sources of the price level growth. The answer is: no. Here, the price is based on the highest cost, i. e. the cost of generating electric power from gas-fired power stations, using a medium that currently presents by far the most expensive alternative per megawatt hour of electric power generated, compared to coal-fired or nuclear power stations. The approach applied here is clearly different to that used in the manufacturing industry in general, for example in the car manufacturing industry, where the customer does not care what medium is used to heat the assembly shop and is therefore unwilling to accept a price of the car that would factor in the fact that some of the car manufacturers' shops are gas-heated while other use cheaper sources of energy. The very fact has no bearing on the selling price of the car. After all, we live in a competitive environment where supply exceeds demand, and therefore an overpriced car is unsaleable.

Is it common to base pricing on the costs of the worst, or the costliest producers, as is now the case with electric power generation? The answer is: yes. But it only applies to pricing in the agricultural and mining industries. That is where the rent system works. Essentially, the price of agricultural products is based on the amount of agricultural production needed for the economy, which includes producers operating land with outstanding soil properties, located near their selling markets, but also those with less fertile land and long distances to the relevant markets. And it is with this link between the quantity of products needed and the operators that still must produce output in relation to the level of demand that the threshold of costs acceptable for the customer arises. It follows from the above that the basis for the price of agricultural products is the cost of those producers who farm on the worst and most distant land, but whose output is still necessary to meet demand. The others show lower costs but sell at the same price, and therefore turn a profit that is greater thanks to the lower costs. The difference is called rent. (There are several kinds of rents, but that is irrelevant here.)

The way electric power is generated in EU countries also gives rise to such rents. It could come as no surprise that with the current shortage of electricity in the EU—to which France has contributed significantly by neglecting maintenance in its nuclear power stations, and which Germany has exacerbated with its experiments in replacing nuclear reactors with modern clean energy—power generation in gas-fired power stations must go on because we simply need it. Hopefully, this will be the case for a limited period of time only. However, it is a good idea to call the portion of profits achieved by other power generators, for example those operating Czech coal and nuclear power stations, for what they clearly are: rents.

One cannot help but ask why the rent phenomenon is associated with electricity—a product of the manufacturing industry. The answer is not that complicated. It is electricity that has gradually become as important to people's lives as food or other agricultural products mentioned earlier. We cannot exist without it. Moreover, supply either does not at all, or only slightly exceeds demand, and if so then only at certain intervals. Still, Europe's dominant economy, Germany, which intends to shut down the rest of its nuclear power stations in the spring and all its coal-fired power stations in the west of the country, certainly cannot dispense with gas-fired power stations. This is why the electricity pricing mechanism can be considered logical and formally quite consistent with an economic system that accepts the rent phenomenon. Nevertheless, the situation needs to be addressed.

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Our tax system responds to the situation with a windfall profit tax[1]. This can be seen as a logical step and we could be indifferent to the fact that is it referred to as "windfall profit tax" as opposed to "rent tax", which would be the proper designation as explained earlier. However, the problem is that the measure is inconsistent in that it entirely fails to account for the EU tax system to such an extent that it cannot be ruled out that the whole concept will end up in a court that could order that the funds levied in this way be returned. This would be in no way surprising since, for example, large agricultural enterprises, which benefit from exactly the same rent (or, windfall profit), are not obliged to pay any windfall tax, even though the increase in the prices of food may be even more painful for consumers than the rise in energy prices We should therefore consider introducing, within the single EU tax system—which is uniform at least when it comes to the structure, if not specific rates—a tax on rents, regardless of the sector of the economy and regardless of the EU Member State. While not hurting electricity companies, it would help our massive deficit-ridden state budgets, without giving rise to the threat of having to pay back the taxes collected on the so-called windfall profits.

In view of the terminological basis, it is worth adding on the subject of the term "rent" that its association with land is not exclusive. The term "rent" can also be used for income that exceeds the expected income or, more precisely, the difference between the two, i.e. the unexpected and expected income. It turns out that explaining the phenomenon of windfall profit through the concept of rent is not a problem even in this sense.

3. Discussion

It is undoubtedly a desirable venture to unify the symbols used in economics as a whole, as exemplified on the term "income". On the other hand, the unification would mean that specific economic disciplines could not hold on to their original approaches, for instance when determining the optimal equilibrium. Let us recall in this context how equilibrium in the global economy was expressed through the interaction of supply curves in contrast to the more usual interaction of supply and demand in micro- and macroeconomics. There is nothing wrong with such a difference, unlike the various terms used for income.

As for terminology when it comes to concepts and categories, two problems emerge. The first problem, exemplified here on the concept of labour force, is the use of an outdated concept, a concept that belongs to the economic school of the past, which does not fit in with current reality. The second problem, exemplified here on windfall profit, is the creation or use of ambiguously defined categories. Yet, historical schools of economics already have another perfectly defined term for the economic reality that is being referred to here (in this case, it is the term "rent"). The newly coined category then becomes redundant, if not confusing in the sense that it hinders the correct understanding of the economic reality.

On the other hand, however, the tax on rent needs to be well thought through, since taxing rents could lead to further increases in the prices of the already expensive agricultural

[1] Let us recall that this concept has a history of its own. The Crude Oil Windfall Profit Tax Act was passed in the USA in 1980. It is incorrect to shorten the original English term to "windfall tax", as is often the case in this country, instead of using the full term "windfall profit tax".

products. It appears that there are simply no simple solutions here. So let them at least be legally unobjectionable.

Final remark: On 21 March 2023, ČEZ Group announced a record net profit of CZK 80 billion for 2022, compared to CZK 10 billion in 2021 and CZK 5 billion the year before (Kratochvíl, 2023).

Conclusion

No scientific discipline can dispense with an original subject of its research, its own apparatus of symbols, concepts and categories, and conclusions of investigation that it can prove and defend. It is therefore a major problem for any scientific discipline, economics included, if it creates confusion by using inconsistent symbols for the same economic concept or category. The problem then also impacts any derived disciplines that base their research on the underlying disciplines.

Every discipline evolves over time, and economics evolves in a very turbulent manner. Certain concepts that had their content clearly defined and which could be used in the past to prove something have become obsolete in modern economics and they no longer fit into the modern conceptual and categorical apparatus at all. The use of such concepts and categories must be abandoned for the sake of a correct understanding of the results of scientific research.

The opposite problem is creating new concepts and categories, even in economics that have no clearly defined content or whose definitions vary, at times to an extent that they contradict one another, in a situation where there already is a clearly defined concept from the past capturing the very economic reality, which has not been overcome by economic development. In this context, it is clear that such a term-coining practice can cause significantly more harm than good and should be rejected.

Under the current state of affairs, it seems highly desirable that economists and researchers focus their attention on this problem and that those experts who are concerned about economic terminology are brought together with a view to remedying the matter.

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Inventory Control of Products at the End of their Lifecycle Based on Nonparametric Methods

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Abstract

In this article, we verify that the use of the past stock movement simulation with all combination search, where both control variables are fully discretized, compared to traditional parametric methods, which are often used in management of inventory with sporadic demand, brings economic savings in area of holding and ordering costs. We use sporadic demand data coming from a small size e-commerce company to compare the best achieved holding and ordering costs in continuous review fixed order quantity inventory control policy where the reorder point calculation is based on moving average and linear regression. At the same time, we examine how the results are affected by the required fill rate of service level, which we test for four levels in the interval 25 % - 95 %. The results of our experiments show that AC outperforms traditional parametric methods in achieving the best holding and ordering costs. Moreover, as the level of required service level decreases, the success of AC in achieving the best costs increases. Simultaneously, we see that the success of the simulation increases with increasing variability of demand, i.e. in the case when the differences in quantity between individual non-zero demands increase.

Key Words

logistics, inventory control, sporadic demand, nonparametric methods, simulation

JEL Classification: M21, C63

Introduction

The product life cycle is crucial for marketing and product managers as well as for the inventory planners that handle demand forecasts and stock control policies. The product life cycle highlights the various stages that a product experiences from the time it is first launched to the market until it is eventually taken off the market (Mousavi et al., 2022). Because each stage of the product life cycle influences the demand pattern for an item, inventory planning is very tightly related to this process. We speak about inventory life cycle management which is the process of managing inventory items differently depending on where they are in their product life cycle by altering stocking policies, reordering guidelines, and demand forecasting techniques (Elsayed and Wahba, 2016). Many manufacturing companies consider this to be a crucial task (Rinaldi et al., 2023).

In this paper we focus on the decline stage which is usually connected with trend changes at the market followed by the releasing of new products. At this stage a demand becomes highly variable in term of demanded quantities. Furthermore, the demand frequency rapidly decreases making the inventory control to be a very challenging task (Huskova and Dyntar, 2022). It is very important for a company to take appropriate action when the decline appears on the horizon to avoid getting stuck with excess (Pourhejazy, 2020) or even obsolete inventory (Bajegani and Gholamian, 2020). These actions involve a

switching among demand forecasting and inventory control techniques suitable for a demand with a certain behaviour, a lowering target service levels and a reduction in the safety stocks (Jiang et al., 2019). Despite the excess and obsolete inventory brings significant financial burden, many enterprises tend to be afraid of losing imaginary sales so much that they refuse to limit the availability of products for customers and rather ensure for example additional warehousing capacities. Moreover, based on our experience, many companies do not understand the importance of supporting the differentiated inventory control during a product lifecycle with an adequate logistics information system and somewhat count on the inventory control based on traditional parametric forecasting methods such as moving average or exponential smoothing that become the ordinary part of ERP systems.

Croston (1972) proved that traditional parametric methods do not perform well when dealing with sporadic demand and suggested a modification of single exponential smoothing taking into account the importance of the occurrence of zero demand periods. Nowadays, Croston's method and various modifications such as the one proposed by Syntetos and Boylan (2005), Levén and Segerstedt (2004), Teunter and Duncan (2009) or Teunter et al. (2001) represent the major stream in the scientific literature focusing on sporadic demand forecasting and inventory control. We recommend readers who are further interested in the development of this stream to study an excellent review by Pinçe et al. (2021).

As parametric methods in general estimate average demand per period which is then used to calculate the demand during order lead time their efficiency depends on an assumption on a standard demand distribution. Nonparametric approaches however are mostly data driven and assumptions free. These approaches represent bootstrapping (see e.g. Willemain et al., 2004), so called empirical method (see e.g. Porras and Decker, 2008), an application of neural networks in learning demand patterns directly from the data (see e.g. Babai et al., 2020) and also the past stock movement simulation (see Dyntar and Kemrova, 2011). In the past stock movement simulation time is discretized to periods with a certain demand and up to 3 following events are performed in each period encompassing an arrival of replenishment order, a demand satisfaction and making a replenishment order. If the simulation run is repeated under the control of a selected inventory policy and the control variables are fully discetized the past stock movement simulation performs better than other techniques (Dyntar and Kemrova, 2011).

The goal of this paper is to show how the inventory control at the decline stage can become more effective when switching from the traditional parametric approaches to the past stock movement simulation with full discretization of time and control variables and with the complete search of the solution space suggested by Huskova and Dyntar (2022). We use sporadic demand data coming from a small size e-commerce company to compare the best reached holding and ordering costs in continuous review fixed order quantity inventory control policy where the reorder point calculation is based on moving average and linear regression. We discuss also the influence of a required service level for the fill rate decreasing from 95 to 25%.

1. Methods of Research

First, in MS Excel environment we analyse one year demand data provided by a company trading mobile phone accessories. We perform ABC analysis based on total sold quanities

to obtain items representing remaining 5% of total quantity sold per year (i.e. C category). We further reduce number of C items entering the simulation experiments by excluding the items that are launched into the market in the examined period. For the rest of 627 items we calculate basic demand features. Total demand (S) is calculated as:

$$S = \sum_{t=1}^{T} S_t \tag{1}$$

where t represents a period (i.e. a week), S_t a demand in a period and T is the total number of periods (i.e. 52 weeks). To assess time irregularity of a demand for each item we calculate Average Demand Interval (ADI) as:

$$ADI = \frac{T}{Number\ of\ nonzero\ demand\ periods} \tag{2}$$

To assess a variability of the nonzero demand for each item we calculate Coefficient of Variation (CV^2) as:

$$CV^2 = \left(\frac{Nonzero\ demand\ standard\ deviation}{Average\ nonzero\ demand}\right)^2 \tag{3}$$

Basic demand features are summarized in Tab. 1:

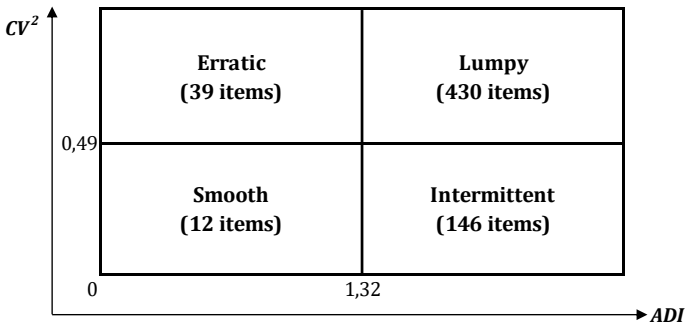
Tab. 1: Demand features

Demand feature	Min	Max
S_t [pcs]	1	22
S [pcs]	99	551
ADI	1,27	4,33
CV^2	0,29	0,81

Source: authors

We use ADI, CV^2 and cut-off values coming from the demand classification scheme proposed by Syntetos et al. (2005) to group items according to a certain demand type (see Fig. 1):

Fig. 1: Demand type based on Syntetos, Boylan, Croston classification scheme



Source: authors

Lumpy and itermittent demand items then become subject to the simulation experiments. As the maximal total demand as well as number of items are relatively low we decide to apply the past stock movement simulation of continuous review, fixed order quantity inventory control policy (i.e. Q-system) with all combinations search (AC) where both control variables (i.e. the reorder point and the replenishment order quantity) are fully discretized and the search of the solution space is complete (Huskova and Dyntar, 2022). Moreover, we simulate the Q-system with reorder point based on 3 months moving average (MA) which is an approach currently used in the company providing input data. And finally we simulate also the Q-system with the reorder point coming from linear regression (LA) as this approach is easy to adopt in the companies with a similar size and is therefore very popular. Reorder point (*Signal*) based on MA or LR is calculated as:

$$Signal = \bar{S}_{t,MA\ or\ LR} \cdot Lead\ time + k \cdot \sigma_{S_{t,MA\ or\ LR}} \cdot \sqrt{Lead\ time} \quad (4)$$

where $\bar{S}_{t,MA\ or\ LR}$ and $\sigma_{S_{t,MA\ or\ LR}}$ represent mean and standard deviation of demand in a period coming from LR or MA and k represents a safety coefficient. When assuming that demand during successive unit time periods are independent and identically distributed random variables drawn from a normal distribution the safety coefficient for a service level in the form of a fill rate can be easily calculated in MS Excel using NORMSINV() function (Huskova and Dyntar, 2023). In the simulation, we avoid back ordering in case of low inventory as well as multiple ordering during the order lead time. Contrarily, a partial satisfaction of a demand in a period is allowed. To prevent getting out of stock in the beginning of the simulation an initial inventory is calculated as:

$$Initial\ inventory = \sum_{t=1}^{Lead\ time} S_t \quad (5)$$

For AC, MA and LR arrangements we simulate 4 scenarios with the fill rate 95, 75, 50 and 25% and for each item we record the best reached total holding and ordering costs. Based on outputs of simulation the total holding and ordering costs (N_c) are calculated as:

$$N_c = AvgStock \cdot T \cdot n_s + O \cdot n_o \quad (6)$$

where *AvgStock* represents average stock coming from simulation, n_s holding costs, O number of orders and n_o ordering costs. Parameteres of simulation show Tab. 2:

Tab. 2: Simulation parameters

Holding costs	14	CZK/pc,week
Ordering costs	420	CZK/order
Lead time	1-3	weeks

Source: authors

To perform simulations MS Excel 16 and computer with the processor Intel Core i7 – 2,8 GHz, 16 GB RAM are employed.

2. Results of the Research

Based on the best reached holding and ordering costs coming from simulation experiments performed in individual scenarios (i.e. all combination search = AC, linear regression = LR and moving average = MA), we calculate the cost differences (Δ) for each timeseries as:

$$\Delta = \frac{N_{c,LR\ or\ MA} - N_{c,AC}}{N_{c,AC}} \cdot 100\% \quad (7)$$

Table 3 then shows the percentiles of cost differences for products with intermittent demand and for each fill rate.

Tab. 3: Δ percentiles for intermittent demand items

	***Δ* - percentil**										
Fill rate	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**	***Signal* by**
95%	0%	0%	2%	5%	8%	10%	14%	25%	34%	69%	LR
	0%	0%	2%	5%	7%	8%	10%	16%	22%	49%	MA
75%	4%	10%	13%	16%	20%	23%	26%	31%	38%	69%	LR
	4%	12%	16%	18%	22%	26%	30%	35%	40%	69%	MA
50%	9%	17%	23%	28%	32%	41%	51%	63%	88%	121%	LR
	8%	14%	22%	27%	32%	39%	50%	61%	77%	139%	MA
25%	9%	19%	26%	31%	37%	45%	58%	78%	94%	159%	LR
	6%	14%	20%	25%	30%	37%	48%	63%	87%	140%	MA

Source: authors

From the achieved results, we can see that as the level of required service performance decreases, AC achieves better results than LR and MA. For example, in the case of a required fill rate equal to 95 %, only 20 % of the timeseries achieve the best possible results when using parametric methods, as does AC simulation. At the 80 % percentile, AC achieves better costs by 25 % when compared to costs in the LR scenario, or 16 % in the MA scenario.

When the required fill rate drops to 50 %, all timeseries in the LR and MA scenarios already reach higher total holding and ordering costs, by 9 % for the LR and 8 % for the MA scenario. For some timeseries, the largest cost differences are more than double.

At the same time, we can observe that slightly better results are coming from the moving average method than by using the method based on linear regression.

The following table (4) shows the differences in costs for products with lumpy demand, again depending on the level of fill rate.

Tab. 4: Δ percentiles for lumpy demand items

	***Δ* - percentil**										
Fill rate	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**	***Signal* by**
95%	0%	1%	3%	6%	9%	12%	17%	22%	32%	81%	LR
	0%	0%	2%	5%	7%	9%	12%	16%	21%	110%	MA
75%	5%	9%	12%	15%	18%	22%	25%	30%	36%	83%	LR
	5%	10%	14%	17%	21%	25%	29%	32%	40%	76%	MA
50%	10%	17%	23%	28%	34%	41%	50%	59%	74%	126%	LR
	9%	17%	23%	27%	33%	41%	49%	59%	71%	239%	MA
25%	13%	19%	26%	35%	43%	51%	62%	76%	93%	153%	LR
	7%	16%	23%	28%	36%	45%	53%	64%	79%	129%	MA

Source: authors

As found for intermittent demand, AC performs better resulst than LR and MA also for lumpy demand. With the required fill rate of 95 %, only 10 % respectively 20 % of the timeseries achieve the same results as AC, for another 40 % of the timeseries then AC achieves better holding and ordering costs by 1 to 9 %. When the required fill rate drops to 50%, the difference in achieved costs rises rapidly. For example, in the 70 % percentile, cost differences correspond to 50 % in the case of LR and 49 % in the case of MA.

3. Discussion

The outputs from the simulation experiments prove that using past stock movement simulation of continuous review, fixed order quantity inventory control policy with all combination search, where both control variables are fully discretized, outperforms the traditional parametric methods in achieving the best holding and ordering costs. Moreover, as the level of required service decreases, the success of AC in achieving the best holding and ordering costs increases. At the same time, we see that the success of the simulation increases with increasing demand variability, i.e. in the case when the differences in quantity between individual non-zero demands increase. Parametric methods, where the calculation of the reorder point is based on a moving average or linear regression, achieve the best possible costs only in 10 - 20 % of the examined timeseries in case of required fill rate of service level by 95 %. In case of a lower service level, AC achieves better results in all observed timeseries.

As both strategies as well as the past stock movement simulation are easy to programme and update, they can become a serious rival to the traditionally used parametric forecasting approaches that perceive a demand forecasting and an inventory control to be two separate stages (Pinçe et al., 2021). It was verified through this experiment, that the use of this method of inventory control would bring savings to the company in this area, which is desirable for any manager.

Conclusion

In this paper, we tested the performance of past stock movement simulation against the standard parametric methods used in management of inventory with sporadic demand, namely thos where the reorder point calculation is based on moving average and linear regression. For this purpose, we used data from a small e-commerce company and apllied

above mentioned methods to products whose demand meets the parameters of lumpy or intermittent demand. In addition, the performance of the simulation was also verified for the decreasing level of service level fill rate, namely for the values of 25, 50, 75 and 95%. For both types of sporadic demand and for all levels of service fill rate, past stock movement simulation has been found as better method to achieve the best results in comparing inventory holding and ordering costs than selected parametric methods that are a common part of corporate ERPs. Due to the relatively low number of items that met the conditions of lumpy or intermittent demand, it was possible to use past stock movement simulation in the AC scenario, i.e. both control variables are fully discretized. For larger portfolios of products with parameters of sporadic demand, it is more suitable to use the modification of all combination serach proposed by Huskova and Dyntar (2022 and 2023), when satisfactory results are achieved in comparing the costs of holding and ordering inventory while there is a significant saving of a computing time.

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The Effect of the Covid-19 Pandemic on Economic Growth and R&D Spending in the EU Countries

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Abstract
The article deals with the issue of economic growth and R&D spending in the EU-27 countries during the Covid-19 pandemic. Using time series analysis, the article examines whether the pandemic and the associated restrictive measures and bailout packages have impacted economic growth and R&D funding. To answer this research question, the development of GDP and GERD Eurostat data was taken, and the period of 2011–2021 was analysed. Besides the development of the monitored indicators (GDP, GERD, GERD as a percentage of GDP), the chain index was constructed to compare year-on-year changes and to analyse the growth rate of the indicators further. The research shows that Covid-19 impacted GDP as well as the field of R&D. Talking in absolute numbers, the impact of the pandemic can be seen in the decrease of both GDP and GERD in 2020. However, since the GDP of the EU-27 countries decrease reached 4 % in 2020 while GERD only reduced by 1 % in the same year, the overall effect on the R&D intensity was positive. However, while the GDP and GERD resumed their growth in 2021 – annual change of 8 % (GDP) and 6 % (GERD) – R&D intensity declined by 2 % compared to 2020. This decline was caused by a more significant growth of GDP than GERD in the same year. However, based on the analysis performed, it can be concluded that the impact of the Covid-19 pandemic on GDP and GERD of the EU-27 countries was neither significant nor had a long-term nature.

Key Words
GDP, GERD, R&D, innovation, EU, Covid-19

JEL Classification: F43, O32

Introduction

The article deals with the issue of GDP and R&D spending changes in the EU-27 countries before and during the Covid-19 pandemic, which represents one of the most significant challenges ever faced by modern medicine (Agarwal & Gaule, 2022). The paper aims to find out wherever restrictive measures taken in the vast majority of the EU-27 countries to combat the Covid-19 pandemic affected their GDP and the financial support of R&D.

The Covid-19 pandemic has significantly changed our everyday lives and how businesses operate. Governments worldwide have implemented various measures to slow the spread of the virus, such as lockdowns, distance learning, travel restrictions, and social distancing guidelines (Aslam et al., 2023). These measures have profoundly impacted businesses across all sectors, with many experiencing significant disruption to their operations. In

addition to the operational challenges, businesses have also had to deal with an uncertain economic environment.

The pandemic has caused significant economic disruption, and businesses have had to adapt quickly to demand and supply chain changes. Despite the challenges, many companies have shown resilience and innovation in response to the pandemic. Innovations in business have also been significant. Businesses have had to quickly adapt to new ways of working, selling, and delivering goods and services. This has led to the rapid adoption of new technologies and digital platforms, such as e-commerce, contactless payments, and remote work tools. In addition, many businesses have pivoted their operations to address unique needs arising from the pandemic. Overall, Covid-19 pandemic has brought about significant changes and challenges for businesses, but it has also provided an opportunity for innovation and adaptation in response to new circumstances (Kotorov et al., 2022). Many countries have implemented significant bailout packages to support businesses during the Covid-19 pandemic. These packages have provided financial support to companies in a variety of sectors.

Innovations, knowledge and R&D are considered essential drivers of economic growth that increase the standard of living and economic performance (Raymond et al., 2015; Savrul & Incekara, 2015). The positive effect of R&D on innovation output and productivity has been confirmed by plenty of studies (e.g. (Baumann & Kritikos, 2016; Griffith et al., 2006; Hall et al., 2010; Mairesse & Mohnen, 2004). It is the technology that helps businesses gain a competitive advantage in the market (Porter, 1985; Van et al., 2022). Therefore, businesses invest in R&D to increase their productivity and profitability.

The authors have addressed the role of innovations within the development process in many research papers (Blaschke et al., 2021a, 2021b; Blaschke & Demel, 2019). In this paper, the topic of innovations is placed in the still current issue of Covid-19. Its objective is to examine how this pandemic has affected not only the field of R&D funding but also countries' economic performance in general.

Roper & Turner (2020) believe that Covid-19 effect is stronger in terms of SMEs, whose financial health is weaker, and their willingness or ability to invest in R&D is disrupted. However, businesses that are able to sustain this investment will have a better chance to survive and achieve stronger economic growth and higher profitability. Also Biswas (2022) confirms that R&D investment can reduce the negative impact of a pandemic on a company. Guan et al. (2022) adds that the ability to adopt digital technology plays a crucial role in becoming resistant to the pandemic – the higher the business's R&D investment, the higher its digital technology level, and thus the greater resistance to the external crisis.

1. Methods of Research

In this part of the paper, the research methodology is introduced. According to Eurostat (2022), R&D intensity may be measured at macroeconomic and microeconomic levels. At a macroeconomic level, the R&D intensity refers to an indicator constructed as a share of R&D gross expenditure (GERD) on countries' gross domestic product (GDP). At a microeconomic level, it represents the percentage of companies' revenues reinvested in their R&D. Since the authors want to analyse the effect of the pandemic on countries' GDP and R&D funding, the first from the afore-introduced approaches will be used (1).

$$R\&D\ intensity = \frac{GERD}{GDP} \quad (1)$$

where *GERD* is gross domestic expenditure and *GDP* is gross domestic product.

Tab. 1 provides an overview of indicators and data sources used, as well as the time series under review within the conducted research.

Tab. 1: Data used in the research

Indicator		Source	Time series
GDP	Gross domestic product	Eurostat (2023a)	2011–2021
GERD	Gross domestic expenditure on R&D	Eurostat (2023b)	
R&D intensity	GERD as % of GDP		

Source: authors' own processing

Since the first case of the Covid-19 disease appeared at the end of 2019 and the restrictive measures in the EU-27 countries were taken in 2020, within this research, the development in the period from 2011 to 2019 is seen as "pre-covid ", the year 2020 is taken as "covid" and 2021 as the first "post-covid" year.

Even though the research covers the period of 2011–2021 and the United Kingdom left the EU in January 2020, it was excluded from the analysis. The research works with data covering 27 current EU member countries (EU-27), and the data of the UK were not taken into account for the entire period covered by the research.

Firstly, the development of GDP, GERD and R&D intensity was separately analysed (see Fig. 1, 2, 3 in section 2). Moreover, to compare the development of all the studied indicators (GDP, GERD and R&D intensity), the chain index (2) of the time series was calculated for all the variables. This index compares two immediately consecutive values – year-on-year changes and thus, it enables to analyse the growth rate of the indicators.

$$Ti = \frac{x_{i+1}}{x_i} \quad (2)$$

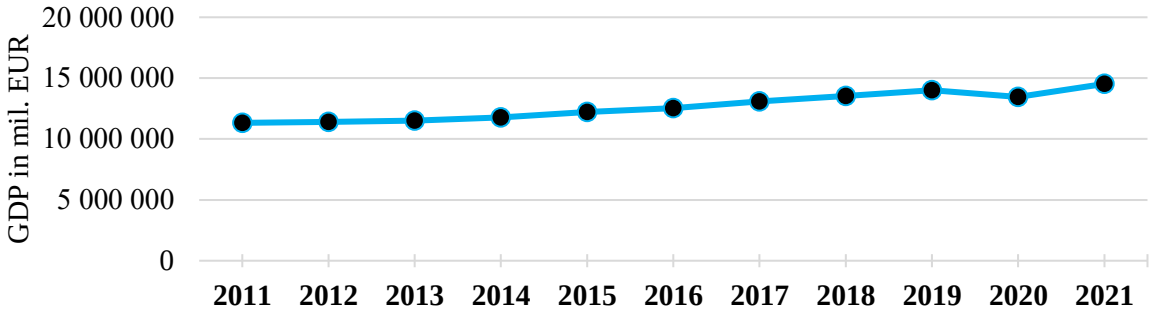
where *Ti* is the chain index in the year *i*, and *x* is the value of the analysed indicator.

2. Results of the Research

In this part of the paper, the research results are further presented. The research findings are summarised in four figures on the development of gross domestic product (GDP), gross domestic expenditure on R&D (GERD), R&D intensity and the chain index development in the analysed period (2011–2021).

Fig. 1 presents the development of GDP in the EU-27 countries over the examined period (2011–2021).

Fig. 1: GDP in the EU-27 countries (2011–2021; mil. EUR)

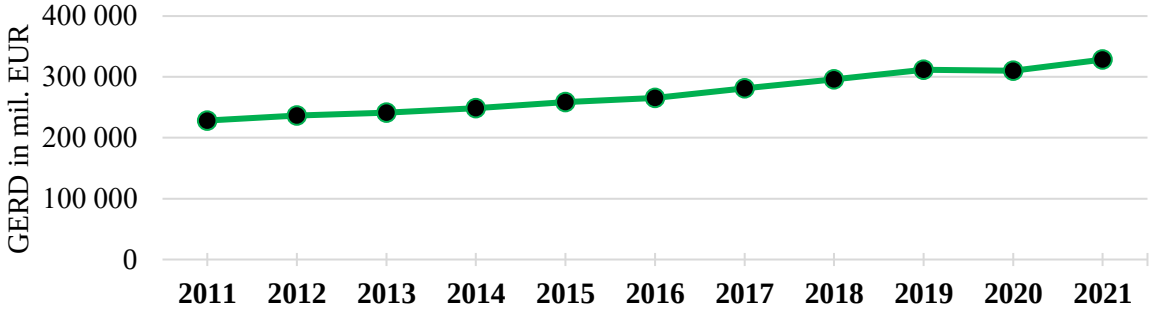


Source: authors' own processing, data from Eurostat (2023a)

The EU-27 countries' GDP grew slowly until 2020 (average annual growth rate of 3 %, with the strongest growth of 4 % recorded in 2017, and 2018). Even though there was a noticeable decline of 4 % in 2020, GDP growth was revived right away in 2021, with an 8 % year-on-year change compared to the previous "pandemic year" 2020.

Fig. 2 captures the development of GERD in the EU-27 countries (2011–2021).

Fig. 2: GERD in the EU-27 countries (2011–2021; mil. EUR)

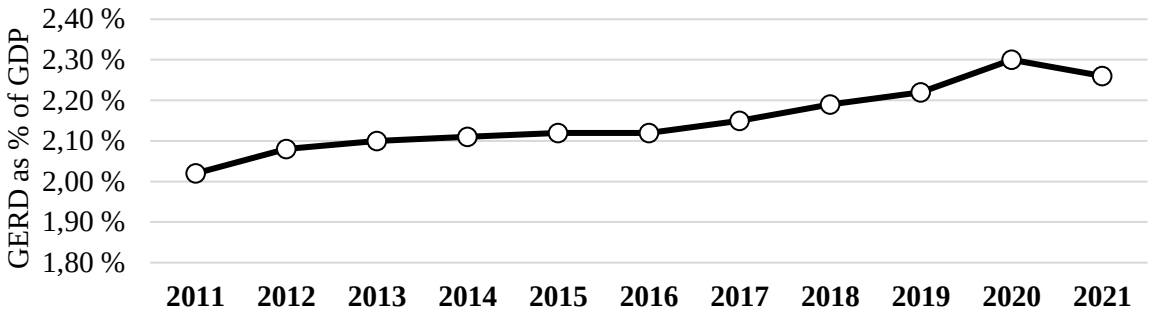


Source: authors' own processing, data from Eurostat (2023b)

The development of GERD largely follows changes in GDP. As presented in Fig. 2, GERD grew at an average annual growth rate of 4 % until 2020, with a growth of 5 % in 2018 and 2019. However, in 2020, the development of GERD was slightly negative – with a year-on-year decrease of 1 %. In 2021, as in the case of GDP, the recovery came, but at a slightly lower rate – an annual increase of 6 % (compared to the GDP growth of 8 %).

The data presented in the previous two figures are further used in Fig. 3, where GERD as a percentage of GDP is expressed using the formula 1 presented in section 1.

Fig. 3: R&D intensity in the EU-27 countries (2011–2021; % of GDP)

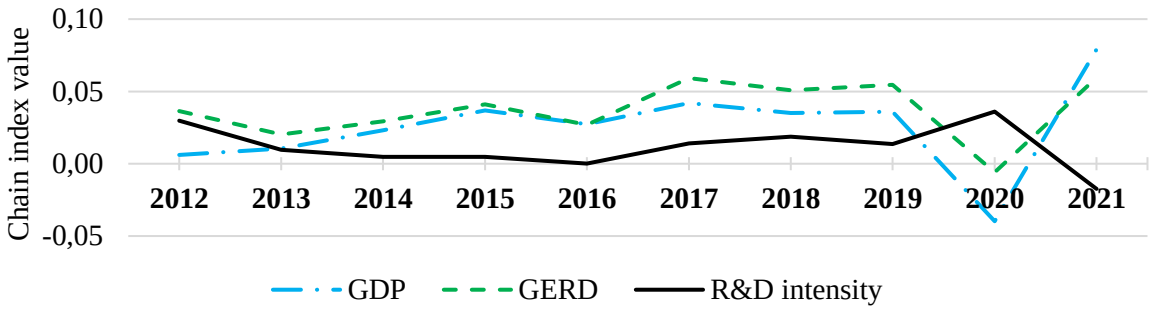


Source: authors' own processing, data from Eurostat (2023b)

As can be seen in Fig. 3, the share of GERD in GDP increased slowly over the period under review until 2019. This slightly rising increase results from a more significant increase in GERD relative to GDP. In 2020, GDP declined much more than GERD (4 % vs. 1 %). This is the reason behind the strong increase in the share of GERD in GDP, thus the growth of R&D intensity. GDP and GERD declined in 2020, while R&D intensity increased by 4 % in the same year. In contrast, the reduction in R&D intensity in 2021 is due to a relatively stronger recovery in GDP compared to GERD (8 % vs. 6 %).

Fig. 4 compares the evolution of the chain index (i.e. the annual growth rate) of the three analysed indicators – GDP, GERD, and R&D intensity.

Fig. 4: Chain index – GDP, GERD, R&D intensity (2011–2021)



Source: authors' own processing, data from Eurostat (2023a, 2023b)

The comparison made in Fig. 4 confirms the aforementioned findings. Regarding the development of GDP and GERD, a significant year-on-year decline can be seen in 2020. However, since GDP dropped by 4 % and GERD only by 1 %, the share of GERD on GDP increased by 4 % year-on-year. On the other hand, the stronger recovery in GDP relative to GERD in 2021 led to the year-on-year development of the R&D intensity indicator turning negative for the first time (-2 %).

3. Discussion

According to OECD (2021), R&D investments are procyclical, prone to contracting or falling sharply in periods of crisis and rising in periods of recovery. Thus, the normal functioning of innovation systems was disrupted. However, the effect of the pandemic may differ across industries – there are businesses that were expanding their R&D activities during the crisis (digital and pharmaceutical sectors), while others reduced their R&D investment (automotive, aerospace, defence).

This research used EU-wide data across economic sectors. However, as Eurostat (2023b) also tracks the data used in this research separately for each country and each sector, it will then be possible to examine the impact of the pandemic on R&D funding in different EU countries as well as sectors of the national economy (business, government, higher education, private non-profit).

It is quite obvious that the crisis accelerated the use of digital means enabling to work remotely, and has also created opportunities for R&D in certain areas. For example, there has been a significant focus on developing vaccines and treatments for Covid-19, which has led to an increased R&D activity in the healthcare and pharmaceutical sectors.

In addition, the pandemic has highlighted the importance of digital technologies and has led to increased investment in areas such as e-commerce, remote work and online education (Kloos et al., 2021). It also illustrates the importance of cooperation with higher education institutions, which continue to play a vital role in research activities in the EU countries and contribute to the development of new knowledge and technologies, the growth of industries and the training of highly qualified personnel (Kotorov et al., 2020). Such close cooperation between higher education institutions, businesses and other stakeholders is essential for the successful implementation of research and development and for the further growth and development of the EU economy, whether we are in forced lockdown or not (Kotorov et al., 2021).

Conclusion

The paper focused on the evolution of GDP and R&D funding and the impact of the Covid-19 pandemic on them. The issue was examined in the environment of the EU-27 current member countries.

Since the Covid-19 pandemic spread across Europe at the beginning of 2020 and the countries took various restrictive measures during that year, we looked at 2020 as the pandemic year. The findings obtained in this research confirm that the Covid-19 pandemic impacted both GDP and GERD of the EU-27 countries. Both GDP and GERD grew slowly throughout the period under review (since 2011). As the growth rate was a bit higher in the case of GERD, also R&D intensity (the share of GERD on GDP) increased. However, during the pandemic year of 2020, there was a significant decline in GDP (by 4 %), and also GERD decreased (by 1 %). However, in 2021, both GDP and GERD recovered again – GDP more significantly than GERD (8 % vs. 6 %), resulting in the year-on-year negative development of R&D intensity (-2 %) for the very first time during the analysed period.

Based on the research findings, it is possible to conclude that the impact of the Covid-19 pandemic on the EU-27 countries' economic growth (measured by the changes in the development of GDP) and R&D funding (measured by GERD) was neither significant nor had a long-term nature. This is confirmed by the analysis of the development of both indicators, where despite the declines in the pandemic year 2020, there is a significant increase again immediately in 2021. Although the evolution of both variables (GDP and GERD) suggests that R&D spending is dependent on economic development, it will be interesting to test this hypothesis with a longer time lag, not only in the context of the pandemic but also in the context of another major economic shock – the consequences of the ongoing war in Ukraine.

The Covid-19 pandemic has significantly impacted the R&D activities of businesses and institutions in the EU countries. While some companies and institutions have continued to invest in R&D activities, others have faced financial difficulties and have had to reduce or postpone their R&D spending.

One factor that has affected R&D intensity in the EU is the economic impact of the pandemic. The pandemic has caused a significant economic downturn, which has led to budget cuts and reductions in R&D spending for some businesses and institutions. In addition, the pandemic has caused supply chain disruptions and changes in consumer behaviour, which may have affected the direction and focus of R&D activities.

Overall, the effect of the Covid-19 pandemic on R&D intensity in the EU countries has been mixed, with some sectors experiencing increased R&D activity and others facing challenges due to budget constraints and disruptions in the economic environment. However, the long-term impact of the pandemic on R&D activities in the EU will depend on a range of factors, including the duration of the pandemic, the speed of the economic recovery, and the future priorities of businesses and institutions.

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Human Resource Sustainability and Digital Transformation: Exploring the Role of Key Actors

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Abstract
Digital transformation changes economy and society, makes significant changes in people's life and can have both positive and negative consequences for individuals, organisations and society. To the success of digital transformation, the human factor is more important than the technology itself. This research survey focuses on the human perception of support needed from different actors for their adaptation towards digital transformation. The quantitative research in the form of a questionnaire survey was carried out using an online panel. The respondents for the questionnaire survey were adult people living in the Czech Republic (n = 1000 from generations Baby Boomers, X and Y). The questionnaire design was inspired by the OECD Risks That Matter Survey 2020. The research focuses on what role different actors play in addressing negative impacts of digital transformation. The findings show that the highest level of responsibility was given to the Czech government, followed by firms and public administration. Conversely, lower levels of accountability were attributed to nonprofit organisations and trade unions, but surprisingly also at the individual level. The findings further found no significant effect on the perception of responsibility of government, firms and public administration, nonprofit organisations and trade unions for gender, education, nature of work and type of generation. However, we identified differences among groups in their assessment of responsibility on an individual level. Findings are important for decision-makers that should be responsible for peoples' transformation in the context of digital transformation.

Key Words
digital transformation, human resources, generations, individual's perception

JEL Classification: M39, M53, M54

Introduction

Digital transformation (DT) has a significant impact on all aspects of our lives, including the manner of doing business, working and living (Švarc et al., 2021). It also represents a challenge for individual companies, institutions and national and global economies as a whole (Kraus et al., 2022). Digital transformation refers to a broader process of transforming an organisation on different levels (e.g., strategy, governance, leadership, culture, people, technology, etc.) by making use of digital technologies and concepts (Heilig et al., 2017). It is also important to note that digital transformation does not solely concern technologies and strategies but also people and their mindset to accept digital changes (Tabrizi et al., 2019). Digital transformation has been becoming increasingly important in the field of corporate sustainability and has brought many benefits to businesses and society (Chen & Hao, 2022). The increase in digital transformation may in many areas accelerate economic performance, significantly improve the production

and innovation efficiency of enterprises, reduce costs, increase revenue, enhance customer engagement and customer service and, in the end, lead to substantial improvements in the companies (Li et al., 2023).

Notwithstanding the positive impacts of digital transformation, some negative consequences for individuals, organisations, and society have occured (Aly, 2020). In this context, increasing attention is given to the human impact of digital transformation. Some authors argue that digital transformation can lead to job displacement or the replacement of some occupations, contribute to social and economic inequality including wage inequality, and increase job polarisation and skills instability (Kristal, 2020, Frey & Osborne, 2017). Similar to any other change, digital transformation induces uncertainty among individuals. The uncertainty and fear in the context of digital transformation, associated with changes concerning potential job loss and the changes in the nature of work, are a burden on individuals (cf. Boswell et al., 2014). However, individuals are not only affected by digital transformation but can actively shape it (Blanka et al., 2022). Thus, it is important to understand people's perceptions and attitudes toward digital transformation in the workplace. An important role in how individuals view and engage with digital technologies is played by generational cohorts (Calvo-Porral et al., 2019). Each generational cohort shares similar values, beliefs, and attitudes and holds specific characteristics that distinguishes one generational cohort from the other (Brink & Zonda, 2021). Thus, the generational cohort approach enables us to understand attitudes and motivations of different generations towards digital transformation in the workplace.

A sustainable approach to human resource management (HRM) has the potential to overcome some of the negative consequences of digitalization in the workplace (Aust et al., 2020). Sustainable HRM refers to social, human and environmental outcomes that contribute to a sustainable organisation. Furthermore, sustainable HRM stressing the leading role of HRM in digital transformation can provide more flexibility to the organisation and its workforce in this process (Kramar, 2022). In addition, sustainable HRM together with digital transformation can help to create sustainable organisations.

It is evident that the impact of DT occurs not only at the business level, it also has environmental, societal, and institutional implications (Kraus et al., 2021). In addition, DT represents a process that involves several ongoing initiatives and different interconnected actors such as government, local institutions, companies, management and individuals. In this process none of the actors can be seen in isolation. Instead, all of them need to actively interact, collaborate with each other, accelerate DT and create sustainable societies (Pappas et. al., 2018).

This research survey focuses on the human perception of support needed from different actors for their adaptation towards digital transformation. Thus, the research raises the following research question: How do individuals perceive the role that different actors play in addressing negative impacts of DT, including their own active involvement? In light of the research question, the following research hypotheses were developed:

H1:Individual's perception of different actors' responsibility in addressing the potential negative side effects of digital transformation is influenced by the type of generation.
H2:There is no difference between men and women concerning perception of different actors' responsibility in addressing potential negative side effects of DT.
H3:Individual's perception of different actors' responsibility in addressing potential negative side effects of DT is influenced by the level of education.

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H4:Individual's perception of different actors' responsibility in addressing potential negative side effects of DT is influenced by the nature of their work (predominance of physical or mental work).

1. Methods

The quantitative research in the form of a questionnaire survey was carried out at the end of the year 2021. The primary data were collected using an online panel. Talk Online Panels operate in Central and South Eastern Europe through a network of representative offices (DATACOLLECT, 2022). Detailed tracking across selected demographic attributes allows for respondents to be selected according to the required sample selection characters (gender, age, location in CZ). The data were collected by both computer-assisted web interviewing and computer-assisted telephone interviewing.

1.1 Sample

The respondents for the questionnaire survey were adult people (aged 18+) living in the Czech Republic. The research sample size was set at 1,000 respondents, which is the usual size for surveys within the Czech population for this type of research (cf. CVVM, 2021). The distribution of respondents in the quota sampling (cf. Burs et al., 2017) is according to the basic demographic characteristics of the population, such as gender and age (see Table 1), but also the region. Therefore, the sample could be considered representative of the Czech Internet population. In addition, in 2022 the Internet penetration in the Czech Republic was 87% (Internet World Stats, 2023).

1.2 Instrument

The questionnaire design was inspired by the OECD Risks That Matter Survey 2020, specifically by the section Digitalization, technology, and the changing world of work and by the items focused on finding out respondents' views on the roles of different actors in addressing potential negative side effects of technological change in the context of DT. For the purpose of our survey, we modified these items in order to use them in the Czech context. In modified items, we used the following actors – the European Union, the Czech government, public administration, firms, trade unions, nonprofit organisations (NGOs) and individual workers. For each questionnaire item, a 5-point Likert scale was used for responses, ranging from 1 = strongly disagree to 5 = strongly agree. In the final part of the questionnaire, supporting information for further statistical analysis was collected from the the respondents' demographic information (for our purpose in particular age = division into generations, gender, educational attainment, nature of work = predominance of physical or mental work).

1.3 Statistical Methods

First, the obtained data were evaluated using descriptive statistics, namely sample means and frequencies. The data was used to determine the ranking of actors according to respondents' comments on the importance of their role in supporting people in the context of digital transformation. Second, formal statistical methods were used to verify the H 1-4 hypotheses. The samples are independent of each other, data have normal distributions and the number of participants is high. Thus, the effect of gender, generation, education and nature of work on the level of need for support from different subjects was

assessed using a two-sample t-test and an one-way ANOVA. Statistical analysis was performed in the statistical software TIBCO (Statistica).

2. Results

The research sample size of 1,000 was obtained using quota sampling. Quotas by gender and generation are presented in Table 1.

Tab. 1: Quota sampling

Gender / Generation	B	X	Y	Total
Male	85	285	130	500
Female	85	285	130	500
Total	170	570	260	1000

Source: own

Table 1 shows that the distribution of males and females in the sample of respondents is 50/50. Table 2 documents the distribution of the respondent population by education and by nature of work (predominance of physical or mental work).

Tab. 2: Overview of control variables

Variable	Number	Percentage
Education Level		
Primary	22	2.2
Secondary	611	61.1
Tertiary	367	36.7
Work Type		
Mental	699	69.9
Physical	301	30.1

Source: own

In Table 3 below we see the distribution of responses to the questionnaire items by generations. Respondents expressed the degree of responsibility of the selected entity for possible negative side effects of technological change in the context of digital transformation on humans.

Tab. 3: Distribution of responses by generations

		Gen BB		Gen X		Gen Y	
Items		**Means**	***SD***	**Means**	***SD***	**Means**	***SD***
EU	Q3_1	3.49	1.13	3.66	1.03	3.65	1.00
Czech government	Q3_2	3.95	0.90	3.84	0.95	3.77	0.99
Public administration	Q3_3	3.79	0.85	3.80	0.85	3.67	0.92
Firms	Q3_4	3.79	0.71	3.81	0.77	3.73	0.82
Trade unions	Q3_5	3.55	0.87	3.63	0.85	3.60	0.84
NGOs	Q3_6	3.01	1.03	3.06	1.03	3.07	0.91
Involvement of individuals	Q3_7	3.38	0.93	3.59	0.86	3.60	0.91

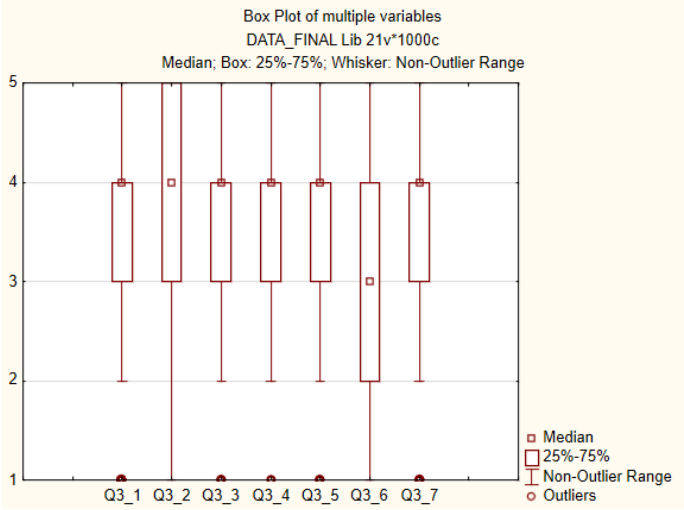
Source: own

Note: 1 = strongly disagree to 5 = strongly agree.

The highest level of responsibility was given to the Czech government, followed by firms and public administration. Conversely, lower levels of accountability were expressed for

NGOs and trade unions, but surprisingly also at the individual level. The basic graphical presentation of descriptive data is shown in Figure 1 below.

Fig. 1: Box plots, data distribution for all generations



Source: own

Figure 1 offers general information about a group of data symmetry, skew, variance and outliers. The box plots show the distribution of numeric data values of the research sample in all items. The results (Table 3) show that differences are only in item Q3_7, and for all groups assessed. This means that hypotheses H1 - H4 will be further evaluated only in this item of the questionnaire.

Thus, the two-sample t-test and a one-way ANOVA were used to determine statistically significant differences in responses according to the classification criteria.

Statistically significant differences were found in Q3_7 item, involvement of individuals in terms of generation type. A one-way ANOVA revealed that the effect of generations was significant between at least two groups (F(2, 1) = [3.91], p = 0.02). H1 for Q3_7 is supported.

Tab. 4: Post hoc tests for statistically significant differences in involvement of individuals towards DT according type of generation.

Generations		Sig. Q3_7
BB	X	0.023
BB	Y	0.034
X	Y	0.975

Source: own

Statistically significant differences were found in Q3_7 item, involvement of individuals in terms of gender. There was a significant effect for gender, t(998) = 3.398, p < .001, with men receiving higher scores than women. H2 is for item Q3_7. Statistically significant differences were also found in Q3_7 item, involvement of individuals in terms of education. In this case, we did not include the group of participants with only primary education in the comparison (n = 22), and the only groups with secondary (n = 611) and university education (n = 367) are compared. There was a significant effect for education, t(976) = -4.509, p < .001, respondents with higher education received higher scores than respondents with secondary level of education. H3 for Q3_7 is supported. Statistically significant differences were found in Q3_7 item, involvement of individuals in terms of

nature of work (predominance of physical or mental work). The participants were divided into two groups, first one = predominance of physical work (n = 301), and second one = predominance of mental work (n = 699). There was a significant effect for the nature of work, $t(998) = 2.963$, $p = .003$, respondents with a predominance of mental work receiving higher scores than respondents with a predominance of physical work. H4 for Q3_7 is supported.

3. Discussion

The findings indicate that respondents ascribed the greatest responsibility to the Czech government, followed by firms and public administration. On the other hand, NGOs, trade unions and surprisingly individuals themselves are perceived as less responsible for addressing the potential negative side effects of DT. This shows that respondents are unwilling to take more responsibility and that they see government, firms and public administration as dominant actors who are decision-makers in the DT. These findings have important implications for policymakers and companies in terms of how much support should be given to encourage digital transformation. As stated by Aly (2022) policymakers should emphasize the benefits of DT on the economy and the society as a whole and encourage a more positive societal attitude toward DT. On the other hand, they need to actively address and anticipate the downsides of DT and lessen the negative impact of digital transformation. Companies must proactively adapt to the new situation that DT presents (Kraus et all, 2022). It is the responsibility of management to prioritize quality policy and strategy for successful DT (Alieva & Powell, 2023).

The findings found no significant effect on the perception of responsibility of government, firms and public administration NGOs and trade unions for gender, education, nature of work and type of generation. However, we found differences among groups in their assessment of responsibility on an individual level. Significant differences emerge in each breakdown according to the groups of respondents. As expected, there was a generation difference (Calvo-Poral et al. 2019). Baby boomers are indeed different from Generations X and Y. Members of this generation expressed significantly lower willingness with their active involvement. Surprisingly, there was also a difference between men and women in this item (Q3_7). Further, we expected persons with university education to be more active in relation to DT and to agree that they need to be actively involved themselves. This findings in fact confirmed the positive influence of higher educational attainment on the activity of individuals in the direction of lifelong learning and development. Our last criterion was the focus of work activity (predominance of physical or mental work), where again people with a predominance of mental work expressed a higher level of agreement with their active involvement in addressing the potential negative impacts of DT on their employment and life security.

Conclusion

DT poses a substantial challenge for global and national economies, companies and individuals. It has a set of various positive and negative effects. Awareness of the negative effects of digital transformation allows us to focus on issues that lessen the negative impact of DT. Different actors should be involved in this process, including individuals who need to interact with each other in order to accelerate DT and create sustainable societies. There are some limitations that we acknowledge. The research design was

influenced by the mentioned resources. The research focused on only one country, and the respondents were not obtained by a random sample (quota sampling and the online panel were used to select respondents).

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The Turów Crisis: Economy vs Sustainability

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Abstract

The text focus on a sensitive topic within the EU, the crisis around the operation of the Turów coal mine in Poland. The mine is located in the Turószow Spur on the borders of Czechia and Germany. The whole Three-border Region belongs to the economic periphery or semiperiphery, although the particular states have visible economic differences. The mine's operation violates many ecological norms, and its location brings adverse cross-border environmental effects. Polish authorities insist on the mine operation despite foreign complaints and international criticism. They are pretty successful with their diplomacy mixed with ignorance. Polish officials promote economy and energy; meanwhile, the neighboring states and the EU prefer ecologically sustainable development and fair neighbor relations. As human geographers, the authors use various methods: desk research of economic, geographical, political, and ecological sources connected to the Turów Mine and Tree-border Region, analyzing available statistical data, media analysis, survey, and expert interviews. The main focus is on Czech-Polish affairs, but some overlaps are inevitable. The study reveals differences in priorities between Poland and its neigbors, leading to conflicting narratives. Together with economic and developmental asymmetries, they determine the status quo mostly regardless of the environment and related pressure from the EU, promoting the struggle against climate change.

Key Words

Turów Mine, Three-border Region, Czechia, Poland, economy, environmental problems

JEL Classification: O52, P28, R11

Introduction

The Turów Mine and the Turów Power Plant create the large energy complex in Bogatynia, the town and commune in southwestern Poland in the so-called Turoszów Spur bordering Czechia and Germany. The whole area is called Three-border Region. The power plant was a source of cross-border problems in the past because of its sulfurous emissions, but since the 2010s, we have observed issues connected with the continuous expansion of the mine towards the Czech and German sides. Nowadays, the pit is located less than 1 km from Czechia and 200 meters from Germany, causing many adverse environmental effects. They decreased locals' quality of life and estate prices and led to cross-border tensions and medialization of the case. The controversy damaged the cross-border integration in the region. There were Polish narratives about Czechs fighting against the mine to sell Czech electric energy to Poland or about the swimming pools in Czech border settlements reporting a water leak.

Czech-Polish negotiations on various levels about the mine in the 2010s were organized without a binding effect. The discontent of the Czechs peaked in 2019 when a proposal to expand the mine and operate until 2026, respectively 2044, was introduced by the mostly state-owned consortium PGE (Polska grupa energetyczna = Polish Energy Group). The Polish authorities supported it without proper cross-border consultations,

research, and regardless of the EU law (Kusiak-Winter, 2022). 10 Czech municipalities sent a petition against mining to the European Parliament in cooperation with the Liberec Region and Greenpeace (Město Frýdlant, 2019). The petition was found to be justified. The European Parliament's endorsement influenced later pro-Czech proceedings of the European Commission and the decision of the Court of Justice of the EU (CJEU), which on May 2021 decided that Poland should immediately cease activities in the Turów Mine and set the penalty of 0.5 mil. EUR for each day of mining. The quarrels between Poland and Czechia around the Turów Mine operation were stabilized through the agreement on 4th February 2022. Poland was de facto pressured into the contract by the penalty. Many Czechs think the compensation from the Polish side could have been significantly higher than 45 mils. EUR. These events inspired German officials to be more active in the affair. German policy was more placatory than Czech, possibly due to the relatively functioning cooperation between Zittau and Bogatynia and lignite mines in the north of the Görlitz District (Boháč et al., 2023). Generally, the Turów crisis was a sui generis case in Central Europe, similar to the Temelín crisis from the 2000s or a dispute about the coking plant in Stonava in the late 1980s.

The text aims to present the economic (energy) and environmental inputs of the Turów crisis, which led to opposite positions of the Czech and Polish sides and disputes under the influence of ineffective cross-border communication. Existing inputs, preconditions and interests, which are still evident after the Czech-Polish agreement, are analyzed primarily through the lens of economic and environmental geography. The economic dimension is highlighted through the analysis of cross-border flows during the crisis (2019-2022), documenting the socioeconomic habits of Czechs and Poles from the region and their change during the dispute.

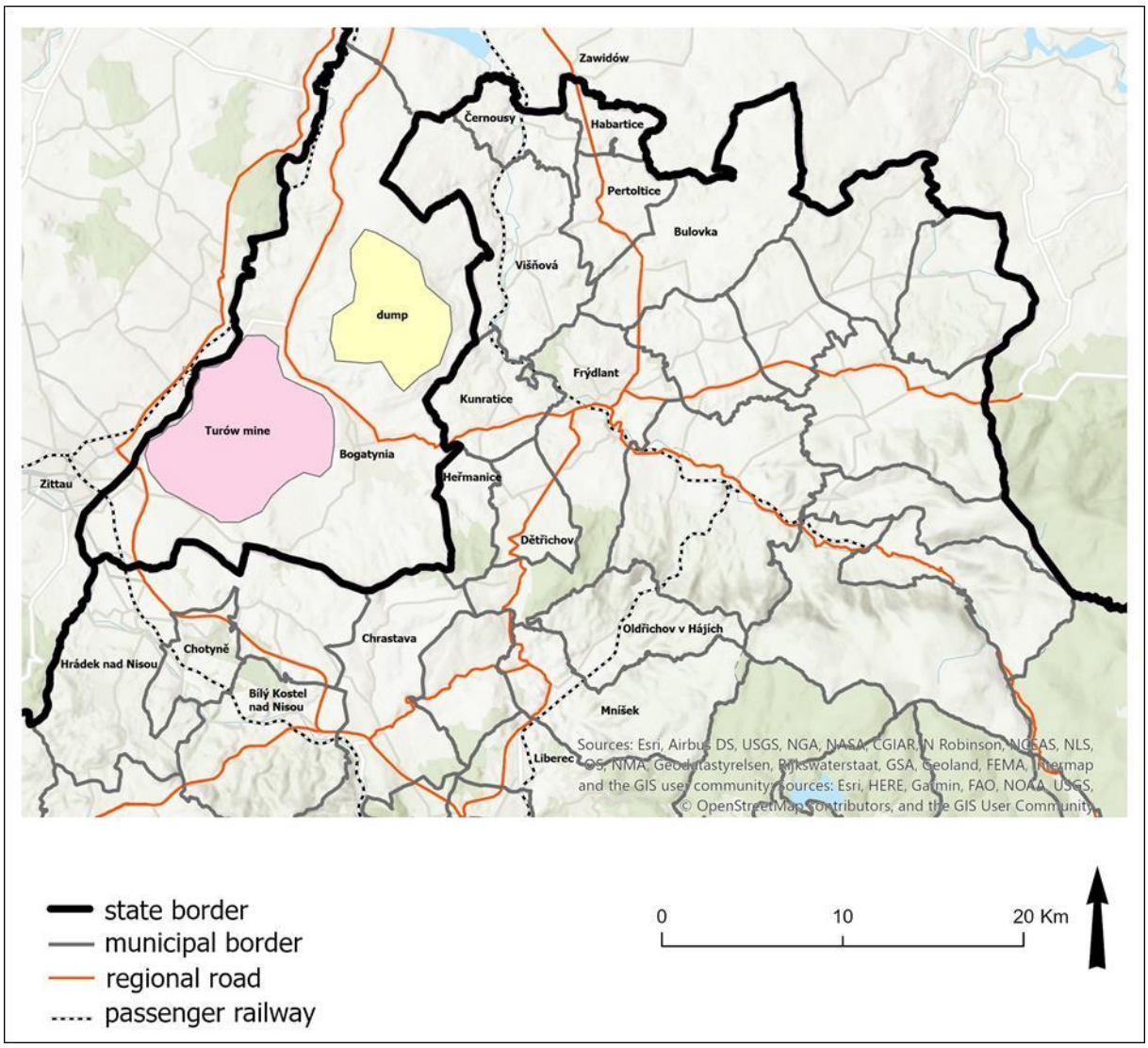
1. Methods of Research

Concerning relevant literature, the climate and energy governance of the EU (Siddi, 2020) or border regions development (Capellano et al., 2022) are frequent topics in academia. Still, the socioeconomic or environmental development of the Three-border Region is rare in academic literature. The Turów crisis, concretely its political and socioeconomic dimension, was analyzed in several publications over the last two years (Kusiak-Winter, 2022; Łaźniewska et al., 2023; Żuk & Żuk, 2022). The concept of cross-border integration encompassing its institutional, ideational, and functional dimensions (Durand & Decoville, 2019; Van Houtum, 2000) is ideal for analyzing local and regional relations in the studied area.

The text focuses on the Czech and Polish municipalities in the Three-border Region affected by the mine operation, specifically:

1. Commune (gmina) Bogatynia in Poland, including the Turów Mine
2. Municipalities Bílý Kostel nad Nisou, Bulovka, Černousy, Dětřichov, Frýdlant, Habartice, Heřmanice, Hrádek nad Nisou, Chotyně, Chrastava, Kunratice, Mníšek, Oldřichov v Hájích, Pertoltice, and Višňová in Czechia (affected by mining according to the Liberec Regional Government)

Fig. 1: Map of the studied Three-border Region



Source: Authors' elaboration

The methodology of the text encompasses the following:

1. Desk research of geographical, economic and other social sciences secondary sources
2. Analyzing available data from Czechia and Poland on various hierarchical levels – some data do not exist for the minor ranks. The data come from the Czech Statistical Office (CZSO, 2022), which also covers statistics of the Euroregion Neisse-Nisa-Nysa (ERN) and Statistics Poland (Statistics Poland, 2022). The data are for the year 2021 unless otherwise stated.
3. Authors' non-participant observation in Bogatynia, Hrádek nad Nisou, Chrastava, Heřmanice, Kunratice, and Višňová in 2021 and 2022
4. Quantitative research contained containing questionnaires distributed to 150 Czechsand 180 Poles chosen randomly

The questioning was conducted within the one-year project Crisis in the Turów Mine and its impact on Czech-Polish cross-border cooperation: evaluation, conclusions and recommendations. The Polish National Agency for Academic Exchange financed the project. The project team was comprised of Czech and Polish researchers.

The text works with the central hypothesis claiming that cross-border socioeconomic asymmetries, intensity and type of cross-border flows, and institutional attitudes towards environmental protection contributed significantly to the escalation of the Turów dispute. The hypothesis was based on the authors' personal experiences from the studied region and media information. Previously, it was found that cross-border asymmetry weakens cooperation and communication and limits cross-border flows to pragmatic ones (Böhm & Opioła, 2019).

2. Results of the Research

The specific shape of the borders, which creates appendix-like Turószow Spur, together with regional geomorphology and hydrology, causes citizens from Czechia and Germany to suffer from adverse mining effects more than Poles. Citizens of Bogatynia also feel the negative impact, but job opportunities and cheap energy in the commune mitigate them. Geography also determines the region's economic, developmental, and transport asymmetries. The exclusive focus of Bogatynia on mining intensifies these asymmetries and vice versa.

The Three-border region belongs to the economic periphery or semiperiphery far from the countries' economic and administrative cores. The disproportion between average wages and GDP per capita between Czechia, Poland and Germany is well-known. It causes the willingness of Czechs and Poles to work in Germany. Poles also work in Czechia, especially in the automotive industry. Few Czechs work in Poland, and no Czech is employed in the Turów energy complex. The wage asymmetry does not fully relate to the prices of estates or food. That is why Czechs are known for their shopping tourism to Bogatynia and Zittau.

Almost no differences in the sectoral distribution of economic activities between Bogatynia and the Czech municipalities were found in the Euroregional statistical data (CZSO, 2022). Nevertheless, there is a significant disproportion in the number of companies and entrepreneurs. Few economic subjects operate in Bogatynia, even in terms of Polish communes. The dominance of the Turów energy complex and its subcontractors in employing local inhabitants is unquestionable. The situation is similar in the civil sector in Bogatynia, lacking NGOs not connected to the Turów complex. There are also asymmetries in transport or tourism favoring the Czech side. No road is higher than the district level in Bogatynia. The only exception is the road between Hrádek nad Nisou and Zittau going through the southern tip of its territory. There is no passenger railway station in Bogatynia. The commune lacks attractivities except for Upper Lusatian houses and the small nature reservation Grądy. It contrasts with the Czech part comprising castles Frýdlant and Grabštejn, Kristýna Lake or Archeopark Curia Vítkov in Chrastava. More statistically evaluated information on socioeconomic indicators in the Czech-Polish borderland is provided by Pászto et al. (2019). Their observations for the Czech-Polish border within the ERN show continuity in population density and proportion of built-up area and discontinuity in emigration rate, ecological stability, and crude mortality rate, favoring the Czech side. These findings correspond with those provided here.

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Tab. 1: Three-border Region in selected indicators and features

	Polish part	Czech part
Area (km²)	136.20	297.13
Population	21 891	30 439
Population density (inhabitants/km²)	160.72	102.44
Natural population increase	-126	-99
Migration balance	-43	107
Average salary per month (EUR)	1 098	1 366
GDP per capita (EUR)	14 566	17 912
Economic subjects	1 906	5 812
Registered unemployed people	315	803
Forest area (km²)	38.13	117.60
Length of tourist routes (km)	43.80	173
Length of cycling routes (km)	7.60	142
Overnight stay options	4	20

Source: CZSO (2022), Statistics Poland (2022) and authors' calculations

Disproportion also manifests in the understanding between Czechs and Poles in the regions that were part of Germany or had a German majority. The level of communication is poor, even though they belong to the same language group (Böhm & Opioła, 2019). Table 2 shows the intensity of cross-border flows in the studied area, which are more or less connected to the mentioned asymmetries. For the vast majority of residents on both sides, the dispute over the Turów Mine did not negatively affect their frequency of crossing the border. It was declared by 94.60% of Czech respondents and 84.80% of Polish respondents on the Polish side. The dispute was not so heated as the media depicted it, but the more substantial impact was noticeable among Poles. 24.02% of Polish respondents and 6.06% of Czechs participated in protests connected with the mine. The controversy did not affect commuting Poles and Czechs shopping in Bogatynia, although minor incidents in shops emerged.

Tab. 2: Main reasons for crossing the Polish-Czech border by the surveyed inhabitants of the ERN

Detailed reason	Very often (%)		Often (%)		Rarely (%)		Very rarely (%)		I do not cross the border for the stated purposes (%)	
	PL	CZ	PL	CZ	PL	CZ	PL	CZ	PL	CZ
Family/Friends	3.80	0	10.87	7.63	11.41	7.63	7.62	5.93	66.30	78.81
Work	7.07	0	1.09	3.51	1.09	9.65	1.63	3.51	89.13	83.33
Business	1.10	0.88	1.10	5.32	2.20	0.88	6.04	7.08	89.56	85.84
Shopping	1.10	3.28	6.52	24.59	16.30	28.69	26.63	27.05	49.45	16.39
Education	0	0	2.18	1.73	2.73	5.17	1.64	12.93	93.45	80.17
Healthcare	0	0	1.10	0	3.82	0.89	8.20	6.25	86.88	92.86
Entertainment	3.20	0.90	8.70	1.80	11.95	9.01	25	27.03	51.10	61.26
Sport/Tourism	8.64	0	15.14	7.02	20.54	21.93	25.95	31.58	29.73	39.47
Journey (transit)	10.58	8.62	14.29	8.62	26.45	19.83	22.75	26.72	25.93	36.21

Source: Authors' research

The Turów Mine has annual output from the deposit of approximately 8 mil tonnes of coal and reserves of 271 mils. tons of lignite. It is a lignite surface mine operated by state-owned company PGE (Polska grupa energetyczna = Polish Energy Group). Since 1962, the Turów Power Plant (with a current installed capacity of 1,499 MWe) has operated and burned coal from the nearby mine. The energy complex employs 3 500 people, and cooperating companies 1 800 people. It is estimated that, together with the families, the

Turów complex ensures a stable living for approximately 70 000 people. The importance of the complex for a region was evident from the involvement of the communes of Bogatynia, Bolesławiec, Lubań, Pieńsk, Sulików, Węgliniec, Zawidów, and Zgorzelec in the unsuccessful pro-Turów petition addressed to the European Commission (Powiat Zgorzelecki, 2020). It is also essential for Poland as a source of 7% of national electric energy (Izidorczyk, 2022). The importance for Bogatynia lies in providing water and heat to the town's inhabitants. Bogatynia is one of the wealthiest communes in Poland because of the Turów energy complex contributions. The municipality's budget per capita incomes are 1 500 EUR. For example, the nearby commune, with a similar number of inhabitants, Lubań, works with the amount of 880 EUR. The Turów energy complex is a dominant employer in Bogatynia, where the unemployment rate is only 2.2% (Statistics Poland, 2022). Despite its wealth, the commune is quite undeveloped. The state of several roads, buildings, sewerage, aquapark and population decline does not indicate wealth.

Poland is one of Europe's leading producers of lignite (46 million tonnes per year, 20 % of the EU's production), and its energy system is dependent on it. Germany is an even bigger producer (107 million tonnes per year) but has diverse energy sources and is more open to the energy transition. Czechia is also important in extracting lignite (29 million tonnes per year), but its energy sources are diverse (data for 2020 – Eurostat, 2021). Extracting and burning coal is inconsistent with the EU's environmental goals, represented by the Green Deal and Just Transition mechanism, and the conclusions of the UN's Glasgow Climate Pact (Siddi, 2020). The Polish government has not presented an adequate strategy to make Poland independent from fossil fuels. The recently announced update of the State's Energy Policy until 2040, the strategic document of the country, assumes further maintenance of coal plants, while the planned share of energy from renewable sources is too small. Coal reserves are frequently located in the border regions where intense activities affect neighboring states and violate their norms.

Nevertheless, the Turów Mine proudly presents its pro-environmental activities, including mitigating the harmful effects of mining activities and recreating post-mining areas. These activities are considered unsatisfactory and part of greenwashing tactics by critics of the PGE. Czechs from the borderlands point to various problems connected to the mine operation, such as air, noise and light pollution, soil subsidence causing cracks in buildings, mudflows from the mine dump to Czech territory and especially drainage of underground waters by the mine evident in the settlements of Oldřichov na Hranicích, Uhelná and Václavice (parts of Hrádek nad Nisou). The hydrologic situation is monitored using boreholes, but its network is insufficient. The relatively small amount of data allows Poland to question the influence of the mine. A similar situation is with air pollution, concretely dust particles, benzo(a)pyrene, NO2 and SO2. Bogatynia is heavily polluted by dust from the excavation site, pool hopper, coal sorting site, coal site and coal transport route in the Turów Mine. Massive pollution in Bogatynia might cause a high crude mortality rate in the commune (Pászto et al., 2019).

There are no viable economic transition programs for Bogatynia offering the necessary 10 000-15 000 job opportunities, and the region remains dependent on mining and heavy industry. PGE promoted a slow transformation of the Commune of Bogatynia with the help of the EU's Just Transition Fund, ensuring Poland's energy security and local jobs.

Nevertheless, nowadays, Poland cannot draw support from the fund because of its non-cooperation in the case of the Turów Mine. Despite occasional floods, the rivers in the region have been affected by drought in the last few years. This trend works against the

recultivation plan of the mine by its flooding. Under current hydrological conditions, it would last approximately 150 years (Łaźniewska et al., 2023). Also, Polish plans for solar, wind or hydrogen energy use in Bogatynia are vague. Settlements existed in the territory of the dump and pit but were destroyed because of mining. Nowadays, the mine expansion has endangered Opolno-Zdrój, known as the spa before the wars. Poland does not care about its settlements, so it is not expected to care about the Czech ones.

3. Discussion

The stats in Chapter 2 showing the asymmetries in the number of economic subjects, migration balance or transport network confirmed the research hypothesis. The specific shape of the borders, geography, and geology of the studied area determine asymmetries in socioeconomic and environmental issues that led to the dispute. It was also influenced by the approach of the state, regional or local governments. Poland is generally known for its preference for economy and energy over environmental protection. Its attitude clashes with the current EU policy on climate change. All these phenomena, together with a language barrier and national stereotypes, limit cross-border integration. It is pretty weak despite the existence of the ERN, which belongs to the most active Euroregions in the Czech borderlands. The authors were surprised by the small effect of the Turów dispute on the intensity of cross-border flows. Cross-border flows in the studied area are still very pragmatic and determined by existing socioeconomic and environmental asymmetries. Czechs go to Poland for cheap shopping and transit, and Poles go to Czechia for job opportunities, transit, sport, and tourism. The lack of personal and cultural ties, also connected to the change of population on both sides of the border after 1945, was one of the reasons why the Turów dispute went to the level of the EU. The crisis was not as heated as the media presented, and its impacts on the not-very-significant cross-border economy were minimal (see Table 2).

Conclusion

Czechia promotes protecting the environment, citizens' health and peaceful cross-border relations in the studied area. Poland prefers energy security and jobs in Bogatynia. Valid criticism concerns the lack of a viable plan for the area's development during the mining slowdown. It looks like PGE wants to mine the last ton of coal there. The ideational and functional dimensions of cross-border integration are weak in the region. Only the institutional one is satisfactory. However, ERN, a leading cross-border institution in the area, did not act during the crisis. Nowadays, it has a chance to improve the situation because it became a manager of special microprojects focused on mitigating the mining effects and financed from the Polish compensation. The Czech- Polish dispute is currently obliterated, but minor controversies still could emerge in case of non-fulfilment of all details from the agreement. Inhabitants of the Czech borderland and environmental activists suspect the contract is not entirely fulfilled on the Polish side (Baroch, 2023). It will be interesting to follow the development of the ongoing Polish-German dispute. Its result could affect Czech territory.

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Knowledge of the Regional Brand in Liberec Region: Case Study

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Abstract

The issue of regional product brands is still a relatively unexplored topic, however, it has recently been gaining popularity among researchers. This scientific article focuses on the question of brand awareness of a selected regional producer from the syrup segment. The article also contains the results of qualitative marketing research focusing on the analysis of students' attitudes and preferences towards the examined regional brand. The questionnaire survey was implemented using the CAWI method and took place in the period from March to May 2022. During the period under review, the answers were obtained from a total of 303 student respondents. The main research question of this article is whether there is a dependence between selected socio-economic indicators (gender, income and size of residence) of the respondents and knowledge of the examined regional brand of the producer from the Liberec region. Based on the research question posed in this way, three sub-hypotheses were subsequently established that focus on verifying the dependencies between selected socio-economic indicators and knowledge of the brand of the regional manufacturer. The statistical software IBM SPS Statistics was subsequently used for data calculation and analysis. As part of testing the hypotheses, a statistical method called Pearson's chi-square test and descriptive statistics tools were used. Based on the statistical calculations made, dependence was proven in the case of the first two of the mentioned socio-economic indicators. The outcomes are continuously commented on in the results section. The last part of the article is dedicated to discussion and drawing additional conclusions.

Key Words

brand marketing, brand knowledge, regional branding, regional product, syrups

JEL Classification: M31, M37

Introduction

The emergence of regional brands is connected with the development of the wishes and needs of modern society of the 21st century. This society is increasingly influenced in its consumption behavior by modern technologies, new modern concepts and challenges. The current topics that influence the consumer behavior of individuals undoubtedly include the issue of ecology, sustainability and a healthy lifestyle (Rutkowska et al., 2020; Ober & Karwot, 2022; Pícha & Navrátil, 2019; Grubor & Milovanov, 2017). The recent Covid-19 pandemic has shown changes in consumer behavior across different markets (e.g. electronics, food, clothing) and the increasing influence of other factors such as locality and product quality; the possibility of quick subscription or use of online marketing tools (Svatošová, 2022; Svajdova, 2021). According to the Association of Regional Brands (ARZ) (2022), the first regional brands in the Czech Republic were created after 2004. Many authors still disagree on their unified theoretical definition and delineation within the marketing scientific discipline (Chalupová et al., 2013; Kašková &

Chromný , 2014). ARZ (2022) claim that regional branding is one of the ways to make a specific region more visible and draw attention to interesting products that are created there, and to make it easier for visitors to the region to navigate the services offered. Čadilová (2011, p. 8) maintains that: *"Regional labeling is one of the ways to make rural regions more visible and to support the development of a socially, culturally and environmentally oriented economy in areas that are interesting for their natural and cultural wealth. The main supported group are local entrepreneurs (artisans, farmers, small and medium-sized enterprises), whose abilities and skills help to spread the good name of the region, and identification with the region means a unique marketing opportunity for them".* For a regional brand to be successful in the market, businesses must build a quality brand image and a certain degree of brand awareness among their target segments (Keller 2007). As follows from the definition by Čadilová (2011), the owners of regional brands are characterized by their size – they are mainly representatives of small and medium-sized manufacturers, for whom the creation of brand awareness and knowledge of the brand can become a key factor in their strategic development. It is at the moment when the brand is known that the customer is able to recall selected associations that can lead to a strengthening of the overall value of the brand (Keller, 2007).

Many authors have discussed different perceptual and cognitive aspects that affect purchasing. In his influential work "Managing Brand Equity," Aaker (1991) identified three primary perceptual and cognitive traits, namely: name recognition, brand associations, and perceived quality. All three are considered essential elements that have an impact on enhancing brand loyalty. The customer-based brand equity model centered around customers, formulated by Keller (2007), is according to the authors, simplest approach in contemporary times. Customer-based brand equity is defined by Keller (1993, p. 2) as "the differential effect of brand knowledge on consumer response to the marketing of the brand". Customer-based equity occurs when the consumer is aware of the brand, is familiar with it, and has found memories of it. In other words, brand awareness and brand image are different kinds of brand knowledge. According to Keller (2007), brand awareness is necessary for creating a brand image. When a brand is well established in memory, it is easier to attach associations to the brand and establish them firmly in customers' memory. These aspects also show how vital brand knowledge is in brand marketing strategies. The main goal of this case study is to identify the knowledge of the regional Kitl brand among a selected group of respondents. As part of the research, the following research question was set: "Is there a dependence of knowledge of the Kitl brand on selected socio-economic indicators?" To better fulfill the main goal and the research question, the following three hypotheses were established:

H1: The variables “Brand Awareness” and “Gender” are independent variables.
H2: The variables “Brand Awareness” and “Income” are independent variables.
H3: The variables "Brand Awareness" and "Size of Residence" are independent variables.

1. Methods of Research

This case study was created in cooperation with a marketing employee at Kitl. The main objective of the collaboration was to determine students’ attitudes and preferences toward brands of syrups. Primary data was collected using an online questionnaire. The questionnaire was initially tested with a smaller group of respondents. This pilot version of the questionnaire helped to reveal shortcomings and incorporate comments into the final version. The entire questionnaire consisted of 27 questions and was created using

Google Forms. The questionnaire contained open and closed types of questions, questions containing a Likert scale. The questionnaire survey was carried out using the CAWI method and took place in the period from March to May 2022. The questionnaire was divided into five areas: attitudes of respondents in the segment of syrups and drinks, knowledge of the Kitl brand and experience with the brand, attitudes and preferences towards the Kitl brand, lifestyle of respondents and socio-demographic data of respondents (Beran and Burešová, 2023). In the article, only the brand awareness section was used.

Pearson's chi-square test of independence was used to test the hypotheses. This test statistic works with the assumption that the null hypothesis captures a situation in which there is no dependence between two qualitative quantities. Verification of individual hypotheses was carried out on the basis of the test criterion which is captured in equation 1 (Neubauer et al., 2016).

$$\chi^2 = \sum_i \sum_j \frac{\left(n_{ij} - e_{ij}\right)^2}{e_{ij}} \tag{1}$$

The statistical program IBM SPSS Statistics was used to calculate the P-value. If the P-value was lower than the significance level (0.05%), then the null hypothesis would be rejected and the alternative hypothesis indicating the dependence of the investigated variables would be accepted.

1.1 Method of selecting respondents

The respondents of this questionnaire were Czech students from the Faculty of Economics of the Technical University of Liberec. The students were selected from all student programs and all forms of these programs. This group of respondents was selected on the demand by the Kitl CEO. The research team was interested in determining brand knowledge as the main factor of the brand building process and the attitude towards it as shown by members of Generation Z (respondents were born between 1996-2010), represented by university students in a situation where they can buy syrups practically anywhere. Many studies have shown that this generation has a different attitude towards brands, and therefore has a different brand knowledge and brand perception. At the same time, this is the emerging generation, which will be the segment with the greatest purchasing power in a few years. It is therefore, important to focus on this generation and determine what brand knowledge it has towards brands and how companies should adjust their marketing mix to fully reflect the special requirements of this generation (Spitznagel, 2020).

The data collection was based on a simple random sampling method. The total number of Czech students at the Faculty of Economics of the Technical University in Liberec was 923. The author chose every second student from this group of 923 students. The selection is not representative and there are some limitations of this research. One limitation of the study is the assumption that students from the Faculty of Economics of the Technical University in Liberec were more familiar with the brand than students at other universities in the Czech Republic. This may be due not only to the fact that the university

and the manufacturer are based in the same region, but also to the fact that the university and the syrup manufacturer have an established partnership relationship.

2. Results of the Research

In this chapter, the achieved results are presented, including the verification of hypotheses.

2.1 Respondents

From 462 respondents, the author received 303 responses. The response rate was 65.5 %. In the group, 57 % of the respondents were women; the remaining 43 % were men. The respondents were from different age groups (age range 20-40). Most of the students (54.46 %) were from the 20-22 age group. Detailed information about the group of respondents can be found in Table 1.

Table 1: Frequency table for the variables "Brand Awareness" and "Gender"

Sociodemografic data	Variables	Frequency (absolute, relative)	
Gender	Woman	173	57.1 %
	Man	130	42.9 %
Age	<20-22>	165	54.5 %
	<23-25>	127	41.9 %
	<26-28>	6	1.9 %
	<29-40>	5	1.7 %
Study program	Bachelor study programs	186	61.4 %
	Master study programs	104	34.3 %
	Doctoral study programs	13	4.3 %
Income	CZK X < 5,000	83	27.4 %
	< CZK 5,000 –10,000>	118	38.9 %
	(CZK 10,000 – 15,000>	54	17.8 %
	(CZK 15,000 –20,000>	21	6.9 %
	(CZK 20,000 –25,000>	7	2.3 %
	CZK X > 25,000	20	6.7 %

Source: authors' own calculation

2.2 Verification of the dependence of the variable "Gender" on "Knowledge of the brand"

Table 2: Frequency table for the variables "Brand Awareness" and "Gender"

Brand knowledge * Gender			Gender		
			Men	Women	Total
Brand knowledge	Yes	frequency	78	123	201
		relative frequency	25.74 %	40.59 %	66.34 %
	No	frequency	52	50	102
		relative frequency	17.16 %	16.50 %	33.66 %
	Total	frequency	130	173	303
		relative frequency	42.90 %	57.10 %	100.00 %

Source: authors' own calculations

Based on the obtained data and results, it can be concluded from Table 2 that the majority of respondents (66.34%) are familiar with the Kitl brand. With regard to the investigated gender, it is clear that the knowledge of the Kitl brand among women (40.59%) is higher than among men (25.74%). The following Table 3 shows the frequencies of individual variables, including their expected values.

Table 3: Dependence of "Kitl Brand Knowledge" on "Gender" of respondents

Brand knowledge * Gender			Gender		
			Men	Women	Total
Brand knowledge	Yes	frequency	78	123	201
		expected value	86.2	114.8	201
	No	frequency	52	50	102
		expected value	43.8	58.2	102
	Total	frequency	130	173	303
		expected value	130	173	303

Source: authors' own calculations

Table 4 captures the p-value which is 0.043.

Table 4: P-value of Pearson's chi-square for H1

	chi-square	sv	p-value
Pearson´s chi-square	4.094	1	0.043

Source: authors' own calculations

Since the p-value is lower than significance level (5%), we reject the hypothesis of independence and accept the alternative hypothesis of dependence of the variables. Based on this finding, it was possible to verify at the 5% level of significance that the variables "Brand Knowledge" and "Gender" of the respondents are dependent variables.

2.3 Verification of the dependence of the variable "Income" on "Knowledge of the brand"

Table 5: Verification of the dependence of the variable "Income" on "Brand knowledge"

Brand knowledge * Income		Brand knowledge					
		Yes		No		Total	
		frequency	relative frequency	frequency	relative frequency	frequency	relative frequency
Income	CZK X < 5, 000	55	27.36 %	28	27.45 %	83	27.39 %
	(CZK 5 – 10, 000>	85	42.29 %	33	32.35 %	118	38.94 %
	(CZK 10 – 15, 000>	33	16.42 %	21	20.59 %	54	17.82 %
	(CZK 15 – 20, 000>	13	6.47 %	8	7.84 %	21	6.93 %
	(CZK 20 – 25, 000>	1	0.50 %	6	5.88 %	7	2.31 %
	CZK X > 25, 000	14	6.97 %	6	5.88 %	20	6.60 %
	Total	201	100.00 %	102	100.00 %	303	100.00 %

Source: authors' own calculations

Table 5 demonstrates that the income of the respondents from the basic group is rather lower due to the socio-economic status of the respondents. The highest level of knowledge of the Kitl brand, based on the conducted questionnaire survey and data analysis, is achieved by respondents with income in the interval of <CZK 5-10,000). Table 6 shows the frequencies and expected values necessary to verify H2.

Table 6: Dependence of "Kitl Brand Knowledge" on "Income" of respondents

Brand knowledge * Income		Brand knowledge					
		Yes		No		Total	
		frequency	Expected value	frequency	Expected value	frequency	Expected value
Income	CZK X < 5, 000	55	55.1	28	27.9	83	83
	(CZK 5 – 10, 000>	85	78.3	33	39.7	118	118
	(CZK 10 – 15, 000>	33	35.8	21	18.2	54	54
	(CZK 15 – 20, 000>	13	13.9	8	7.1	21	21
	(CZK 20 – 25, 000>	1	4.6	6	2.4	7	7
	CZK X > 25, 000	14	13.3	6	6.7	20	20
	Total	201	201	102	102	303	303

Source: authors' own calculations

The P-value in case of verification of H2 came out to be 0.048 and is recorded together with other quantities in Table 7.

Table 7: P-value of Pearson's chi-square for H2

	chi-square	sv	p-value
Pearson´s chi-square	11.173	5	0.048

Source: authors' own calculations

Based on the p-value calculated in this way (p-value < significance level), it was possible to verify the dependence of the examined variables "Brand knowledge" and "Income" at the 5% significance level, that is, we reject the null hypothesis and accept the alternative hypothesis.

2.4 Verification of the dependence of the variable "Size of residence" on "Knowledge of the brand"

Table 8: Frequency table for the variables "Brand awareness" and "Size of residence"

Brand knowledge * Size of residence		Size of residence					
		Yes		No		Total	
		frequency	relative frequency	frequency	relative frequency	frequency	relative frequency
Size of residence (inhabitants)	X < 1, 000	33	16.42 %	19	18.63 %	52	17.16 %
	(1, 000 – 5, 000>	45	22.39 %	31	30.39 %	76	25.08 %
	(5, 000 – 10, 000>	18	8.96 %	14	13.73 %	32	10.56 %
	(10, 000 – 50, 000>	37	18.41 %	16	15.69 %	53	17.49 %
	(50, 000 – 100, 000>	19	9.45 %	4	3.92 %	23	7.59 %
	X > 100, 000	49	24.38 %	18	17.65 %	67	22.11 %
	Total	201	100.00 %	102	100.00 %	303	100.00 %

Source: authors' own calculations

Table 8 illustrates that the majority of respondents came from places with different populations during the monitored period. However, the largest number of respondents came from a place of residence with a population greater than 100,000, followed by respondents living in areas with a population of (>1,000 - 5,000). Table 9 captures, as in the previous two examples, the frequency and expected values.

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Table 9: Dependence of "Kitl brand knowledge" on "Size of residence" of respondents

Brand knowledge * Size of residence		Brand knowledge					
		Yes		No		Total	
		frequency	Expected value	frequency	Expected value	frequency	Expected value
Size of residence (inhabitants)	X < 1, 000	33	34.5	19	17.5	52	52
	(1, 000 – 5, 000>	45	50.4	31	25.6	76	76
	(5, 000 – 10, 000>	18	21.2	14	10.8	32	32
	(10, 000 – 50, 000>	37	35.2	16	17.8	53	53
	(50, 000 – 100, 000>	19	15.3	4	7.7	23	23
	X > 100, 000	49	44.4	18	22.6	67	67
	Total	201	201	102	102	303	303

Source: authors' own calculations

The p-value in the case of testing H3 corresponds to the value of 0.169 (see Table 10).

Table 10: Dependence of "Kitl brand knowledge" on "Size of residence" of respondents

	chi-square	sv	p-value
Pearson´s chi-square	7.779	5	0.169

Source: authors' own calculations

Since the p-value is lower than the 5% level of significance, we do not reject the null hypothesis in this case and do not accept the alternative hypothesis. In other words, on the basis of the obtained values and the defined level of significance, it was possible to verify the assumption that the variables "Brand knowledge" and "Size of residence" of the respondents are independent variables.

3. Discussion and conclusion

The main objective of this article is to identify the knowledge of the Kitl brand among a selected group of respondents. Based on the conducted research, it was found that the vast majority of all respondents are familiar with the existence of the selected regional brand. The research question was to find out how knowledge of the investigated brand depends on selected socio-economic indicators (gender, age, size of residence). Three hypotheses were established. Dependence was proven for two out of three predetermined hypotheses. The results are discussed with examples of three selected studies carried out in the Czech Republic over the past few years (Chalupová et al., 2013; Pícha and Skořepa, 2018; Stoklasa & Matušínská, 2022). The studies were selected with regard to the close relationship to the investigated issue and the stated goals of this article.

In the case of H1: (The variables "Knowledge of the brand" and "Gender" are independent variables) It was possible to demonstrate the dependence of the investigated variables at the 5% level of significance. As part of knowledge of the Kitl brand, a gender is therefore an important indicator. The measured data show that more than half of the respondents are familiar with the Kitl brand and that women are more familiar with the investigated brand than men. A similar dependence was also found in the research of Chalupová et al. (2013).

For the second of the tested hypothesis H2: (The variables "Brand knowledge" and "Income" are independent variables) it was also possible to demonstrate dependence at the 5% level of significance. In this case, the knowledge of the brand is higher among the group of respondents with a lower income. In the research done by Chalupová et al. (2013), Pícha and Skořepa (2018), there was found a dependence characterized in the opposite direction, it means that brand awareness is higher as respondents' income increases. Since regional products are usually sold at higher selling prices, it seems to be an adequate explanation that higher incomes of consumers allow to show a higher interest in regional product brands. In the case of H2, the resulting dependence may be influenced by the representation of a larger number of respondents in bachelor's fields of study. We expect that bachelors students earn less money than their masters and postgraduate colleagues. This tested hypothesis H2 gives a new point of view on the theoretically verified hypotheses (including the variables "Brand knowledge" and "Income"). It is necessary to mention that contradiction of H2 could be caused due to regional limitation of this research. Students, the university, and the company's headquarters are in the same region. We expect that "Knowledge of the regional brand" will be higher among researched students. For generalizing and setting up H2 into the theoretical background, further research across other Czech universities' students would be necessary.

Calculations focused on the hypothesis H3: (The variables "Brand knowledge" and "Size of residence" are independent variables) confirmed at a significance level of 5% that there is no dependence between the variables. Within the framework of building awareness of the Kitl brand among the group of respondents, these variables do not represent a key indicator. None of the discussed studies verified the dependence of brand knowledge on the size of the place of residence.

Hypotheses verified in this way can help to expand knowledge within the framework of a non-uniform consensus which, in the academic environment, focuses precisely on explaining the influence of socio-demographic factors on the preference or knowledge of regional product brands (Chalupová et al., 2013; Pícha and Skořepa, 2018; Stoklasa & Matušínská, 2022). The verified hypotheses help to expand the issue with a new segment of respondents (students) and with a new, as yet unexplored, segment of regional product brands. For the Kitl company, selected socio-economic indicators and their influence on the identified degree of brand awareness can be beneficial in planning future marketing activities. In addition to future brand equity building strategies (brand awareness, image, etc.), other businesses can use this article as inspiration for measuring brand awareness in other industries. For other companies, this case study can serve as a tool for measuring and verifying brand knowledge in their customer segment and improving their marketing strategies.Therefore the hypothesis was tested, and the research question was answered; the case study poses a few limitations (eg. size of sample, region limitation). To generalize the results and conclusions from the research, conducting further research on the same topic across other Czech Republic universities would be necessary.

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Criminality vs. Development and International Trade, Case of Latin America

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Abstract
Latin America as a developing region is facing various developing problems, however one of them is the most convex - the high crime rates. High inequality of the region only deepens the negative effect of criminality. Several authors deal with psychological, sociological, historical, legal, political impacts of crime, less attention is paid to the impact of crime on development and international trade involvement. Therefore, we decided to explore whether increased crime is precisely connected to countries with low economic development, and whether countries with an important level of crime have low involvement in the international trade. To confirm this hypothesis, we used econometric regression OLS models. We concluded that development and international trade are complex phenomena, and even in economies with higher development, an increase in crime can occur. We can conclude that crime is not the main factor leading to a decline in economic growth and international trade involvement.

Key Words
International trade, development, criminality, Latin America

JEL Classification: F1, O1, C50

Introduction

Latin American states are facing various developing problems, but one of them is the most convex: the high crime rates reaching 33% of all homicides worldwide, despite to the fact, that the region is home to only 9% of the world's population (World Bank, 2023a). Crime has devastating consequences at all levels of social and economic life. The high inequality only deepens the negative effect of criminality. From the 1990s, organized crime began to spread as smuggling, drug, human and arms trafficking. The expansion of organized crime was also driven by the prohibition on the USA markets, when banned products began to be smuggled to north American market (in the 20th century) (Troncoso and Garay 2017). Prohibition in the USA in the 1920s led to the reinforcement of Ciudad Juaréz in northern Mexico as a centre for alcohol and heroin smuggling. Many such centres were allocated in remote rural areas in Central America or Colombia, with limited attention and control of the state. Another significant factor was the involvement in international networks of illegal trade, operating in parallel with the traditional branches of trade. For example, in Medellin, Colombia, the traditional textile industry was replaced by coca cultivation, cocaine production and the drug trade to North America and Europe, with higher demand and value than the traditional sector. Drug trafficking, as well as trafficking in people, arms, money laundering and the rise of violent gangs, have reached such large proportions in the Latin American region because of globalization and involvement in a high-value transnational market (Briscoe et al., 2014). The spread of crime was also made

possible by the inability of governments to suppress it. A historical example is the Plan Colombia from 1999, a bilateral agreement between the USA and Colombia for suppressing drug production and trafficking. However, production only moved to even more remote areas of the country and trade hubs to neighbouring countries such as Venezuela or Ecuador.

Bailey and Touboul (2019) in their article stated that criminal economics is not yet integrated into the study of economics. Although the culture of crime is examined from a psychological, sociological, historical, legal, political or anthropological point of view, there are few studies dealing with the criminal economy, including its commercial and financial flows, as well as its interactions with business. Yaacoub (2017) noted in his study that variables such as the level of poverty, health, stability of the individual, family and society, social and cultural background, demographic and political considerations have an impact on the development of crime. The types, causes and effects of crime on the socio-economic development of society were defined by Jonathan et al. (2021). They concluded that crime hinders economic growth. Their recommendation includes governmental measures on fair redistribution of wealth, modern equipment for security agencies higher wages and better living conditions for country's residents. The World Bank Group's study (Chioda, 2017) focuses on comparing the relationship between crime and economic development, as well as the relationship between crime and inequality in Latin American countries. The author argues that the relationship between crime and development is non-linear, as crime rises with rising incomes. According to this study, there is a relationship between the degree of openness of the Latin American economy and the number of murders. The author interprets this phenomenon using the example of improvements in infrastructure, financial markets, and incomes, which support economic growth and the development of legal trade, however at the same time can facilitate access to illegal markets by reducing the cost of entry or reducing control over the market.

1. Methods of Research

To achieve the main aim of the paper to evaluate, based on scientific methods, the international development and trade development in the context of high crime rates and for the selection of suitable methods, we defined 2 hypotheses:

1. H1: Latin American countries with the highest crime rates will be among those countries that show the lowest economic development.
2. H2: Latin American countries with the highest crime rates will be among the countries with the lowest share of foreign trade in total GDP and the lowest export performance (exports of goods and services as a percentage of GDP according to Pavelka et al., 2021 definition) in the region.

We compared the relationship of crime data with selected indicators of economic development and international trade during the years 2011 to 2021, and we used the deduction to help answer our hypotheses. For their verification, we used two regression OLS models with dependent and independent variables. A general one-equation linear model has the following equation form (Lukáčiková and Lukáčik, 2008):

$$\gamma_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + u_i, \quad (1)$$

where, γ_i represents i observations of the endogenous variable, x_{ij} represents exogenous variables. $\beta_0, \beta_1, \beta_k$ represent unknown estimated parameters. When we substitute the variables of our research into the equation, the form of the equation of the first model is as follows:

$$IEF_{2021} = \beta_0 - \beta_1 GOCI_{2020} + \beta_2 HDI_{2020} + \beta_3 \times CPI_{2020} + u. \quad (2)$$

The resulting equation for our measurements will have the form The model is in Tab. 3):

$$IEF_{2021} = 4{,}626 + 7{,}327 \times GOCI_{2020} - 26{,}143 \times HDI_{2020} + 0{,}803 \times CPI_{2020} \quad (3)$$

In the second case, we built logarithmic model, since both dependent and independent variables are expressed in logarithms. The general form of the logarithmic model equation has the following form:

$$\ln \gamma_i = \beta_0 + \beta_1 \ln x_{i1} + \beta_2 \ln x_{i2} + \ldots + \beta_k \ln x_{ik} + u_i. \quad (4)$$

We decided to use the logarithm function, as the dependent variable EP is expressed in percentages and the other independent variables are indices. The logarithm helped us to solve the problem of scaling the values of the given variables, since by its nature it approximated the values of the investigated variables, regardless of whether they are presented as a percentage or as an index. After substituting our variables, the form of the logarithmic model equation is as follows (Lukáčiková and Lukáčik, 2008). Model is in Table 4 and 5:

$$\ln EP_{2021} = \beta_0 - \beta_1 \times \ln GOCI_{2020} + \beta_2 \times \ln HDI_{2020} + \beta_3 \times \ln CPI_{2020} + u. \quad (5)$$

In the equations, we used a minus before the GOCI variable, since we assume an inverse relationship between crime and the dependent variable, since we expect that with a decrease in crime there will be an increase in the dependent variables. In the second equation, the dependent variable is the Index of Economic Freedom (IEF). In the fifth equation, the dependent variable is Export Performance (EP; exports of goods and services as a percentage of GDP). The independent variables include the Global Organized Crime Index (GOCI - index consisting of 3 pillars: criminal markets - human trafficking and smuggling, arms trafficking, environmental crimes and drugs trade; criminal actors and resilience) (GI-TOC, 2021), which assesses the level of crime and resistance to organized crime and Human Development Index (HDI).

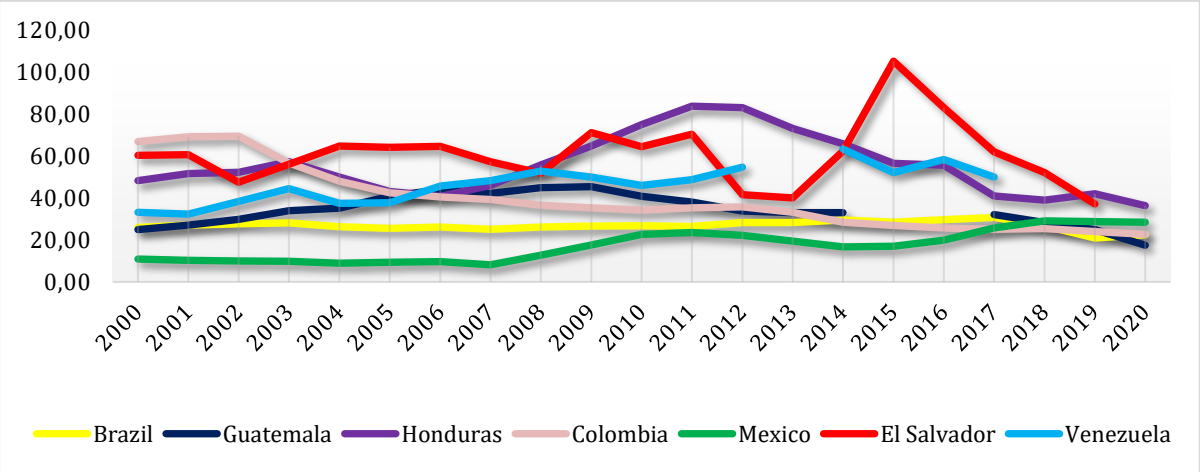
Due to missing data on export performance of Venezuela, we did the regression model with Venezuela and one where we left out Venezuela, but the result was basically the same – both models were not statistically significant and did not show mutual correlation. For this paper, we used the one with Venezuela (Table 4).

2. Results of the Research

Based on the analysis of data on criminality in Latin America, we identified Mexico, the countries of the Northern Triangle, Colombia, Venezuela, and Brazil as the countries with the highest crime rate. We therefore focused on these countries when comparing economic results.

Fig. 1 shows the development of **crime** according to the rate of intentional murders per 100,000. population over the past 20 years in selected countries. Mexico has the lowest rate (28 in 2020), Brazil reaches almost constant values during this period (22 in 2020), In the case of Colombia (23 in 2020), there is a constant decrease in the murder rate. In Honduras (36 in 2020), the homicide rate peaked between 2011 and 2012, and has since been declining thanks to government measures. In the case of Venezuela (50 in 2017), data is not available for the years 2013 and 2018 to 2020, but the homicide rate in this South American country is high in all the years shown. The highest values are achieved by El Salvador (37 in 2020) (World Bank, 2023a).

Fig. 1: Criminality development in selected countries of Latin America (2000 – 2020)



Source: authors' own calculations, data from (WORLD BANK, 2023a)

When considering the **GDP** of Latin American countries, it is Brazil (with a GDP value of 1,608,981 billion USD) and Mexico (with a GDP value of 1,272,839 billion USD) reaching the highest values of this indicator in the region, thus characterizing them as countries with a higher rate of economic development despite crime. On the contrary, the countries of the Northern Triangle (except for Guatemala, which reached a value of 85,986 billion USD) show significantly low GDP values. After Nicaragua and Haiti, Honduras achieved the third lowest GDP in the region in the amount of 28,489 billion USD, followed by El Salvador with a GDP value of 28,736 billion USD. For a better interpretation of development according to GDP, we used a comparison of Latin American countries based on **GDP per capita**. Mexico achieved the highest value of 9,926 USD followed by Brazil (7,519 USD), Colombia (6,131 USD), Guatemala (5,026 USD), El Salvador (4,409 USD) and Honduras (2,831 USD). GDP data for 2021 were not available for Venezuela. In terms of the percentage growth of the economies Mexico and Brazil achieved lower growth in 2021 than the other selected countries, namely Mexico with a growth of 4.7% and Brazil with a growth of 4.6%. Conversely, the countries of the Northern Triangle achieved higher growth: Guatemala 8.0%, El Salvador 10.3%, and Honduras 12.5%. Colombia achieved higher growth of 10.7% (World Bank, 2022). Another indicator is the **HDI**. None of the selected countries with the highest crime rate achieved a remarkably high HDI (the range was from 0.621 to 0.758) (UNDP, 2022). The value of **Corruption Perceptions Index** (CPI) is also low, indicating high corruption levels (Venezuela 14, Honduras 23, Guatemala 25, El Salvator 34, Mexico 31, Columbia 30 and Brazil 38) (Transparency international, 2021). Analysis of the organized crime index for individual selected countries in Latin America shows that the most serious components of the organized crime are: "mafia style groups" where the index is reaching the highest values in all countries. Out of crimes with

economic background among the most serious are: "cocaine and other drugs sale" and arms trafficking trade" (GI-TOC, 2021).

Economic development is linked to international trade, which fulfils important macroeconomic and microeconomic tasks and supports the country's long-term economic stability. Table 1 compares the development of export and import of goods and commercial services of selected Latin American countries between 2011 and 2021 in billion USD. Mexico and Brazil have the highest export and import values, when in 2021 Mexico's exports reached a value of 521.7 billion USD and import 560.9 billion USD. Brazil's exports recorded a value of 311.6 billion USD this year and import 291.5 billion USD. El Salvador exported the least (9.7 billion USD), the import of this country also recorded only 17.3 billion USD. Due to the political and economic situation in Venezuela, the values from 2015 are only estimated.

Tab. 1: Foreign trade in goods and commercial services of selected countries in billion USD, total merchandise value, in 2011 – 2021

Country		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Brazil	E	288.3	276.4	268.5	259.5	219.7	211.8	247.4	265.1	253.5	236.1	311.6
	I	316.3	319.0	341.5	335.2	258.0	212.7	238.7	264.0	262.7	216.8	291.5
Guatemala	E	12.9	12.7	12.9	13.9	13.8	13.7	14.5	14.4	14.8	14.0	16.6
	I	19.2	19.8	20.4	21.3	20.7	20.1	21.6	23.2	23.4	21.0	30.6
Honduras	E	10.2	10.6	10.1	10.8	11.1	10.7	11.4	11.4	11.7	9.6	12.9
	I	12.5	13.0	12.6	12.7	12.8	12.3	13.4	14.8	14.5	12.0	17.6
Colombia	E	63.3	67.6	67.0	63.3	44.0	40.3	46.3	52.3	50.0	36.7	47.9
	I	66.3	72.9	74.0	80.1	67.9	57.7	59.9	66.0	67.5	53.5	75.1
Mexico	E	365.3	387.0	398.0	418.0	403.3	398.0	436.8	479.6	492.2	434.0	521.7
	I	392.3	411.6	422.9	445.8	437.7	430.3	469.0	516.5	506.5	421.3	560.9
El Salvador	E	6.9	7.1	7.6	7.6	7.9	7.9	8.3	8.7	9.1	7.1	9.7
	I	11.1	11.6	12.2	11.9	11.8	11.5	12.4	13.4	13.6	11.7	17.3
Venezuela	E	92.8	97.3	88.8	74.7	37.3*	26.7*	32.0*	34.4*	17.2*	5.0*	3.6*
	I	48.0*	51.3	48.8	43.2	33.3*	15.5*	10.6*	11.7*	5.9*	6.6*	7.8*

Source: authors' own calculations, data from (WTO, 2022)
Note: E = export, I = import; * Estimate

Table 2 contains the data on export of goods and services as a % of GDP for selected countries, growing in case of Brazil and Mexico, stable or declining in other countries. Mexico and Honduras are countries with the highest share of export on GDP (41% and 38%).

Tab. 2: Export of goods and services, % of GDP, in 2011 - 2021

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Brazil	11.6	11.9	11.7	11.0	12.9	12.5	12.5	14.6	14.1	16.5	20.1
Guatemala	27.1	25.3	22.0	21.7	19.8	18.8	18.5	18.2	17.6	16.3	17.8
Honduras	51.3	50.9	47.9	47.6	45.2	42.7	43.1	41.5	39.9	35.1	38.5
Colombia	19.3	18.8	18.1	16.6	15.7	14.7	15.1	15.9	15.9	13.5	16.4
Mexico	31.0	32.3	31.3	31.9	34.5	37.0	37.7	39.3	38.8	39.5	41.1
El Salvador	29.0	28.6	29.7	29.6	29.5	28.5	29,0	28.9	30.0	24.3	29.5
Venezuela	29.9	26.2	24.8	16.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: authors' own calculations, data from (WORLD BANK, 2023b)

To answer our hypotheses, we used OLS regression analysis in the GRETL program. In model 1, we chose the IEF for the year 2021 as the dependent variable. The independent

variable was the GOCI for the year 2020, when we assume that it takes a certain period for crime to manifest itself in the economy. For greater objectivity, we included two more independent variables HDI for 2020 and CPI for 2020.

Tab. 3: Regression analysis, dependent variable – IEF in 2021

Model 1: OLS, using observations 1-20					
Dependent variable: IEF_2021					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	4.62613	29.3188	0.1578	0.8766	
GOCI_2020	7.32660	2.29360	3.194	0.0056	***
HDI_2020	−26.1428	45.1319	−0.5793	0.5705	
CPI_2020	0.803003	0.289564	2.773	0.0136	**

Mean dependent var	57.00500	S.D. dependent var	12.80166
Sum squared resid	1683.256	S.E. of regression	10.25688
R-squared	0.459415	Adjusted R-squared	0.358056
F(3, 16)	4.532529	P-value(F)	0.017526
Log-likelihood	−72.70630	Akaike criterion	153.4126
Schwarz criterion	157.3955	Hannan-Quinn	154.1901

White's test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present
Test statistic: LM = 9.42618
with p-value = P(Chi-square (9) > 9.42618) = 0.398899

Source: authors' own calculations in GRETL, *data from (The Heritage Foundation,), (UNDP, 2022), (Transparency International, 2021), (GI-TOC, 2021).*

The results of our model are in Tab. 3. The effect of organized crime (GOCI) is highly relevant (three stars at the p-value, i.e., with 99% probability this variable is statistically significant). Another variable that meets this estimate with a 95% probability is the CPI index. HDI index is not considered significant. A limitation of our approach is that the CPI index may appear in the IEF index. For this reason, we performed a correlation test between the IEF and CPI variables and the Kendall's tau correlation coefficient reached a value of only 0.26, i.e., very weak dependence, so we accept the regression equation estimate.

Hypothesis 1, which assumed an inverse relationship between the IEF index and the GOCI index, was not confirmed (the G0CI is a plus sign and not a minus sign). It follows that if the values of all independent variables (GOCI, HDI and CPI) are equal to zero at the same time, then the average change of the dependent variable (IEF) is 4.62613. The result is that a 1% increase in the index of organized crime, holding constant the values of the remaining independent variables, induces a 7,33% increase in IEF. It may seem like a remarkably high increase, but from an econometric point of view, the result is correct.

To verify the regression model, we determined a pair of hypotheses H0: $\beta\_1 = 0$ and H1: β_1^1 0. The value of the t-ratio parameter for the GOCI index is 3.194. The critical value at the 0.025 significance level for 16 degrees of variance is 2.1191. The value of the parameter β_1 GOCI index (3.194) is greater than its critical value (2.119), which means that we can reject the null hypothesis and confirm that the parameter β_1 is statistically significant at the 5% level of significance. This means that GOCI has an impact on IEF. Since we used cross-sectional data to construct the model, we tested heteroskedasticity using Whit's test. In our model, the value of WH after Whit's test is equal to 9.42618 and its critical value is 16.919. Since the WH value is lower than the critical value, we accept the null hypothesis and can confirm that heteroskedasticity is not present in the

model.Using the coefficient of determination R2 we can assess what part of the variability of the dependent variable is expressed by the regression model. In our case, the coefficient of determination reached the value of 0.459415, which means that with our regression model we can explain 45.94% of the variability of the IEF index. *This regression analysis confirmed that there is a directly proportional relationship between crime and economic development and that high crime does not necessarily signal low economic development and vice versa.*

The second regression model was focused on foreign trade, and export performance (EP) for the year 2021 was selected as the dependent variable. The independent variables remained the same as in model 1. The result of our research is in Tab. 4. We examined the 2020 impact of organized crime (GOCI) on export performance in 2021 for 19 Latin American countries, as 2021 EP data were not available for Venezuela. The results confirm that crime, or organized crime in connection with other independent variables does not have a statistically significant effect on the export performance of the countries under study.

Tab. 4: Regression analysis, dependent variable – export performance in 2021

Model 2: OLS, using observations 1-19					
Dependent variable: l_EP_2021					
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	4.50722	3.14881	1.431	0.1728	
l_GOCI_2020	0.143389	0.492969	0.2909	0.7751	
l_HDI_2020	2.34158	1.63598	1.431	0.1728	
l_CPI_2020	−0.199792	0.613236	−0.3258	0.7491	

Mean dependent var	3.301933	S.D. dependent var	0.460353
Sum squared resid	2.987773	S.E. of regression	0.446301
R-squared	0.216765	Adjusted R-squared	0.060117
F(3, 15)	1.383777	P-value(F)	0.286077
Log-likelihood	−9.385682	Akaike criterion	26.77136
Schwarz criterion	30.54912	Hannan-Quinn	27.41071

White's test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present
Test statistic: LM = 14.3639
with p-value = P(Chi-square(9) > 14.3639) = 0.109956

Source: authors' own calculations in GRETL, *data from (WORLD BANK, 2023b), (UNDP, 2022), (Transparency International, 2021), (GI-TOC, 2021).*

To confirm the low correlation between EF and GOCI variables, we performed a correlation test, when the Kendall's tau correlation coefficient reached an extremely low correlation between variables (0.06). Based on P-value (F), which is higher than 0.05, we can determine that the given model is not statistically significant. Using the correlation matrix, we found that the cross-correlation between EP and GOCI is -0.0268, which represents a negative correlation, and we confirm that *there is no correlation between crime and export performance.* Results are in Tab. 5.

Tab. 5: Correlation matrix of dependent and independent variables of model2

Correlation coefficients, using the observations 1 – 19				
5% critical value (two-tailed) = 0.4555 for n = 19				
l_EP_2021	l_HDI_2020	l_GOCI_2020	l_CPI_2020	
1.0000	0.4408	**-0.0268**	0.2850	l_EP_2021
	1.0000	-0.3387	0.8208	l_HDI_2020
		1.0000	-0.5780	l_GOCI_2020
			1.0000	l_CPI_2020

Source: authors' own calculations in GRETL, data from (WORLD BANK, 2023b), (UNDP, 2022) (Transparency International, 2021)

3. Discussion

Application of simple analysis of development of basic economic indicators could not determine a clear connection with crime and its effect on the economic development of selected countries, nor could be assessed the relationship of the crime to the openness of the economy. Prior drafting the econometric model, we assumed an inversely proportional relationship between crime and economic development - we expected that the decrease in crime would lead to an increase in economic development. We also assumed that the countries with the highest crime rate would also be the same countries that achieve the lowest economic development. However, the econometric calculation of the OLS regression model refuted our hypothesis. Likewise, with the second model, we assumed that crime would negatively affect the foreign trade of Latin American countries. We hypothesized that countries with the highest crime rates would exhibit low export performance. However, the resulting regression model showed no relationship between export performance and crime, our second hypothesis is therefore rejected. However, this does not mean that crime cannot influence foreign trade in a certain way, especially in connection with other factors. In our analysis, we found that the crime factor does not reduce indicators of economic development, and that it has no or minimal impact on the foreign trade of individual countries as a whole and high crime rates are also present in the more economically developed countries of the region. However, to believe that crime does not negatively affect the economic level and international trade of Latin America would not be entirely correct. Economic development and international trade are complex phenomena, the development and intensity of which is influenced by many conditions such as poverty, infrastructure, qualified workforce, the current situation in the world, diseases, or the coronavirus pandemic.

Conclusion

Considering the specify of the criminality, it is not possible to unequivocally confirm that the important level of criminality must automatically reduce country's economic development or involvement in international trade. Since development and international trade participations are complex phenomena influenced by number of factors, it si not possible to confirm or refuse their mutual correlation using simple comparation of selected indicators of economic development and foreign trade with crime indicators. Using econometric observation, we concluded that, paradoxically, higher economic development and process of globalization could also lead to an increase in crime. Nor was confirmed the correlation between the export performance and criminality. It follows that the criminality is not the most dominant factor that would contribute to the reduction of the economic power of countries in our survey. The negative effect of criminality is

reflected in the expenses of governments when dealing with the consequences of the problem. It is not easy to find general solution valid for all countries, however, governmental projects and strategies should be focused on crime prevention, rule of law enforcement (support law enforcement units and judiciary system, prosecution of serious crimes, fight the corruption in police), strengthening border control (difficult task in many countries where borders, due to geographical specifies, are porous), whether for drug smuggling or arms trafficking, tightening the rules for records and registration of weapons, more strict indexing of seized firearms etc. Cocaine trade is source of financing organised crime in majority of Latin American countries and is tightly connected with mafia practices. Unfortunatelly, numerous elimination attempts to reduce cultivation and production failed. Considering the lack of funds, country leaders should use international organizations financial and other support programs. The fight against international organised crime remains the most challenging task for local governments and its solution requires experts and sophisticated information systems.

In this paper we have dealt with crimes in general. Our future research may focus on impact of drugs and arms crimes on international trade performance of selected countries.

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The Impact of Robotic Process Automation and Artificial Intelligence on Employees in the Accounting Profession

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Abstract

The article discusses data and information based on selected research and definitions drawn from the professional literature related to robotic process automation (RPA) and artificial intelligence (AI) and their impact on employment in the accounting profession. The article incorporates a review of the literature on the given topic. This article serves companies as a basis for further research, deeper processing of the given topic and as a scholarly basis for creating the research component. The issue addressed in the article is presented in the introductory part. The first part of the article deals with the collection of RPA definitions and the benefits of implementing RPA in companies. The next part of the article discusses the relationship between RPA and AI. The third part of the article summarizes the results of research previously conducted. In the selected studies, of primary interest was whether and to what extent the jobs of accountants are threatened by automation and whether AI helps accountants. The following part of the article is devoted to the discussion. Here, individual authors' views on job loss due to RPA and whether human labour is irreplaceable in accounting jobs are presented and discussed. The final part of the article is devoted to the findings.

Key Words

Robotic process automation, artificial intelligence, robot, software, the accounting profession

JEL Classification: C21, R13

Introduction

Terms such as robotics, automation, and AI are associated with Industry 4.0. This industrial revolution refers to the current trend of digitization and the related automation of business processes. Even though automation in production has been going on for a long time, RPA has only recently come to the fore. Industry 4.0 includes advanced technologies and automation tools in businesses.

Thanks to the covid-19 pandemic and the transition of many employees to Home office, the pace of introducing automation technologies has accelerated even more (Pláteník, 2021).

According to Kršková (2020), implementing robotization in companies creates new jobs for other employees, such as managing and controlling robots. If robots are incorporated sensitively and efficiently, their introduction will increase employee productivity, as they can focus on non-routine tasks. After the appropriate introduction of robots, the efficiency of the entire company can subsequently increase.

According to Pláteník (2021), up to 85 million jobs may disappear by 2025 due to automation. On the other hand, 58 million more new jobs will be created due to increased

robot deployment. Companies are already seeking new employees who are specialists in 2 artificial intelligence, machine learning and big data. According to Bartoš (2023), professions whose activities could be largely automated include accountants and other jobs that require working with large amounts of numerical data.

This article aims to conduct a detailed literature review on the impact of robotic proces automation and artificial intelligence on employees in the accounting profession.

The aim of this article is to provide a comprehensive overview of the current state of research on the impact of robotic proces automation and artificial intelligence on the accounting profession. You will want to get a comprehensive view of the key trends, questions and challenges that you will follow accounting professionals in the era of increasing digitization and automation.

The following research questions were formulated for the topic of this article: Are employees in accounting positions concerned about the full replacement of jobs by artificial intelligence? Do employees in the accounting profession perceive artificial intelligence as a threat or an opportunity to eliminate routine (boring) activities? What new jobs can be created as a result of the implementation of automation?

1. Methodology

Most of the resources are published within the last 5 years, taking into account the rapidly developing technologies and trends in the field of automation and artificial intelligence.

Sources come from scholarly articles, books, and articles from experts in the fields of accounting, artificial intelligence, and robotic automation. When selecting literature, priority was given to literature that presents empirical evidence, results of studies or analyzes of real situations.

The literature for this article was selected according to the following procedure:

Identification of Basic Keywords - Based on the topic of this article, the following keywords were identified: Robotic Process Automation, Artificial Intelligence, Robot, Software, Accounting Profession.

Literature search - For the literature search, an online database of scientific articles, libraries and Internet article searches, which are associated with defined keywords, were used.

Selection and evaluation of resources - The resources found were evaluated using the following criteria: relevance, actuality and expertise.

Compilation of the bibliography - After evaluating the found sources, the sources were modified according to the given standard and a bibliography was compiled.

2. What is RPA, and what are its benefits?

BDO (2020), an international company providing accounting, tax and advisory services, stated that RPA could be defined as robotizing processes with AI elements. Lowe et al. (2021) argue that RPA is a business process automation technology that is based on the concept of software robots. According to Mahey (2020), the role of RPA is the automation of human activities on computers. These activities are high-volume, repetitive, and lengthy. Such tasks drain the joy of work from employees. Brooks (2020) explains that RPA enables businesses to engage in activities and projects that are more inspiring than routine tasks. RPA can also help alleviate the stress that is typically associated with complex tasks and can help improve employee productivity and creativity.

According to Mahey (2020), with RPA it is possible to open emails and attachments, log into web/enterprise applications, read and write to databases, copy and paste, fill in forms, move files and folders, follow "if/then" decisions /rules, collect social media statistics, extract structured data from documents, make calculations, connect to system APIs and scrape data from the web.

According to Kršková (2020), RPA represents software robots. These robots appear in digital form as programs, so they are not physical machines. With the help of these software robots, individual actions are simulated on the computer as if they were performed physically by a person. According to Horton (2015), RPA is an option for automating repetitive and often rule-based processes. These processes are usually located in a shared services center or another part of the back office. More robots represent a virtual workforce, i.e., a back-office processing center without human resources. According to Dumitrica (2018), RPA brings companies not only accuracy, speed, and increasing productivity, but also reduces costs and saves the time accountants would have to spend manually transcribing, moving, sending, and collating data between systems.

Naqvi (2020) describes in his book that an RPA bot can be considered a simple agent that works as it is told. Irpaai (2023) specifies that employees in companies can use RPA to set up computer software (robots) to record and interpret existing IT applications to process transactions, manipulate data and communicate with other digital systems.

According to Kršková (2020), the advantages of implementing RPA in companies are that they are more accurate, faster, and can work continuously compared to people. Since repetitive, rule-based activities are best suited for robotics, they can relieve people of the routine activities they must perform on a computer. Employees who are relieved of routine manual tasks will gain time and energy for more demanding and essential work activities. Also, Weis (2020) explains that RPA removes repetitive and manually intensive work, such as manual data entry. It thus gives employees space to focus on more critical activities. Employees are thus more creative and productive.

According to Mahey (2020), RPA is more advantageous than traditional automation because it does not require any modifications in the current IT infrastructure, has lower implementation costs, can make improvements instantly, and eliminate the need to change the current processes in the system.

The advantages and disadvantages of using RPA are shown in the table below (see Table 1).

Tab. 1: Advantages and disadvantages of using RPA

Advantages	Disadvantages
performs routine, repetitive tasks	it is difficult to determine whether the error that occurs is caused by people or the system itself
improves productivity and creativity	requiring regular maintenance, updating and monitoring
it is accurate, fast	requires specialist knowledge
reduces costs and saves time	with complex processes and unstructured data, it can be difficult to achieve effective automation
more advantageous than traditional automation - requires no adjustments in IT	

Source: author's processing

3. The relationship between RPS and AI

According to BDO (2020), RPA incorporates elements of robotics and AI. Robotics is a field concerned with designing and building robots. Robots are machines programmed to perform various activities essentially or entirely autonomously. However, it is always a defined sequence of movements. AI acts as a tool to enable even more outstanding performance optimization as it uses algorithms to develop computer programs to complete tasks. These tasks would otherwise require human intelligence without AI intervention.

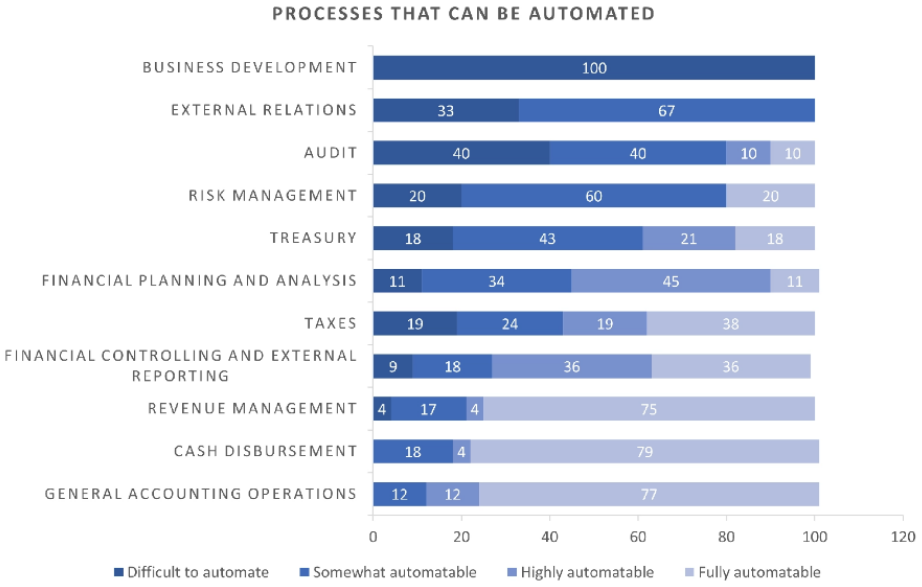
Lawton (2020) mentions in his article that robots are often equipped with AI technology, such as machine learning and optical character recognition that captures text from documents. Thanks to this, robots can help people, for example, with routine tasks. The BDO Company (2020) also claims that robots are not AI and, therefore, robots cannot independently make cognitive decisions.

Furthermore, Horton (2015) states that robots are not artificial intelligence or voice recognition and reply software. He also mentions that Robots are not Walking, talking auto-bots or physically existing machines processing paper. In contrast, robots are computer coded software programs that replace humans performing repetitive rulesbased tasks or cross-functional and cross-application macros.

4. Research Results

In his article, Peccarelli (2016) reports that the Boston Consulting Group predicts that by 2025 up to a quarter of jobs will be replaced by either innovative software or robots. A study from the University of Oxford alone suggests that 35% of existing jobs in the UK will be at risk of automation in the next 20 years. Among the 10% of jobs most likely to be automated are tax advisors, loan officers, credit analysts, and accountants.

Fig. 1: Processes that can be automated



Source: (Dilmegani, 2019)

According to Dilmegani (2021), from the performed analysis (see Fig. 1), it is possible to see that around 42% of financial operations can be fully automated. According to the analysis, the accounting operations can be fully automated by 77%.

According to Weis (2020), several studies show that many people find much of their work boring and repetitive. For this reason, they are not very productive. Furthermore, these people tend to leave their jobs within two years, which, according to Weis (2020), leaves businesses seeking more promising talent. If RPA were to replace human activity in performing routine tasks, these jobs could become more attractive for many people, and the employees in these positions would be more productive.

Oberoi et al. (2021) worked on a study where they identified and validated various determinants of AI systems and investigated their impact on the performance of accounting firms. As part of the study, they created a questionnaire that was administered to 176 accountants working in accounting firms in Delhi-NCR. The study shows that AI helps accountants work better and contributes to the delivery of better accounting work by eliminating errors and fraud. This study is one of the few studies that empirically investigated the impact of AI on the performance of accounting firms.

5. Discussion

Boulton (2021) points out that robots are viewed in two ways: as digital employees that take people's jobs or as tools that make people's jobs easier and relieve them of dull activities. Companies perceive robots as assistants rather than competitors that take their employees' jobs.

Nowadays, there are various programs and applications to simplify and automate many tasks and accounting processes. Bartoš (2023) claims that one of these applications is, for example, ChatGPT from Open AI. Owing to its launch, a fundamental milestone in the

development of new technologies and the development of the labour market has been achieved. Bartoš (2023) mentions in his article that, according to research conducted by the creator of ChatGPT, the OpenAI Company and the University of Pennsylvania, who dealt with the impact of large language models on the labour market, jobs with higher incomes are at a higher risk of being replaced by artificial intelligence. Thus, employees who have graduated from college are more at risk of losing their jobs due to AI than those with primary or secondary education. Therefore, employees in accounting positions are more at risk of job loss. In contrast, Svetlana Sicular of Gartner, Inc. stated that job loss due to RPA affects most people without qualifications and those whose jobs have a high potential for automation (Kelemen, 2018).

According to Dilmegani (2021), it is possible to fully automate accounting operations by 77% based on the performed analysis. On the contrary, the Czech bank ČSOB (2023) published an article on its website claiming that human labour is irreplaceable. The involvement of AI in professions such as accounting does not intend to replace the work of humans fully but rather to simplify it and automate routine tasks performed by employees daily. Thanks to this, employees' work will become more efficient, and the quality of work outputs will be improved. Furthermore, cost savings can also occur.

I personally see robotic automation and artificial intelligence as tools that can increase the efficiency and productivity of accounting processes. It can make routine tasks easier and allow accounting staff to focus on a higher level of analysis and strategic decision-making.

Conclusion

Based on the research conducted, it was found that the purpose of integrating RPA and AI in accounting positions is for RPA and AI to facilitate the work of accountants, not to take it over. This implementation intends to facilitate the work of accountants by eliminating the routine tasks they have had to attend to. Some jobs may be automated, which may lead to cost savings for companies and an improvement in the quality of work output. Furthermore, thanks to this implementation, new jobs can be created, as mentioned (Kršková, 2020).

In my opinion, a lot of accounting tasks can be performed by artificial intelligence. However, this activity will only be in the form of providing assistance to accountants, not replacing their job position. I think that human reasoning is irreplaceable in this profession and there will be a need for humans to control and make the final decisions in the given tasks that will be done by artificial intelligence.

I think that due to the application of artificial intelligence and deeper development, many new jobs will be created, for example: development, management, operation and maintenance of robotic systems. With new technology like RPA and AI, people can educate themselves, deepen their knowledge and create new jobs.

Regarding the content of the various studies, doing more profound research on the issue from the employees' point of view would be useful. It could reveal whether employees in accounting positions perceive AI as an assistance that facilitates their jobs or as competition that threatens them.

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The results of studies, articles and research answered selected research questions.

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Fairtrade Town Certification in the Czech Republic

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Abstract

This article presents the topic of Fairtrade Town certification, the conditions associated with obtaining it and the potential for its holders. Quantitative research was carried out on the example of a selected Czech town in order to determine the awareness of the town and its surrounding area about the Fairtrade label as such and the potential willingness and interest to support the town's application for Fairtrade Town certification. Furthermore, a benchmarking analysis of existing Czech Fairtrade towns was prepared. The results of the research were then used for suggestions that can help the selected town to become a successful applicant for Fairtrade Town certification and for other Czech towns as a possibility to steer their future, taking into account the implementation of sustainable development goals, where the Fairtrade issue clearly belongs. The results of the research have shown that the residents of the town, and in their perception the town as such, are not yet ready for the process of Fairtrade Town certification and its active implementation. However, due to the growing interest in this topic and the marketing and communication activities of various stakeholders, it can be expected that in the short or medium term the selected town will be able to apply for Fairtrade Town certification.

Key Words

Fairtrade Town, certification, quantitative research, benchmarking

JEL Classification: A13, L31, M14, Q01

Introduction

The Fairtrade Town certification can be awarded only to towns, but also to islands, districts, zones or regions. The main objective is to raise awareness in order to promote the sale of Fairtrade products in a given place. Fairtrade Towns to promote Fairtrade was established in 2000 in Garstang, UK, which thus became the first Fairtrade town. Here the individual criteria for the title were developed. Five basic objectives are defined, which are the foundation of all international Fairtrade Town campaigns. There are more than 2,000 Fairtrade Towns in the European Union alone. (Fairtradetowns.org, 2022)

There are 14 such towns in the Czech Republic that take pride in supporting Fairtrade. The Fairtrade Towns campaign reached the Czech Republic in 2010 thanks to the Ecumenical Academy. This academy is a non-governmental organization and together with NaZemi has been working on the idea of Fairtrade since 2004. (Fairtrade Czech Republic and Slovakia, 2023)

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Jasinski (2012) mentions that Fairtrade Town could be perceived as beneficial not only to disadvantaged producers from underdeveloped countries, but also to the places themselves. The aim of his article "Fairtrade Town Initiative as a Marketing Tool" is to present the Fairtrade Town initiative as a marketing tool which could affect the image of places and give them additional value and distinctiveness in the eyes of different target markets, such as inhabitants, tourists or new residents. Jasinski (2012) presents examples of how the FTT title can create additional value to places and become a part of a town or city's marketing message.

Gmenier, Herrmann and Reithinger (2021) highlight the huge potential of Fairtrade Town certification in Germany. The champion of the Fairtrade Campaign and the awarder of the certification is the non-profit organization TransFair, e.V. The concept of Fairtrade Towns is based on four pillars:

a) *The development cooperation level* – as defined by the Fairtrade concept (fair prices to producers, long-term business relationships, social contribution to community development, possibility of pre-financing production).

b) *The ethical level* – prohibition of forced child labor and decent working conditions.

c) *The educational level* – information about the provenance of goods, producers and the wider context of international trade.

d) *The social aspect* – the campaign can bring together different actors from politics, business and civil society. (Ecumenical Academy, n.d.)

It is necessary to mention that the issue of Fairtrade Towns is very underestimated in scientific publications worldwide. In the Web of Science database there are only 15 scientific outputs published on this important and very current topic, without any distinction made of the above-mentioned pillars. The absolute largest number of scientific outputs on Fairtrade Towns have been published by the authors Anthony Samuel and Ken Peattie from Cardiff University and their teams. This article seeks to fill the niche of a scientific approach to the issue of Fairtrade Towns and their certification.

It is essential for each town to meet five criteria, without which it is impossible to obtain the title.

a) Form *a local steering group* that is essential to the campaign. It must be made up of at least five members who are connected to the town leadership, are active and committed to Fairtrade projects.

b) *Official endorsement of Fairtrade,* declared by the members of the municipality, preferably the mayor of the town. This commits the town to provide support to help with the campaign and also to consume Fairtrade products.

c) *Availability of Fairtrade products* to be ensured by the town in local retail and food service establishments.

d) Get *local support* from residents and organizations, e.g., schools, NGOs and churches.

e) *Work with the media and the public* to promote Fairtrade ideas and campaigns to the residents of the town and its surroundings. (Fairtrade Czech Republic and Slovakia, 2021)

After meeting the five criteria of the campaign, candidates for the title of Fairtrade Town will have to send their application to the Fairtrade Czech Republic and Slovakia organization, which is responsible for the campaign. The latter will assess the application and audit the town to decide whether the criteria have been met. In the event of full compliance, the town will be awarded the title of Fairtrade Town. However, the campaign does not end there. The local steering group continues to promote and develop Fairtrade. Every year the steering group sends Fairtrade Czech Republic and Slovakia a report on its activities and requests renewal of the title (Fairtrade Czech Republic and Slovakia, 2021). However, it is important to highlight the fact that, even with regard to the above criteria, the commitment and participation of the public, in this case the residents of the selected town, is crucial for the success of putting Fairtrade certification into practice.

Despite their rapid growth, Fairtrade Towns' role in promoting and developing Fairtrade consumption remains under-researched. (Samuel & Peattie, 2015)

1. Methods of Research

The aim of the quantitative research was to analyze and identify the current awareness of fairtrade issues in general, including knowledge of the fairtrade label in the selected Czech town and its surroundings. In addition, it was to determine the interest in applying for Fairtrade Town certification among the residents of Strakonice and its immediate surroundings. To determine this objective, a quantitative survey with selected hypotheses was chosen, which concerned only the inhabitants of Strakonice and its immediate surroundings, as it is primarily their town. The town of Strakonice was chosen for the research due to the personal ties of the authors of the article to the town in an effort to help the town in its development and thus also to make a contribution to sustainable development. In addition, the town of Strakonice is located near the long-certified fair trade town of Volyně, which successfully passed the certification process in 2011 and can serve as an example of best practice in comparable initial conditions.

The respondents therefore consisted of residents of Strakonice of all age groups. In order to obtain the required data taking into account all age groups of respondents, both paper and electronic forms of questioning were used. The paper form of the survey was chosen for the segment of elderly residents. This form of the questionnaire was distributed in the local retail store Jednota Coop in Strakonice, next to the advertising board with information. On the other hand, the electronic survey had many advantages, including easy and quick distribution and capturing a large number of the target segment. Thanks to this online distribution, it was possible to focus on the necessary geographical segment, and obtain a large number of responses from respondents.

The town of Strakonice lies southeast of Pilsen. It is a district town with 22,428 inhabitants, of whom 10,722 are men and 11,706 women. The average age is 43.8 years, of which men 41.8 and women 45.7 (Czech Statistical Office, 2021).

The questionnaire survey consisted of a total of 18 questions made up of both compulsory and optional answers. Prior to defining these questions in the questionnaire, hypotheses were established, which were then processed through two statistical tests after the data collection was carried out. The tests are applied according to the significance of the hypotheses. The π test of the alternative distribution parameter tests that the relative frequency of a certain phenomenon is equal to a certain number. Most often this is some percentage of the total sample size. For this test, a significance level of 0.05 is chosen. The second statistical test to confirm or reject the null hypothesis is the Chi-square test of independence. In this case, it detects the independence between gender, that is, between two discrete traits, females and males. The given hypotheses are chosen according to the previous theoretical research and estimation about the awareness of the residents of the selected town about Fairtrade and their personal experience.

Defined hypotheses used to determine the objective:

H1: More than 65% of respondents have already encountered Fairtrade.

H2: There is a correlation between gender and knowledge of Fairtrade.

H3: There is a correlation between gender and the purchase of products by provenance.

H4: At least 10% of respondents are aware of Fairtrade support organizations.

H5: At least 30% of respondents could imagine their town as a Fairtrade Town.

Individual definitions explaining Fairtrade issues, the Fairtrade Towns campaign and the requirements for becoming a Fairtrade Town were added to the survey questions. The definitions were used to clarify the topic and also to make the questions easier to answer by referring to the necessary answers to obtain the research objective. Prior to the actual research, a pilot study was carried out on a sample of 5 representatives from all age groups.

The quantitative research was launched on 17 January and ran for a full month until 17 February 2023. The main vision was to get at least 100 suitable responses. The distribution of the electronic questionnaire was ensured through the social network in the specific Facebook group "Strakonians", where most of the residents of Strakonice are registered. As mentioned above, it was also distributed in paper form in the local Jednota Coop to reach seniors, whom this topic also concerns.

2. Results of the Research

188 respondents took part in the questionnaire survey. The respondents consisted of 137 (73%) women and 51 (27%) men, of which 112 respondents are from the town of Strakonice and the remaining 76 respondents live in the immediate vicinity of Strakonice (within 10 km). None of the respondents indicated any other gender. In order to meet the criterion that this research be intended only for residents from the town and its immediate surroundings, a question on residence was included in the questionnaire. Those respondents who were not from the area were excluded from the survey. The largest representation of respondents was between 31 and 50 years of age and amounts to 84 respondents, i.e., 45% of the total number. The second largest representation was

in the 18-to-30 age category. The sample of respondents in the survey cannot be considered representative, but it does follow the prevailing trends in the individual demographic criteria. This was achieved, among other things, by different ways of distributing the questionnaires (electronically and on paper) in different locations, taking into account the likely reach of the target groups.

Tab. 1: Respondents' gender and age

	Less than 18	**18 - 30 years of age**	**31 - 50 years of age**	**51 - 65 years of age**	**Over 65 years of age**
	Relative number	Relative number	Relative number	Relative number	Relative number
Woman	100%	77%	81%	38%	60%
Men	-	23%	19%	62%	40%
Other	-	-	-	-	-
Σ	**100%**	**100%**	**100%**	**100%**	**100%**

Source: authors' own research (2023)

The questionnaire consisted of questions on the concept of Fairtrade, the Fairtrade Mark and the Fairtrade Towns campaign. The first defined hypothesis relates to the question about the concept of Fairtrade, and whether the residents have already come across it. The hypothesis assumes that more than 65% of respondents have already encountered Fairtrade.

Tab. 2: Have you ever encountered the term Fairtrade?

Have you ever encountered the term Fairtrade?	**Men**	**Women**	**Total**
No	63%	42%	48%
Yes	37%	58%	52%
Total	**100%**	**100%**	**100%**

Source: authors' own research (2023)

$H1_0$: More than 65% of respondents have already encountered Fairtrade.

$H1_A$: Less than 65% of respondents have already encountered Fairtrade.

A p-value with a significance level of 0.05 was determined using MS Excel with *the π test of the alternative distribution*. The p-value came out to be 0.000215, which is lower than the 0.05 significance level. The low p-value argues against the null hypothesis, thus **rejecting** hypothesis $H1_0$. The alternative hypothesis is accepted as **'Less than 65% of respondents have had any encounter with Fairtrade'**. The test confirms the alternative hypothesis $H1_A$.

The following hypothesis H2 is interested in the correlation between gender and knowledge of the concept of Fairtrade. This question was put to respondents who chose the answer "Yes" in the previous question, i.e., that they had already encountered the concept of Fairtrade.

Tab. 3: Do you know what Fairtrade is about?

Do you know what Fairtrade is about?	Men	Women	Total
No	1	5	6
Yes	18	74	92
Total	**19**	**79**	**98**

Source: authors' own research (2023)

$H2_0$: There is no correlation between gender and knowledge of Fairtrade.

$H2_A$: There is a correlation between gender and knowledge of Fairtrade.

No correlation was found between the two variables, i.e., women and men. In the *Chisquare test of independence*, the test criterion came out to be 0.030279331 and the critical value came out to be 0.999886545. The test criterion is lower than the critical value and thus the null hypothesis that there is no correlation between gender and knowledge of the concept was **confirmed**.

The third hypothesis H3 states that there is no correlation between gender and the purchase of products by provenance. This refers to the question that is interested in whether respondents purchase products by provenance.

Tab. 4: Are you interested in the provenance of the products you buy?

Are you interested in the provenance of the products you buy?	Men	Women	Total
No	21	26	47
Yes	30	111	141
Total	**51**	**137**	**188**

Source: authors' own research (2023)

$H3_0$: There is no correlation between gender and the purchase of products by provenance.

$H3_A$: There is a correlation between gender and the purchase of products by provenance.

The *Chi-square test of independence* in MS Excel revealed a test criterion value of 9.367017244 and the resulting critical region value is 0.052552644. The value of the critical region is too low and indicates **rejection** of the null hypothesis $H3_0$. Therefore, the alternative hypothesis is confirmed, which is **"There is a correlation between gender and purchase of products by provenance".**

The opening section concerning the campaign began with the question "Did you know that there are various organizations around the world that support Fairtrade? For example, Fairtrade Towns." The *"Yes"* answer chosen by 20 respondents went on to an open-ended

question asking them to write where they had encountered the organization or a Fairtrade Town. This question also relates to hypothesis H4, which relates to the Fairtrade Towns campaign.

$H4_0$: Less than 10% of respondents are aware of Fairtrade support organizations.

$H4_A$: More than 10% of respondents are aware of Fairtrade support organizations.

The hypothesis that less than 10% of respondents are aware of the various campaigns to promote Fairtrade was confirmed. Through the *Test on the π parameter of the alternative distribution*, the p-value came out to be 0.633891004, which is greater than the 0.05 level of significance, thus **confirming** the hypothesis on the awareness of the residents. The higher the p-value, the more it supports the validity of the null hypothesis.

Another open-ended question asked for information on where respondents had found out about or come across organizations and the campaign. Five respondents stated "a town near Strakonice", meaning the town of Volyně, which is a Fairtrade Town, and also that there is a Fairtrade school in the town. Respondents also listed various Fairtrade Towns across the Czech Republic, such as Český Krumlov. The rest of the respondents said that they had come across Fairtrade on the Internet, at university or in a newspaper article.

The most important question is number 9, which is one of the main questions answering the research objective. The question attempts to find out the attitude of the interviewees towards the Fairtrade Towns campaign itself. A total of 86.2% of the respondents find the campaign interesting. Of the total number of men, 70.6% were interested in the campaign, while in women it was 92%. The question preceded more specific questions dealing with the campaign in Strakonice.

Tab. 5: Do you find the Fairtrade Towns campaign interesting?

Do you find the Fairtrade Towns campaign interesting?	Men	Women	Total
No	29 %	8 %	13 %
Yes	70 %	91 %	86 %
Total	**100 %**	**100 %**	**100 %**

Source: authors' own research (2023)

The following two questions aimed to test the interest of the residents of Strakonice and its surroundings in the title of Fairtrade Town. The first of these questions focuses on the opinion of the residents on whether it would be possible to implement such a campaign in Strakonice. Respondents had a choice of four options. The most frequent answer was *"Probably not"* (43.6%) and the second most frequent answer was *"Probably yes"* (30.8%). 17% of the total gave a clear *"No"* answer and only 8.5% of the total gave a clear *"Yes"* answer. Residents indicated, therefore, a slight interest in such a campaign being run in Strakonice.

Tab. 6: Can you imagine Strakonice as a Fairtrade Town?

Can you imagine Strakonice as a Fairtrade Town?	Yes	Probably yes	No	Probably not	Total
Surrounding area	2,7%	13,8%	5,3%	18,6%	40,4%
Strakonice	5,9%	17,0%	11,7%	25,0%	59,6%
Total	**8,5%**	**30,9%**	**17,0%**	**43,6%**	**100,0%**

Source: authors' own research (2023)

The eleventh question was a follow-up to the previous question about the campaign. It sought to uncover the impressions and feelings of the residents about whether they think that Strakonice is sufficiently prepared for the Fairtrade Towns campaign. At the beginning of this section, the criteria and prerequisites for the campaign title were explained to the respondents. Here, respondents chose from simple *"Yes"* and *"No"* questions to determine the clear opinions of Strakonice residents. Most of the respondents from Strakonice and the surrounding area chose the answer "No", believing that the town does not have the prerequisites for the campaign. Of the 128 who chose the *"No"* option, 75 respondents were from Strakonice and 53 from the surrounding area. The opinions of the residents of Strakonice and its surroundings on the prerequisites for the campaign are also addressed in hypothesis H5.

H5$_0$: More than 30% of respondents think that Strakonice has the prerequisites for the campaign.

H5$_A$: Less than 30% of respondents think that Strakonice has the prerequisites for the campaign.

The hypothesis claims that more than 30% of respondents think the town has the prerequisites. Here again, the significance level was 0.05 and the p-value came out to be 0.362414907, using the *Test on the π parameter of the alternative distribution*. Thus, the p-value is higher and **confirmed** hypothesis H5$_0$.

The last two questions are focused on the prerequisites of Strakonice to become a Fairtrade Town according to its residents. Here, the residents could also give their opinions on what they think Strakonice has or does not have to obtain the title. The first one was aimed at getting what prerequisites the town of Strakonice has. Respondents chose from 4 closed options and could also choose the *"Other"* option, where they could elaborate. The options were chosen according to five criteria for obtaining the title. The total number of residents who think the town **has** enough prerequisites is 59 respondents. Respondents from the Strakonice area most often chose the option *"Products in stores"* and the option *"Support from schools and other organizations"*. Local residents agreed with respondents from the surrounding area, who also chose the option *"Products in stores"* and *"Support from schools and other organizations"* most often. The least preferred option was the interest of the residents of Strakonice and the surrounding area.

The second single-answer question aimed to obtain opposite data from question number twelve, that is, to get residents' opinions on where they think the town is lacking in pre-requisites. According to 127 respondents, Strakonice does not meet the conditions to get the title. The biggest deficiencies from the respondents' answers come from the options

"Interest of residents", *"Products in stores"*, *"Support from local media"* and *"Support from schools and other organizations"*.

The questionnaire survey showed that people mainly learn about the campaign or Fairtrade in schools during lessons, on the Internet and in various articles. Knowledge of Fairtrade towns in the Czech Republic was also evident, confirming the effect of the campaign on promoting and spreading awareness of Fairtrade. For citizens, the Fairtrade Towns campaign is interesting especially in theoretical terms as after the explanation of the definition, the respondents found the campaign very interesting. When asked about the implementation of such a campaign in Strakonice, the majority of respondents expressed disapproval and slight disinterest. Out of the total, 35 respondents would be in favor of implementing a campaign in the town. The prerequisites that the town has according to the respondents are Fairtrade products available in stores and the support of the local schools and other organizations. There is therefore hope for the campaign to be implemented.

In the response space, respondents expressed their knowledge and perception of the Fairtrade label in the Lidl supermarket. They also recognize the need to educate themselves about Fairtrade and to get their priorities straight. Other responses expressed more negative attitudes. The most common was the low spending power of local residents, for whom Fairtrade products would be too expensive and thus would not support the campaign. The limitation of the research is the fact that it was not based on a representative sample of respondents, and this fact could influence the results of the research, as varying awareness of fairtrade issues can be assumed among different age groups.

Subsequently, the benchmarking was carried out on the basis of a comparison of the Fairtrade towns of Volyně and Žďár nad Sázavou and the town of Strakonice. The selected towns were chosen based on how long they have held Fairtrade Town status in order to be able to compare older and newer towns and thus get different information and options. The town of Volyně, located near Strakonice, has held the status since 2011. In contrast, the town of Žďár nad Sázavou has been a Fairtrade town only since 2021.
As part of follow-up work on this topic, benchmarking on foreign examples, e.g., German towns where this certification is significantly more established, can be recommended. After this analysis, options for Strakonice in the individual criteria necessary for obtaining the Fairtrade Town status are proposed. **The local steering group** would consist of employees of the municipality or members of local organizations and people willing to participate in such a project. **Official support** would be expressed by the mayor with the town councilors. **The availability of Fairtrade products** would be ensured in local retail stores that deal with organic products and take pride in the provenance of the products they sell, and also in local supermarkets and drug stores that offer Fairtrade products to customers. Last but not least, sweet shops and cafes would offer products made from Fairtrade raw materials. **Local support** would come from primary and secondary schools, of which there are several in the town. The schools would organize events promoting Fairtrade and other projects involving pupils in cooperation with the town. Local for-profit as well as non-profit organizations would be involved in events and projects to spread the word about the Fairtrade campaign and movement. **Local media**, such as the local Strakonice daily, would feature interesting articles about
Fairtrade and the Fairtrade Towns campaign. It would inform residents about upcoming events supporting the movement and how residents themselves could support or help the

organizers of these events. Public outreach would also include organizing seminars for residents in the community center or in some schools, where teachers, pupils or Fairtrade professionals themselves would give presentations.

3. Discussion

At the national level, there is a need to continue educating the population on sustainable development. As such, the town should build on these activities and take them to the local level, demonstrating the impacts of sustainable behavior through specific examples (Samuel & Peattie, 2015). Fairtrade clearly contributes to the Sustainable Development Goals. If national economies are more inclined to emphasize sustainable development in their strategies and, above all, in the specific measures to achieve the strategic objectives, awareness of this issue will grow in the future, which will also contribute to a better understanding of the principles of fairtrade and its importance for society. It can be estimated that there will be a growing interest from cities and institutions in fairtrade certification. Marketing communication of sustainability at different levels can very easily turn into greenwashing, or misleading messages towards customers about the positive environmental impact of a selected product or activity of a company or organization. (Delmas, Burbano, 2011) According to Wu, Zhang and Xie (2020), greenwashing is often referred to in the context of CSR (Corporate Social Responsibility).

The significance of fair trade also needs to be communicated widely, e.g., what it helps to do, what problems it helps to solve. By explaining the global issues with impacts on their lives, residents would become aware of the situation we are in and perhaps change their minds and start supporting the Fairtrade Town campaign. (Jasinski, 2012)

Ensuring the availability of Fairtrade products in retailers and catering establishments in the selected town would also not be easy. Some retailers might find the products expensive and fear that residents would not buy them. The town would offer benefits to such establishments when selling these products. The main benefit would be promotion of the establishment, which would be supported by the municipality. For example, there would be a Fairtrade category on the town's website, listing all Fairtrade-supporting establishments selling Fairtrade-certified products. In addition, the town would provide a favorable price for a stall that the establishment could open at local markets. However, the stall would have to sell at least one Fairtrade product.

The town would also arrange for the regular purchase of Fairtrade products from the establishment for events hosted by the town. These could be events held at the town hall e.g., meetings, conferences, seminars and appointments, as well as events held in the town for residents and visitors. They would offer retailers the benefit of a positive brand image. By selling Fairtrade products they would be socially responsible and gain new customers based on sustainable consumption and ethics. Furthermore, differentiating themselves from competitors by offering Fairtrade products will help to differentiate themselves in the market. This is in comparison to retailers who sell non-certified goods and do not guarantee quality.

According to Samuel, Peattie and Herman (2020), the town itself should also be interested in gaining the title. Obtaining the Fairtrade Town Certification would attract new tourists and investors, which would bring new opportunities and funding. It would also show that

the town is active and cares about the interests of its residents, whom it wants to support and educate.

Conclusion

According to the results of the research, Strakonice is not yet fully prepared for the Fairtrade Town certification process. Nevertheless, the research results offer several positive approaches that signal a good start to the campaign. For example, a group of residents who would like to participate in such a project. Others are the town's prerequisites in the form of Fairtrade products placed in local shops and support from schools and local organizations. As mentioned above, it is first necessary to convince residents that this campaign is for the pursuit of sustainable development. In the future, we can expect to see a growing awareness of Fairtrade in general, what the products are, where they come from, who grows them, how the growers are treated, and what they gain by being part of the Fairtrade organization.

Samuel, Peattie and Herman (2020) explain the resulting evolution of Fairtrade Towns is shown to have passed through two stages. The first supports the broader global 'mainstreaming' agenda of the FT movement, with the second more focused on a novel contribution of local 'sidestreaming' to horizontally interconnect a range of types of place within a locality.

The Fairtrade Towns campaign has potential in the Czech Republic, especially in larger towns. Residents of larger towns and cities have higher incomes, and therefore higher purchasing power, and can afford Fairtrade products without thinking about cheaper options. Awareness of what individuals would gain by supporting Fairtrade needs to be raised, e.g., voiding the unfair practices that are happening amongst growers in the southern hemisphere. A certain number of people buy Fairtrade products even though they do not know what the label is involved in. If such products did not sell, they would not be found in our supermarkets and drugstores. More people are becoming interested in fair practices in the world and in environmental friendliness. That is why Fairtrade certified towns are feasible in the Czech Republic and have great potential for future urban development.

In addition to strengthening the scientific outputs on the issue of Fairtrade Town certification, the article serves to spread awareness of the issue of Fairtrade Town certification and at the same time is a guideline for Czech towns that may consider getting involved in the process of preparing an application for Fairtrade Town certification.

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Pitfalls of Strategy Creation and Selection after COVID-19

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Abstract

We see a possibility for researching the issue of strategic processes as a whole in companies, as there are publications on individual strategic processes, but from the point of view of the complete picture in company, the view of the intervention of foreign capital is absent. We want to point out significant differences in individual management strategic processes, while pointing out the difference in the functioning of companies with and without the participation of foreign capital. The method of data collection was carried out on the basis of a questionnaire survey, which consisted of 5 parts of the strategic process, namely: Vision, mission, goals; Analysis of the external environment; Analysis of the internal environment; Choosing and creating a strategy; Strategy implementation and control. The factor Participation of foreign capital was selected for the purposes of the work. The participation of foreign capital in companies has a fundamental impact on strategic processes and companies' sustainability and efficiency, as our results suggest. In our conclusion, investigating the issue of foreign capital participation has a fundamental impact on understanding the business environment. For the sustainability of a high-quality business, we consider updating and understanding the issue to be an important point for efficiency and sustainability.

Key Words

foreign capital, strategic management, strategy, efficiency, sustainability

JEL Classification: F23, M19

Introduction

Strategic management that is flexible and responsive to the new business environment is necessary in the post-COVID-19 era. Businesses now operate in a new world as a result of the epidemic, and in order to stay successful and competitive, they must adjust their strategy proactively (Mostafizur et al., 2021). Being adaptable and nimble is a crucial component of strategic management in the post-COVID-19 era. Businesses must be able to swiftly modify their plans in reaction to shifts in the market, changes in consumer behavior, and disruptions in the supply chain. This necessitates an environment where businesses are open to trying new things and making quick adjustments when necessary, that´s where strategic management comes in (Lifan et al., 2022). Therefore, more than ever, there is strong need to understand every aspect of strategic management processes. Also it is important to understand how different factors, such as size of the company, capital structure, area of operations and many more, influence the companies in the terms of strategic management, it´s efficiency or sustainability. A creation and right decision to choose a good strategy is a key to successful strategic management and also to avoid many problematic areas. That is why we decided to look closely on several strategic management processes. We expect

differences among companies especially in terms of foreign capital participation. But firstly we need to understand what strategic management is and how it is affected by foreign capital participation.

1. Theoretical Background

In the words of (Fuertes et al., 2020), strategic management is defined as a stream of decisions and actions that lead to the development of an effective strategy or strategies to help achieve corporate goals. The strategic management process is how strategists determine goals and make strategic decisions. (Ansoff et al., 2018), define strategic management as a systematic approach to the main and increasingly important responsibility of general management for positioning the firm and its relationship to its environment in a way that ensures its continued success and protects it from surprises. In their work, (Bryson & George, 2020) state that strategies are generally believed to have financial and nonfinancial benefits. The right strategy helps the organization and itsleadership to think and plan its future existence, fulfilling the main responsibility of the board of directors. The strategy determines the direction of the organization and its employees. Unlike one-off strategies, effective strategies continuously plan, monitor, and test the organization's activities, resulting in greater operational efficiency, market share,and profitability. We therefore will closely look on each phase of strategic management. There are many divisions but we decided to look at give phases of the strategy creation process in strategic management according to (Fotr et al., 2020) which are goal setting, analysis, strategy creation, strategy implementation and strategy monitoring. The 5 points are mentioned by many authors, for example (Wheelen et al., 2017), andaccordingly we will look at the following points, define their use and why they are crucial for the existence of businesses. However, the business itself is subject to internal and external environmental interventions and therefore must respond to them. In a time of rapid growth, rapid change, and the coma that exists in almost all industries, the challenge for companies is to create a strategic agenda to address these competing currents and grow despite them. A company must understand how the above currents work in its industry and how they affect the company in its particular situation. Analysts then use a very useful tool. The name of this tool is external analysis. External evaluation is a step in which a company identifies opportunities that could benefit it and threats that it should avoid (Jasper & Crossan, 2012). On the other hand, internal analysis provides a comparative view of the company's resources and capabilities, identification of the company's strengths, identification of the company's weaknesses, how these strengths and weaknesses compare to the competition. It helps the firm determine whether its resources and capabilities are likely sources of competitive advantage, helps create strategies that will take advantage of any sources of competitive advantage. In addition toassessing the firm's external environment and the industry in which it operates, strategic management requires the firm to conduct an internal assessment of its resources and capabilities (Frynas & Mellahi, 2015). Following we have strategic synthesis. Strategic synthesis in business refers to the process of combining various strategic elements or components into a coherent and integrated overall strategy. It involves analyzing and synthesizing information about the business environment, identifying the organization's strengths and weaknesses, and formulating a strategic plan that aligns with the organization's goals and objectives. This process typically involves the participation of top management and other key stakeholders to ensure that the resulting strategy is both feasible and effective in achieving the organization's desired

outcomes. In essence, strategic synthesis is a crucial aspect of strategic management that helps organizations develop a comprehensive and effective approach to achieving their goals (Johnson a et. al., 2020). Effective implication and control of strategy in strategic management require continuous evaluation and adjustment to ensure that the strategy remains relevant and effective. This involves assessing the impact of the strategy on organizational performance, identifying areas of improvement, and making necessary adjustments to ensure that the strategy continues to achieve its objectives. In summary, strategy in strategic management has significant implications and requires effective control to ensure that it remains aligned with organizational goals and objectives (Oliveira et al., 2021). This is the point where multiple factors are starting to interfere such as size of the company, company´s operation area, foreign capital participation or others. We will therefore look at the role of foreign capital in strategic processes.

The Role of Foreign Capital in Strategic Processes

Foreign capital participation can open up new financial avenues for businesses. This might be crucial for businesses who have trouble accessing finance on the domestic market or that need a lot of money to grow and expand (Metais et al., 2022). By loweringthe risk of an organization becoming overly dependent on a small number of shareholders or domestic investors, foreign capital participation can help to diversify a company's ownership structure. Foreign investors frequently contribute new technology, management strategies, and competencies that can boost a company's efficiency and competitiveness. By generating new jobs, raising the demand for local goods and services,and fostering economic growth, foreign capital participation can also have beneficial spillover effects on the local economy. A corporation can gain from foreign investment ina variety of ways. First off, foreign investment may improve the company's financial resources. The company could be able to expand its operations or invest in new projects if it has more money available. As a result, the company may decide to pursue opportunities that were previously out of reach, which may modify its strategic objectives(O'connor et al., 2023). Second, foreign investors could contribute important skills to the company. They might have worked in several industries or marketplaces, or they might be familiar with cutting-edge technologies or business strategies. According to (Cachón Rodríguez et al., 2022), however, problems with foreign capital participation could also exist. For instance, when interacting with international investors, the company may need to overcome language obstacles or adapt to new cultural or regulatory standards. Additionally, disputes amongst stakeholders may arise as a result of the flood of foreign investment. For instance, local shareholders or employees may perceive that foreign investors' interests are being prioritized over their own. Overall, while foreign capital participation can have a positive impact on a company in many ways, it is crucial for businesses to carefully assess how it may affect their stakeholder relationships and strategic procedures. By doing this, they may make sure that they are maximizing their chances for foreign investment and safeguarding their long-term interests. Of course, some authors point out the negative consequences of foreign capital participation such as(Paramati et al., 2017). The article highlights the value of strategic management in accomplishing organizational objectives, especially in times of crisis or ambiguity. Strategic processes help in defining company goals, seeing possible problems, effectively allocating resources, and promoting an open and accountable culture.

2. Methodology and Data

Several factors influence the issue of strategic management processes. That is whywe tried to select the factors that have the most influence on the investigated companies and with the help of them we stated the following hypotheses. We directly point out the issue derived from the literature review. For the purpose of this paper we eventually set amodel factor for only Share of foreign capital. For better understanding the hypothesis development we add all 4 main factors, starting with Legal form of organization. The legalform of a business refers to the structure or entity under which it operates and isrecognized by law. It is an important factor because it affects many aspects of how the business is operated, regulated, and taxed. Legal form requirements to change the work of enterprises management in terms of forming strategies related to developing the activity of legal entities they control as a whole in case of macroeconomics crisis. Second factor of our identification is Number of employees. It is a factor that has been evaluatedas the most important in many studies, such as (Ainin et al., 2015), and therefore, even if it is not directly related to the topic, we decided to include it. We have 43 microenterprises, 47 small business, 58 medium enterprises and 52 large enterprises. The third selected factor was share of foreign capital. It is an important factor influencingthe whole company structure. It states the amount of foreign direct investments in the company's capital structure with the level of linking strength towards the investor. Out of200 companies we have 88 Exclusively Slovak (100% SK), 68 Balanced (99 – 1% SK) and 44 Exclusively Foreign (0% SK). The last we used the field of activity of organization. Economic sectors are an important indicator because they provide information about thestructure and composition of an economy. They help us to understand how resources arebeing utilized and what types of goods and services are being produced and consumed. Atthe same time, we want to find out whether the strategic process depends on the selectedcharacteristics of the company. Therefore, we ask ourselves the following hypothesis question:

- Are there differences in strategic processes between enterprises with and without foreign capital? Enterprises with foreign capital are likely to engage in more extensive andcomplex strategic processes compared to enterprises without foreign capital.

Article examines the evaluation of the strategic management process in companies operating in Slovakia. It will be a comprehensive assessment, especially in the area of strategy and control. For the purposes of this paper, we have chosen one area and it is Choosing and creating a strategy. In doing so, we linked the factor of participation of foreign capital in companies to this section. The research was conducted in the form of the interview filled by company representative. Investigation based on our previous research, which included a pilot study, so in this case it was not necessary to repeat it. However, interviewers had to be familiar with the topic of interest and the questionnaire itself as part of the preparatory phase. Out of 250 addressed entities, 202cooperated. Thus, the response rate of 80.80% was calculated. Following data adjustment, the samplewas narrowed to 200 examined companies. For this research, a stratified randomizationwas used. Subjects were selected based on one criterion. Monitored entity must be a separate legal entity registered in the Slovak Commercial Register. The only additional prerequisite was to fill in the questioner with a company representative who is aware of monitored problems. Therefore, we asked for cooperation with a director or one of the top managers. We monitor a sample of 200 business entities operating in Slovakia. Condition for inclusion in the research: registration in the commercial register of the Slovak Republic - legal personality in the

Slovak Republic and ability to respond to all questionnaire questions regarding planning processes. Main factor was selected for the purpose of this paper and that is direct foreign equity participation. The next step questionnaire included 67 questions. The first part of the questionnaire contains questions related to the interface / qualifications of the respondents. This is followed by a general part about strategic management and then 5 basic key areas from the mission, vision and goals, through the external environment followed by the internal environment. The penultimate part of the questionnaire contains questions focused on the selection, evaluation and implementation of strategies. The last part consists ofquestions aimed at checking strategies. Questions were based on the Liker scale from 5 to1, where 1 – totally disagree, 3 – neutral attitude; 5 – totally agree. We started with Cronbach´s Alfa, which had a value of 0.805, which is generally acceptable value. Shapiro–Wilk test told us that our data are not normally distributed and we therefore followed with non-parametric Kruskal-Wallis test, followed later by post hoc tests. To analyze the differences in the extent of application of planning, general hypotheses H0 were established. Assumption: the more the company correctly implements the individual strategic processes, the more efficient the company is and the less critical the individual strategic phases are for it. At the same time, we want to find out whether the strategic process depends on the selected characteristics of the company. Therefore, we ask ourselves the following research questions:

• Do strategic management decisions in the company depend on the allocation offoreign capital in the company?

•Are there differences in the strategic process between enterprises with and withoutforeign capital?

For the purpose of this paper optimization of variables was used, for better understandingof individual markings. We present the optimization of variables in the following table 1.

Tab. 1: optimization of variables

Variables	Operationalization	Method of measurement
Share of foreign capital	To what degree is foreign capital represented in your company?	1 – 0%; 2 – 1% to 50%; 3 – 51% to 100%
Choosing and creating a strategy	Items A1-A9	Likert scale 1-5: 1 – complete agreement, 3 – neutral attitude; 5 – completely disagree

Source: authors' own work

The methodical procedure of the paper in the analysis of the results of the questionnaire survey was as followed. The initial step of the evaluation was the calculation of Cronbach'salpha (Viladrich, et al., 2017) for the tested model, which indicates the reliability of the test. In our case, the results showed a set value of 0.805, which is considered a generally acceptable measure, and the test is therefore suitable for statistical investigation. Following table contains Item statistics results with average and Std. Deviation. The totalnumber of observations in all items is 200. The next step was to run the Durbin-Watson test, which showed results between 1.5 and 2.5 for all factors and thus we did not confirm autocorrelation between them. An

intermediate step in the procedure was the use of Shapiro Wilk's normality test, which demonstrated that our main factor is not normally distributed for each level of independent variables. For the purpose of distribution of our data, we used Kruskal-Wallis test, followed by post hoc test. Results of the test are summarized in the discussion and conclusion of this paper. For the data analysis the IBM SPSS Statistics Subscription 1.0.0.1447 was used.

3. Research Results

The presented results are part of a large-scale study focused on various aspects in thefield of planning processes of a selected group of business entities in Slovakia. First of all,we present the general model summary. We used the Durbin-Watson test to compute a test statistic that measures the degree of autocorrelation in the residuals, in our case the model summary value is 1,824. Subsequently, due to the non-normal distribution of the data, the non-parametric Kruskal-Wallis test was applied with the assumption of statistically significant differences between our chosen factors and individual variables. We will present only results for the factor Share of foreign capital. Identify the overall objective: Begin by determining the broad objective that company wants to achieve. Meanvalues are presented in report table, including questions A1 – A9.

Tab. 2: Average values in the items in the section Choosing and creating a strategy

Share of foreign capital	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**
1 (0%)	3,74	3,75	3,11	3,44	3,00	3,35	4,01	4,06	3,50
2 (1–50%)	3,74	3,75	3,50	3,74	3,21	3,56	3,87	4,00	3,82
3 (51–100%)	4,09	3,80	3,73	3,68	3,20	3,68	4,02	4,32	4,09
Total	3,82	3,76	3,38	3,60	3,12	3,50	3,96	4,10	3,74

Source: authors' own calculations

Tab. 2: Kruskal-wallis test with post hoc test - Choosing and creating a strategy

	A1	A2	A3	A4	A5	A6	A7	A8	A9
Kruskal-Wallis H	4,543	,710	6,379	2,176	,808	2,386	2,252	2,102	6,539
Asymp. Sig.	,103	,701	,041	,337	,668	,303	,324	,350	,038
Post Hoc analyses			1 - 3						1 - 3

Source: authors' own calculations

The test statistics shows significant values across questions (A3) and (A9). The questions examine in case (A3) the degree of diversification in the company is high, it operates in several sectors, has several subjects of business, offers many products or services and in question (A9) The company has databases for storing its experience and knowledge. It is thus possible to turn to the results of past periods in future decisions. Wecan attribute the differences to the different intentions of individual companies, as foreigncapital participation largely affects the very goals of the company. Only two out of the nineitems had statistically significant changes. Enterprises without (1) and with foreigncapital participation (3) were found to differ from one another. According to the statistically significant differences found, organizations with higher levels of foreign participation are more oriented toward defining long-term sustainability processes for the organization and are better at understanding how to develop short- and medium-termgoals.

Discussion

Depending on the particulars of the firm and the nation in which it operates, COVID- 19's effects on foreign capital in firms can vary. However, according to (Weilu et al., 2022),the epidemic has generally produced a difficult economic environment that could endanger foreign investment in enterprises. On the one hand, because of the pandemic's disruption of global supply chains and lower demand for goods and services, many businesses have seen their sales and profitability fall. Due to the potential for a variable return on their investment, this may discourage international investors from making investments in these companies. Planning in firms has changed after COVID-19, as the pandemic created new challenges and uncertainty that required businesses to adapt andinnovate. The pandemic highlighted the importance of having contingency plans and being prepared for unexpected events, therefore all business factors had to be reconsider(Pradip et al., 2023). In our research, I want to point out the

current possible critical points after the covid-19 pandemic from the point of view of strategic processes, when companies started with a strong diversification of their portfolio, while, as our research shows, there are differences between companies that keep a database of experience and knowledge from previous projects, this was already pointed out by, for example (Pradip et al., 2023). What we subsequently see as a problem is that if the portfolio begins to diversify strongly,while employees who have knowledge from previous business activities decide to changeoperations during the natural turnover of employees, this creates a space for a vacuum of experience and knowledge that should be replaced by a database. In this way, however, well-experienced employees or management cannot appeal to current threats and possibilities, while the database itself could help them to a large extent in decision-makingprocesses. (Benur & Bramwell, 2015), on the other hand support the idea than only in specific sectors a huge diversification can bring benefits, for example in tourism industry. (Lee & Kang, 2015) state that it is necessary to implement into diversification also technology and innovations. In previous years' man firms had to adapt to the online worldand (Lee & Kang, 2015) points out the critical point of sharing knowledge from team toteam online. Therefore, a good experience and knowledge can sometimes get lost in companies' structure.

Conclusion

In conclusion, our exploration of foreign capital participation in company operations and the impact of planning process variations has shed light on the significant role that planning processes play in shaping the dynamics of foreign capital participation. We have identified that strategic management processes can vary significantly across different companies in Slovakia, leading to diverse outcomes in terms of foreign capital participation. These variations may include differences in strategic decision-making, risk assessment, stakeholder involvement, and cultural factors. T We also found supportive arguments and researches conducted in V4 countries with similar issue. Our research results in critical knowledge in the area of creating databases of past projects and experience. As stated in the discussion, this creates room for the loss of experience and knowledge, which can represent a significant loss in the long term. Since we have enteredthe post-covid era, it is necessary to try to eliminate uncertainty and focus on long-term intentions. Some companies have started to diversify their business portfolio in a big way,hand in hand with a missing database, a critical point for the company's inefficiency can occur. Our findings also highlight the importance of understanding and addressing these planning process differences when dealing with foreign capital participation in companies. This knowledge can assist stakeholders, including company managers, investors, policymakers, and international business professionals, in making informed decisions and formulating effective strategies to optimize foreign capital participation outcomes. The result is high-quality strategic planning that also takes into account the possibility of crises, such as COVID-19. Further research in this area could delve deeper into specific planning process variations in different countries, industries, and company sizes, and explore how these variations impact foreign capital participation and related outcomes. Additionally, studying the role of regulatory frameworks, legal structures, andinstitutional factors in shaping planning processes and foreign capital participation dynamics would provide valuable insights for both academics and practitioners.

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Circular Economy as a Determinant of Environmental Behavior and Engagement of Business Subjects in Slovakia

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Abstract

The paper focuses on the current issue of business and its environmental aspects with regard to the circular economy in the Slovak business environment. As indicators of corporate environmental behavior, companies' approaches to the circular economy, willingness to invest in environmental technologies and implement environmental innovations, and character interactions of companies with the market and competition are defined. One of the approaches that forms the basis of such behavior is the circular economy. The aim of the article is to define the environmental behavior of Slovak companies and their decision-making on the concretization of environmental approaches and strategies in business activity and to identify the areas of concretization of the environmental behavior of Slovak companies operating in various industries and their environmental engagement. It was based on the assumption that Slovak companies show environmental awareness depending on their size, economic strength and the subject of their business. Factor analysis based on the KMO test was used to identify the individual groups of environmental approaches that are applied within the company's business activities, thus verifying the correlation between the variables. The highest intensity of environmental manifestations of business behavior was expected for economically strong companies operating in manufacturing sectors located in the western regions of Slovakia with the highest interaction with customers and partners who take into account the environmental behavior of companies and competitors. An increase in the intensity and a stronger enforcement of environmental behavior in the business activities of Slovak business entities compared to the present will require an increase in the support of the business environment at the macro, meso, and micro levels. Not only high-quality legislation or various support mechanisms in the financial and technological fields, but also continuous information of these business subjects and effective support of science and research are essential.

Key Words

environmental behaviour, environmental approach, environmental engagement, circular economy

JEL Classification: L 26, L 29

Introduction

The environmental behavior of companies is a manifestation of several aspects and combinations, consisting in the use of different strategic approaches in the area of decision-making, the willingness to invest in environmental technologies, the involvement of customers and partners in the business activities of companies and monitoring the activities of competitors. The advent of new technologies as well as social pressure due to environmental damage as well as social deformities manifesting in various areas of life and society emphasizes the necessity of changes in business and requires the development of new business models that are oriented towards environmental protection and respect the needs of future generations and create values

for society as a whole. For many companies, this approach means new business opportunities and growth opportunities based on technological trends and bringing socio-ecological well-being while maintaining their financial viability.

Geng and Doberstein (2017) describe the circular economy as a closed circle of material flows throughout the economy. The definition of the circular economy as a regenerative system is very apt, in which the leakage of input resources as well as waste, emissions and energy is minimized by slowing down, closing and narrowing material and energy cycles. This can be achieved by designing for long-term consumption, maintenance, repair, reuse, rework, renovation and recycling (Geissdoerfer et al., 2017).

The definition of the circular economy in the broadest sense is based on "narrowing resource flows" within the existing linear economy. This is a more efficient use of resources, especially through new technologies or greater use of current resources. A narrower understanding of the circular economy is characterized by the definition of "slowing resource loops", which focuses on the production and design of the product. This approach can be applied in a traditional linear economy as well as in an economy with a certain degree of circulation (McCarthy et al., 2018).

The circular economy should be understood as a fundamental systemic change, and not just as small improvements to the current state. It should also be seen as a tool for implementing the concept of sustainable development. Only a small part of the definitions mention all three aspects of sustainability. They mainly focus on its economic and environmental aspects. Interesting are the studies that deal with the relationship between the economic return and the environmental aspects of the circular economy and related innovations (Antonioli et al., 2022, 1). Several autrhors provide new and global empirical insight into the financial returns of green practices by analyzing a panel of publicly traded companies in 58 countries over 13 years, showing that what they define as internal green practices (pollution prevention and green supply chain management) are the main drivers financial performance forces, while product development is secondary and the adoption of environmental management schemes (specifically ISO 14001) negatively affects financial performance (Antonioli et al., 2022). Bhattacharyya, Biswas and Moyeen emphasize the determinants of pro-environmental behavior of managers/companies (2020). Kuah and Wang also point to the necessity of involving consumers in circular economy practices and systems (2019). Szilagyi et al. in turn, they analyze the factors of the environmental purchasing behavior of consumers in the circular economy for the environmental purchasing behavior of savers (2022).

The circular economy brings new business opportunities. It provides a reliable structure for the radical improvement of current business models within the development of a preventive and regenerative ecological industry, as well as for the promotion of well-being based on renewed environmental integrity (Ghisellini et al., 2016; Kumar et al., 2021; Suchek et al., 2021). Environmental issues and relevant political plans constantly involve the concept of circular economy in business development (Kiriakopoulos, 2021). The attention of experts has recently been focused on innovations in business models for doing business in the conditions of a circular economy, because the circular economy promises to bring economic prosperity within ecological limits. The research of circular business models for the circular economy is starting to develop as a prospective area of economic-environmental research (De Angelis, 2020).

The circular economy can be understood as an economic system that operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, state and others), with the aim of achieving sustainable development, i.e. to simultaneously create environmental quality, economic prosperity and social justice for the benefit of current and future generations. It is feasible thanks to new business models and responsible consumers.

1. Methods of Research

The aim of the article is to define the environmental behavior of Slovak companies and their decision-making on the concretization of environmental approaches and strategies in business activity and to identify the areas of concretization of the environmental behavior of Slovak companies operating in various industries and their environmental engagement. Knowing the nature of environmental behavior of companies and defining its indicators was key. Emphasis was placed on clarifying the position and influence of the circular economy on this behavior. Subsequently, a scientific instrument was designed, which was used in the analysis of the obtained data and their interpretation. As part of mathematical statistical methods, the method of main components was used, which is a collection of methods used to examine how underlying constructs influence the responses on a number of measured variables. Ward's hierarchical clustering method based on Euclidean distance was also used. Fisher's Exact Test - is used to determine whether or not there is a significant association between two categorical variables. Factor analysis based on the KMO test was used to identify individual groups of environmental approaches that are applied within the business activities of companies.

For research purposes, in the spring of 2023, primary quantitative research was carried out using the CAWI method using a standardized questionnaire. The sample consisted of 300 companies from the sectors (1) waste management, (2) services, (3) recycling and (4) processing of secondary materials. Information about the examined companies was obtained from data published by the Statistical Office of the Slovak Republic. Our definition of the studied subjects was based on the statistical classification of economic activities SK NACE Rev. 2, which was issued in the decree of the Statistical Office of the Slovak Republic on 18.6.2007 under number 306/2007 Coll. The data were processed with the statistical program IBM SPPS Statistics.

2. Results of the Research

The starting point of the research was the assumption that Slovak companies show environmental awareness depending on their size, economic strength and the subject of business. The highest intensity of environmental manifestations of business behavior was expected for economically strong companies operating in manufacturing sectors based in the western regions of Slovakia with the highest interaction with customers and partners who take into account the environmental behavior of companies. At the same time, these companies regularly monitor the behavior and environmental strategies of competitors.

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Tab. 1: Fisher exact test

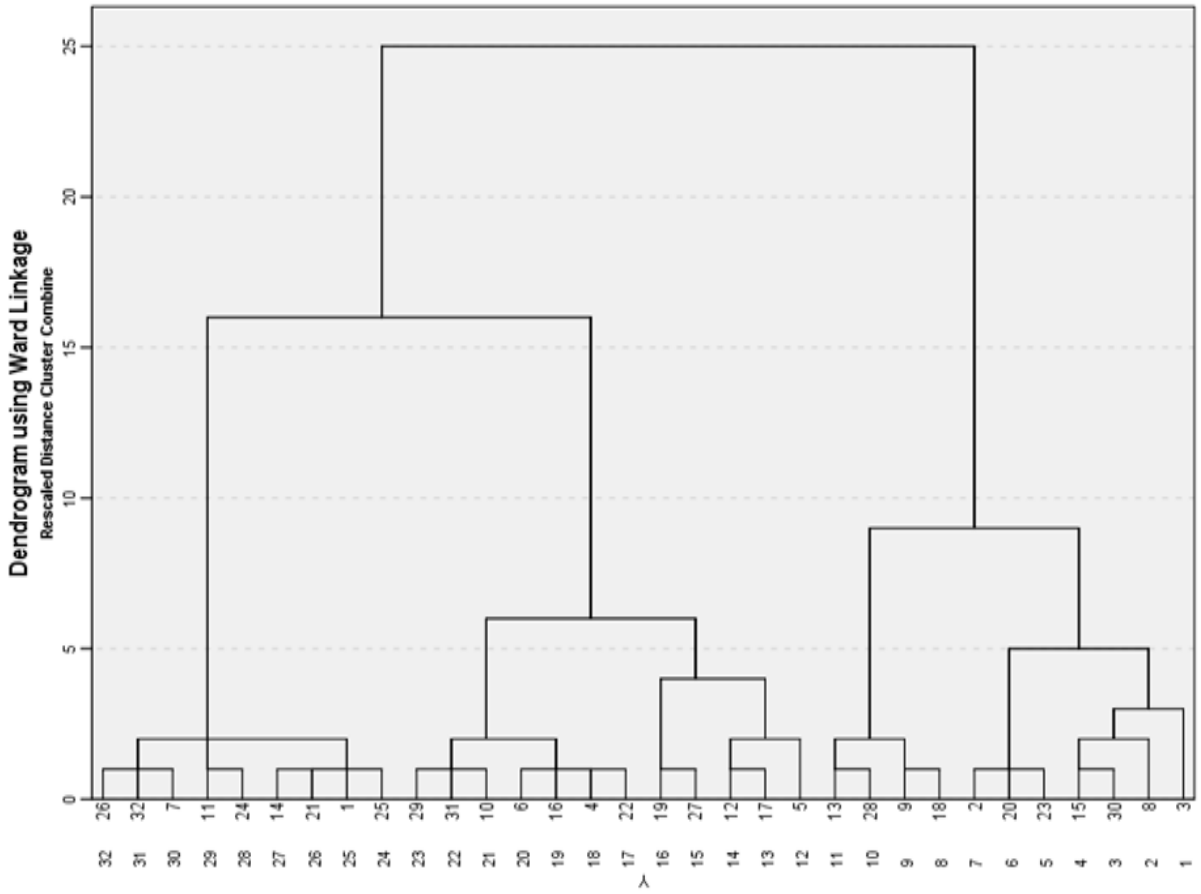
Fisher exact test	Environmental innovations	Economic solutions	Environmental requirements customers and competitors	Environmental passivity customers and competitors
The main area of the company's activity	0.272	0.157	0.022	0.025
Number of company employees	0.788	0.847	0.032	0.145
The average amount of sales for the last three years	1.000	0.413	0.943	0.61
Head Office	0.605	0.509	0.025	0.01
Company ownership	0.104	0.279	1.000	1.000

Source: authors' calculations in IBM SPSS Statistics 25

From table 1, it can be concluded that neither the average amount of sales nor the ownership of the company have a statistically significant effect on the environmental behavior of companies. In companies that are engaged in trade and production and employ a larger number of employees, customers and partners have an obvious environmental commitment and a much greater willingness to engage in environmental issues than customers and partners of companies providing services. From a regional point of view, the regions of eastern Slovakia show greater interest in environmental issues. Subsequently, the following questions were examined: Q1: How do you involve your partners in the environmental activities of your company?, Q2: How do you involve customers in your company's environmental activities?, Q3: Do you follow the activities of the competition in the field of environmental trends?, Q4: What are your plans for investing in technology?, Q5: What are your plans for investments in the circular economy?

Based on the dendrogram (fig.1), it can be determined that the ideal number of clusters is three clusters, where not a single company forms a separate cluster.

Fig. 1: Cluster analysis of the environmental behavior of Slovak companies (dendrogram)



Source: authors' calculations in IBM SPSS Statistics 25

Tab. 2: Average for individual clusters

Cluster	Average Q1	Average Q2	Average Q3	Average Q4	Average Q5
1	1.333333333	1.111111111	1	1.222222222	1.333333333
2	2.454545455	2.545454545	2.818181818	2.181818182	2.909090909
3	1.333333333	1.75	1.583333333	3	2.333333333

Source: authors' calculations in IBM SPSS Statistics 25

Cluster 1: consists of companies that actively involve their customers and partners in the environmental activities of their company and monitor the activities of competitors, and have also already invested in technology and the circular economy.

Cluster 2: consists of companies that do not involve customers and partners in their environmental activities, do not follow and are not inspired by competition in the environmental field, and currently or in the next 3-5 years plan to invest in technology. These are mainly small companies with up to 10 employees, with low sales of up to 100,000 euros and exclusively Slovak ownership.

Cluster 3: consists of companies trying to involve their customers and partners in environmental activities and planning investments in the circular economy and technologies within 3-5 years. These are mainly small companies with up to 10

employees, with low sales of up to 100,000 euros from the Nitra and Trenčia regions and with exclusively Slovak ownership.

Correlation between variables was verified. The value of the KMO coefficient has a value of 0.633, which expresses a moderate dependence and meets the condition for the application of factor analysis.

Tab. 3: Rotated components

Rotated Component Matrix			
	Component		
	1	2	3
Q1_B	0.851		
Q1_C	0.746		
Q1_I	0.726		
Q1_D	0.600		
Q1_A		0.816	
Q1_H		0.585	
Q1_E		0.576	
Q1_G			0.729
Q1_F			0.677

Source: authors' calculations in IBM SPSS Statistics 25

The first factor can include approaches aimed at the reuse of products and products (recycling, reuse of materials, reuse of a discarded product, change of use method (sharing). The second factor can include alternative approaches to the use of used materials and products (energy recovery - combustion, refurbishing, reduction (reduction of consumption).The third factor can include approaches that do not require high time or financial demands and are only small adjustments compared to other approaches (renovation, repair).

The most intensive environmental engagement was manifested in the east of Slovakia in the least developed districts of this region. Companies from central and western Slovakia show their environmental engagement less intensively. In both cases, these are mainly medium-sized and small companies with a perspective of growth and development and an interest in using the business potential of the circular economy, taking into account its innovative and environmental aspects. These companies operate in all the investigated sectors, except the service sector. It is obvious that the innovative potential of their business has, or can have positive effects on environmental engagement and overall environmental behavior. Furthermore, these companies have a multi-level management system, especially medium-sized companies, which includes modern effective management tools. Last but not least, it is a regional aspect that is related to the influx of foreign investments in the east of Slovakia and their strategic approach or innovative environmental business model. In the case of small companies, it is primarily the business ambitions of their owners.

3. Discussion

The environmental behavior of companies is a manifestation of various aspects and combinations, consisting in the use of different strategic approaches in the field of circular

economy, willingness to invest in environmental technologies, engagement of customers and partners in the business activities of companies and monitoring of competitor activities. Increasing the intensity of environmental behavior and its stronger enforcement in the business activities of Slovak business entities compared to the present will require an increase in the support of business activities at the macro, meso, and micro levels. Circular economy is intrinsically bound to environmental innovation in the way societies legislate, produce, and consume (Prieto-Sandoval et al., 2018). High-quality legislation or various support mechanisms in the financial and technological fields, continuous information of these business entities and effective support of science and research are therefore essential. Based on our findings from the conducted research, reflecting the behavior of Slovak companies in the researched area as well as the latest trends related to our topic, we state that further research and related processes of successful transition of business entities to the circular economy should focus on: (1) waste as a factor of pollution and/or environmental protection and as an input raw material forming part of a (new) product, (2) regenerative use of natural resources, (3) economic benefits for business entities, (4) customers as key bearers of these changes in all stages of their purchasing behavior and decision-making. The four perspectives mentioned ensure the concurrent alignment of environmental protection requirements with regard to limited resources, business interests, and customer needs and preferences.

Conclusion

The connections between the environmental behavior of companies, their environmental awareness and engagement represent relationships and ties that form the basis for new progressive business.Companies can long-term use the opportunities brought by the environmental aspect of their business only on the condition of systematic identification of environmental aspects of their business activity and associated expectations of improvement of economic indicators in all business functions. This opens up new challenges, market opportunities and profit possibilities for companies in an environment requiring environmental protection. One of the ways of finding relationships between individual markets, customers and natural resources is the circular economy. In order to effectively implement an environmental approach as an idea of business behavior, environmental protection must be recognized as a goal in all decisions and with the simultaneous use of relevant development and support tools at the macro, meso, and micro levels.

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Family Business Innovativeness: A Tool for Successful Succession?

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Abstract

Family businesses are founded with a vision of long-term sustainability and longevity over generations. Therefore, succession in a family business is an important prerequisite for achieving this goal, representing one of the greatest challenges for contemporary family businesses. We are now in an era in which the millennial generation, which is known for their interest in innovation and technology, is among the potential successors. However, the relationship between family business innovation as a potential motivating factor and the next generation's intention to take over the family business has not been sufficiently investigated. This study examines the relationship between family businesses' innovativeness and potential successors' intention to take over the family business. On a sample of 18,000 responses from university students in the role of a potential successor to a family business, we demonstrate a positive correlation between the intention to take over a family business and the innovativeness of that business. Although the Cramér's V coefficient indicates weak association, it is evident that the relative number of potential successors of family businesses increases with a higher rating of innovativeness. We also show that this trend has not changed over the last five years. The innovativeness of the family business plays an important role in the next generation's decision whether to continue with the business and ensure the longevity of the family business over generations. Our findings may therefore be relevant for owners of family businesses in addressing potential succession issues.

Key Words

family firms, succession intention, potential successor, innovation, millennials

JEL Classification: O30, M21, J53

Introduction

Family businesses typically intend to pass on the business and specific knowledge, experience and capabilities of the family to the next generations in the long term (Nwuke, 2020). Family succession, i.e. the transfer of control in terms of ownership and management, is a critical prerequisite for achieving the goal of transgenerational sustainability of a family business; however, it is also one of the biggest challenges for the continued survival of family businesses (Basco & Calabrò, 2017). Only 30% of family businesses survive into the second generation of family ownership and only 15% into the third generation (Hidayati et al., 2020). Given the global social and economic importance of family businesses (Shanker & Astrachan, 1996), it is vital to examine the circumstances that motivate students with a family business background to become successors, as opposed to founders or employees of another business. Although many studies have examined the behavioural patterns of intentional founders, entrepreneurship research lacks studies that examine the career decisions of intentional successors (Zellweger et al., 2011).

Scherer et al. (1989) were among the first to investigate the relationship between the presence of a parental entrepreneurial role and children's preferences for entrepreneurial careers. Other studies that examined the succession intentions of students with entrepreneurial parents have primarily done so from the perspective of career choice intention (i.e. analysing the factors that determine the career choice intention to become an employee, successor or entrepreneur)(Cieślik & Stel, 2017; Zellweger et al., 2011). Moreover, related studies have almost invariably relied on the theory of planned behaviour (Jebsen & Boyd, 2023; Romaní et al., 2022)and examined the relationship between individual personal characteristics and internal motivation (push and pull factors) and succession intention (Hidayati et al., 2020). However, young people's motivations change over time and generations. Today, the current workforce and the potential successors are millennial (born 1982–2004) (Holmberg-Wright et al., 2017), who are known to have a strong interest in technology and innovation (Hidayati et al., 2020). Therefore, in the digital age, today's family business owners should consider what new motivational factors could influence their millennial children's intention to take over the business. As Hidayati et al. (2020) and Spiezia and Vivarelli (2000) asserted, family businesses' innovation performance could be one of these factors.

Innovativeness refers to the ability and ingenuity to create new things. It is associated with novelty and creativity (Kunz et al., 2011), both of which are highly valued and appreciated by millennials when evaluating a potential workplace (Holmberg-Wright et al., 2017). McGrath (2001) defines innovativeness as the extent to which a company strives for new approaches to business, technology, processes or products. Innovativeness is also understood as an integral aspect of strategy and is a specific organisational characteristic. Innovativeness also refers to a company's ability to remain open to new ideas and work on new solutions that are not geared towards a one-off success but a lasting one (Kunz et al., 2011). The innovative approach is also very important for potential successors when they evaluate their family's business. The perceived innovativeness of a company is a subjective perception and attribute based on one's own information, knowledge and experience (Holmberg-Wright et al., 2017). Organisations are considered innovative if they exhibit behaviour and practices that are stable over time and help to ensure longevity (Covin et al., 2000), which is crucial for family businesses.

Many studies have indicated that family businesses that are more innovative are more likely to survive than those that are less innovative (Cefis & Marsili, 2006; Ballal & Bapat, 2019; Chan et al., 2019). However, there are two opposing views regarding whether family firms are innovative. The first view on family businesses' innovativeness is based on the theory that family businesses feel more responsibility for their success because of their direct connexion to the family, which motivates them to develop new ideas (Zellweger et al., 2012). In contrast, this responsibility may hamper innovativeness due to an increased sense of risk when implementing innovations. Family businesses are more reluctant towards implementing new ideas than non-family businesses. In addition, family businesses feel compelled to consider altruism toward children and extended family members and to accommodate different attitudes within the family. Simply put, the business must also resolve family conflicts (Anderson & Reeb, 2003). However, according to Eddleston et al. (2008), altruism combined with innovativeness is the right approach for enhancing family businesses' performance and also seems to be lucrative for potential employees (Spiezia & Vivarelli, 2000).

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Hidayati et al. (2020) found that millennial successors who are now at the age to take over the family business prefer innovative strategies compared to the others. Therefore, the innovativeness of a business is a condition that attracts young people to work in such businesses (Setiyani et al., 2020). The relationship between family business innovativeness and the participation of young, well-educated family members was examined by Antlová et al. (2020); however, the authors concluded that it is the young family members who drive the innovativeness. On the other hand, Zellweger et al. (2011) found that students who place a high value on innovativeness "*are more likely to prefer the founding intention to the succession intention*" (Zellweger et al., 2011, p. 522). This could be due to the fact that older members of family businesses are generally not open and enthusiastic when it comes to changes in their existing businesses (Soni, 2019). The question arises whether, in the case of family businesses that are considered highly innovative by potential successors, potential successors intend to take over the respective business. Therefore, this study examines the relationship between family business innovativeness and entrepreneurial intention, i.e. the intention to become a successor in the family business right after graduation and five years after graduation. To do so, we propose the following hypotheses:

H1: The variables of family business innovativeness and the intention to become a successor right after graduation are independent.

H2: The variables of family business innovativeness and the intention to become a successor five years after graduation are independent.

Following this introduction, this paper includes four further sections. In the next section, we describe the research methodology. We then present the results of the study, including the related statistics, followed by the interpretation and discussion of the results. The final section of the study presents our conclusions.

1. Research Methods

The data for this study are obtained from the Global University Entrepreneurial Spirit Student Survey (GUESSS). The survey is based on quantitative data collection via questionnaire among university students around the world. The survey focuses on presenting a unique and new perspective on students' relationship with entrepreneurship in several ways. It explores students' entrepreneurial intentions, nascent entrepreneurship, new venture growth and performance and family business succession. The project has gradually expanded to many countries and universities around the world since it began in 2003 (GUESSS, 2022). A responsible country team leader is appointed to coordinate data

collection in each participating country. The author's research team participated as country team leaders for the last three survey years—2016, 2018 and 2021.

The sample of respondents from the 2021 GUESSS survey was selected for this study based on four criteria:

1. At least one of the students' parents was self-employed and/or owned most shares in a business.
2. The student considered the parental business to be a family business.

3. The student had not yet worked in the family business.
4. The student answered the question, 'How do you rate the innovativeness of your parents' business compared to its competitors over the last three years in the following dimensions?' (1=much worse, 7=much better)

Using the above criteria, we obtained 18,011 responses from the 2021 survey to test our hypotheses. To support our findings and determine whether changes occurred over time, we also referenced data from the 2018 and 2016 surveys for illustration (see Fig. 1).

The selected respondents in the 2021 sample included 80.7% undergraduates and 12.3% graduate students. The remaining respondents were in doctoral studies (2.7%) or other programmes (4.3%). Most students study engineering (including architecture) (18.2%) and business/management (18.1%), followed by social sciences (13.8%), human medicine/health sciences (13.1%), arts/humanities (6.4%), economics (6.3%) and law (6.3%). The remaining students studied natural sciences (4.6%), computer sciences/IT (4.4%), science of art (1.4%), mathematics (1.0%) or other sciences (6.3%). All of these students indicated that at least one parent is self-employed and/or the majority owner of a business and that they consider this business to be a family business. A total of 22.7% of the students are already trying to start their own business, but none of them actually runs their own business.

Analytical approach

We used the chi-square test for independence (1) to test our hypotheses. Our two hypotheses examined the existence of a dependency between the values of innovativeness and entrepreneurial intention to become a successor directly after graduation (H1) and five years graduation (H2), respectively.

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i} \tag{1}$$

where χ^2 denotes chi-square test of independence; c degree of freedom; O observed value(s) and E expected value(s).

To test these two hypotheses, students were given the opportunity to choose one of 10 options about what they would most like to do right after graduation and five years after graduation. We then merged the responses into respondents with the intention of becoming a successor in a family business and those without the intention of becoming a successor in a family business.

The variable innovativeness was assessed by asking university students with the potential to become successors in a family business 'How do you rate the innovativeness of your parents' business compared to its competitors over the last three years in the following dimensions?' (1=much worse, 7=much better) We considered the subjective measurement proposed by Kellermanns et al. (2012) to be the most appropriate instrument for our research. This type of subjective measurement of the innovativeness of one's own family business has been used in many studies as the ratings are highly correlated with objective measures of business innovativeness (Kellermanns et al., 2012).

Both hypotheses were tested in IBM SPSS Statistics 26 Programme at the 5% significance level.

The study subsequently used Cramér's V-test to determine the strength of the relationship between the variables (2).

$$\phi_c = \sqrt{\frac{\chi^2}{N(k-1)}} \tag{2}$$

where ϕ_c denotes Cramér's V; χ^2 is the chi-square test of independence from the aforementioned test; N is the sample size involved in the test and k is the lesser number of categories of either variable.

2. Results

The variables for H1 are presented in Table 1. Overall, only 2.45% of the respondents plan to become successors in a family business immediately after graduation. The results of the chi-square independence test between the variables innovativeness and intention to become a successor right after graduation are as follows: N = 18011, Z-statistic = 130.450; Df = 6, p-value = 0.0000. The p-value is less than 0.5, which indicates that we can **reject the H1 hypothesis** that the variables innovativeness and intention to become a successor right after graduation are independen twith a confidence level of 95% and **accept the alternative hypothesis** of their **dependence**. The mean value of the assessment of family business innovativeness was 4.15 for the students who did not intend to become successors in a family business right after graduation. The mean value for the students who answered 'yes' to their intention to become a successor in a family business right after graduation was 5.13.

Tab.1: Innovativeness and intention to become a successor right after graduation

	Innovativeness							Total
Intention to become a successor in 5 years after graduation	1	2	3	4	5	6	7	
Yes	11	13	42	82	90	99	104	441
	2.5%	2.9%	9.5%	18.6%	20.4%	22.4%	23.6%	100.0%
No	2025	1632	2200	4101	3096	2431	2085	17570
	11.5%	9.3%	12.5%	23.3%	17.6%	13.8%	11.9%	100.0%

Source: authors'own

The results in Table 1 indicate that the decision to become a successor in a family business increases with students' higher rating of the firms' innovativeness. We used Cramér's V-test to determine the strength of the relationship between the variables. The strength of dependance between the variables in this case was 0.085, indicating a less strong relationship.

The variables for H2 are presented in Table 2. Overall, only 2.7% of the respondents plan to become a successor in a family business five years after graduation. The results of the chi-square independence test between the variables innovativeness and intention to

become a successor in five years after graduation are as follows: N = 18,011, Z-statistic = 106,119; Df = 6, p-value = 0.0000. The p-value is less than 0.5, which means that we can **reject the H2 hypothesis** that the variables innovativeness and intention to become a successor five years after graduation are independent with a confidence level of 95.0% and **accept the alternative hypothesis** of their **dependence**.

Tab.2: Innovativeness and intention to become a successor five years after graduation

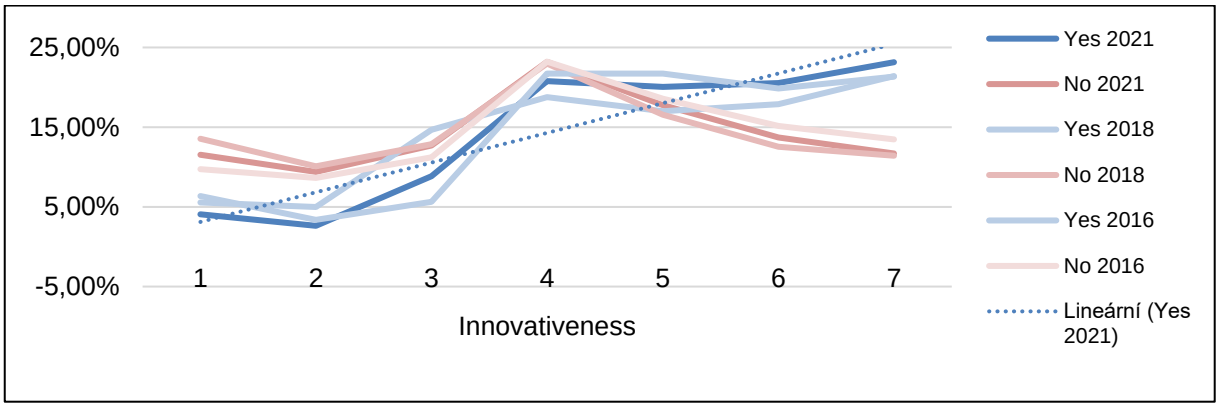
	Innovativeness							Total
Intention to become a successor in 5 years after graduation	1	2	3	4	5	6	7	
Yes	20	13	45	99	99	93	108	477
	4.2%	2.7%	9.4%	20.8%	20.8%	19.5%	22.6%	100.0%
No	2016	1632	2197	4084	3087	2437	2081	17534
	11.5%	9.3%	12.5%	23.3%	17.6%	13.9%	11.9%	100.0%

Source: authors'own

The mean score for the business innovativeness rating was 4.15 for students who did not consider becoming a successor in a family business right after graduation and 5.00 for students who considered becoming a successor in a family business right after graduation. We used Cramér's V-test to determine the strength of the relationship between the variables. The strength of dependence between the variables in this case is 0.077, indicating a less strong relationship.

An illustration of the results from Table 2 examining the relative changes is shown in Fig. 1. We also added data from the 2016 and 2018 surveys to our graph to determine whether there are changes over time, revealing that that the data from all years follow the same trajectory. In addition, there is no difference in the shape of the curve between the two groups (with and without the intention to take over a family business) in all three surveys measured up to point 4 of innovativeness. Furthermore, a higher proportion of students preferred options other than succession when assessing innovativeness from 1 to 4. However, from point 5 onwards, there are differences in the decision to become a successor in a family business. From points 5 to 7, the tendency to become a family successor continues to rise, while the proportion of students who do not intend to become a successor decreases.

Fig. 1: Plan to become a successor family business in five years after graduation



Source: authors' own

3. Discussion

This study was designed to answer our research question of whether, in the case of family businesses that are considered highly innovative by potential successors, potential successors intend to take over the respective business. Although many studies have emerged in recent years on the topic of the influence of certain factors on the intention to take over a family business, most of them have examined factors related to entrepreneurial orientation and personal characteristics (Romaní et al., 2022; Zellweger et al., 2011). However, the next generations to take over family businesses are the millennials, who are known for a keen interest in technology (Holmberg-Wright et al., 2017). Therefore, family businesses confront a situation in which potential successors from the millennial cohort have two career options, either continue the business built by their predecessor or choose a career that is more aligned with their personal interests, such as building a technology start-up (Hidayati et al., 2020). Our results demonstrate the correlation between family business innovativeness and entrepreneurial intention, i.e. the intention to become a successor in the family business.

A novel contribution of this study is the investigation of the intention to take over the family business based on the self-assessment of the innovativeness of the respective parent business. First, we examined the correlation between innovativeness and students' intention to become a successor in a family business right after graduation. Second, we examined the correlation between innovativeness and students' intention to become a successor in a family business five years after graduation. Our results show that the observed value for the intention to become a successor is related to the value of innovativeness in both cases. Although the strength of the dependence between the variables in both cases indicates a weak relationship, our results are supported by Ballal and Bapat (2019). They found that more innovative family firms are more likely to survive than less innovative ones. Our findings may therefore be relevant for owners of family businesses in addressing potential succession issues. If the actual owners start to be more open and enthusiastic to changes and new ideas in their existing businesses, they can motivate their children, potential successors to become a part of their business. To support our findings and show that this trend has not changed, we examined data from three independent GUESSS surveys. Based on our findings, we can conclude that the innovativeness of family businesses is a significant motivation for well-educated men and women and their intention to take over the family business and become successors and thus help the business to achieve its goal of transgenerational sustainability (Basco & Calabrò, 2017).

This study, however, has some limitations similar to all survey-based research. First, the evaluation of innovativeness compared with competition is based on respondents' perception. Here we assume that the evaluated phenomenon is correlated with the objective state. Second, respondents' higher education also has a role, as it can influence their attitude toward innovation. And third, we did not consider any other specifications of our respondents as their gender, age, field of study or personal interests, which could be considered in future research.

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Conclusion

Family businesses are founded with the aim of achieving long-term sustainability by passing them on to the next generation; however, many businesses fail during the succession process. Therefore, this study shows the relationship between family business innovativeness and the intention of well-educated family members with university degrees to become successors in the family business. In summary, family businesses should strive to innovate in the context of sustainability to encourage the next educated generation to become entrepreneurial and subsequently take over the family business. Since the next generation are millennials, who are typically attracted to innovation and technology, family business innovativeness could have an important influence on this decision. Although this study has some limitations that should be considered, a deeper understanding of innovativeness in relation to the intention to succeed in a family business was obtained.

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ICT Professionals Wages Development – Is the Economy in Resilence Period?

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ABSTRACT
EU countries are trying to rationalise the processing of many agendas at both international and national level. The holy grail being sought is the digitisation of all available agendas.. In our paper, we address the issues of wages of workers who work in the field of information and communication technologies - ICT Professionals. We deal with the development of their number in the Czech economy over the last five years and also with the development of their nominal wages. In addition, we also look at the issue of gender pay gap in ICT. For the data analysis, we used a set of surveys for the Ministry of Labour and Social Affairs on wages, which are conducted annually by Trexima Ltd. For data analysis we used mainly MS Excel tools - statistical functions and Python as well. The results show that the number of ICT Professionals in the Czech economy is permanently growing. The identified wage growth trends show that wages are growing fastest for ICT Manager and ICT Specialists positions - here the growth is faster than the overall wage growth in the Czech Republic. For ICT Technicians, although wages show an increasing trend, but it is lower than the wage growth trend in the Czech economy. In the Gender Pay Gap question, we concluded that it is minimal for ICT Professionals in public and state administration, but still very high in the business sphere. A positive phenomenon is that the Gender Pay Gap is decreasing permanently.

Key Words
human capital in ICT, wages in ICT, ICT Professionals, ICT specialists, ICT Technicians

JEL Classification: J24, M21

Introduction

The coming digitalisation of society and the increasing emphasis placed on digitalisation must necessarily be reflected in other areas of the economy (European Commission, 2023). Among the decisive factors for the implementation of digitalization are necessarily the number of workers who are able to actively work with information technologies and the level of their knowledge and skills (Peiró and Martinéz-Tura, 2022). Another important factor is then the awareness of the problem of linking the performance of work processes with the deployment of information and communication technologies (ICT) and thus the acceptance of ICT resources by ordinary workers in the business sphere. All of these considerations converge to the management of human resources in the context of Information Technology not only in companies or public and state administration organizations but in the whole economy (Hanclova and Doucek, 2012).

In recent years, significant new trends have emerged in the use of information technologies and in the development of human resources in ICT - or in the requirements for their competence, knowledge and skills (Peiró and Martinéz-Tura, 2022). There is a growing demand for a larger number of ICT Professionals in economies (Doucek et al.,2022). With this, the requirement for their knowledge is also growing, which, however,

changes quite a lot compared to the situation ten and more years ago - it is, for example, the ability to use remote communication tools, work with social sites and, last but not least, the estimation of the behaviour of viral communication channels. With the advancement of technology, there has been a need for IT professionals to develop new skills and knowledge in areas such as data analytics, cloud computing, cybersecurity, and artificial intelligence. Closely related to this are the methods that are used to educate ICT Professionals as well as ordinary executives. These include e.g. online training, opportunities for consultation on products offered e.g. via Chatbots, etc. (Gartner, 2022).

We are presenting results of our analysis of the gross wages of ICT Professionals and their development during last 5 years, precisely years 2018-2022 in this paper. The main goal of this paper is comparison of gross wages development among selected profession groups during last 5 years. The selected professions are:

- ICT Specialist,
- ICT Technicians and
- ICT Managers.

We use two main indicators to provide insight into the remuneration of ICT Professionals. One is the number of ICT Professionals in the Czech economy. The second one is an analysis of the evolution of gross salaries of ICT Professionals according to the above mentioned categories.

1 The Number of ICT Professionals in the CR - Trend

The number of ICZ Professionals in the Czech Republic is growing every year and although number of ICT students is increasing too, the number of ICT Professionals does not fulfill market requirements and there is missing mor then 20.000 ICT Professionals in the Czech Republic (CZSO,2021).

The growth is visible in the following picture containing comparison of data between 2015 and 2021. The 2021 are the latest numbers provided published by Czech Statistical Office (CZSO, 2023). We present time series from 2015 to provide better overview in the trends of number of ICT Professionals in the Czech Republic.

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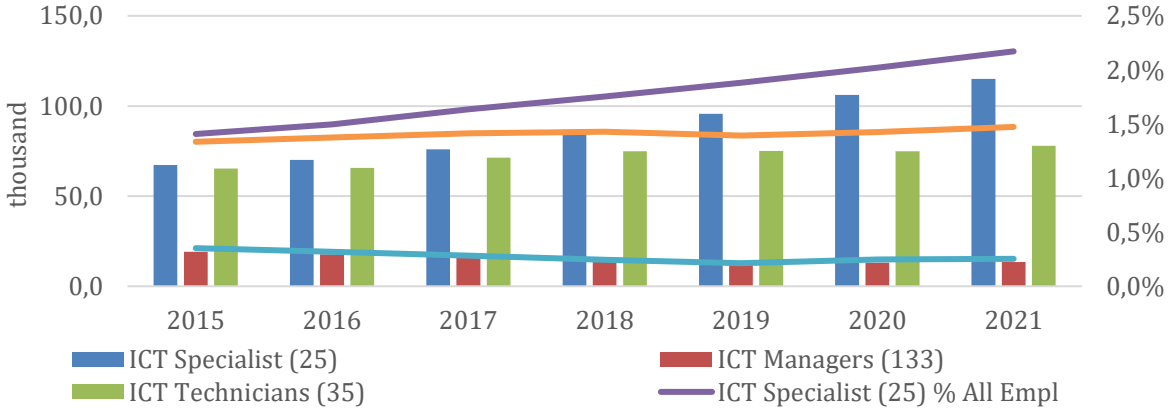
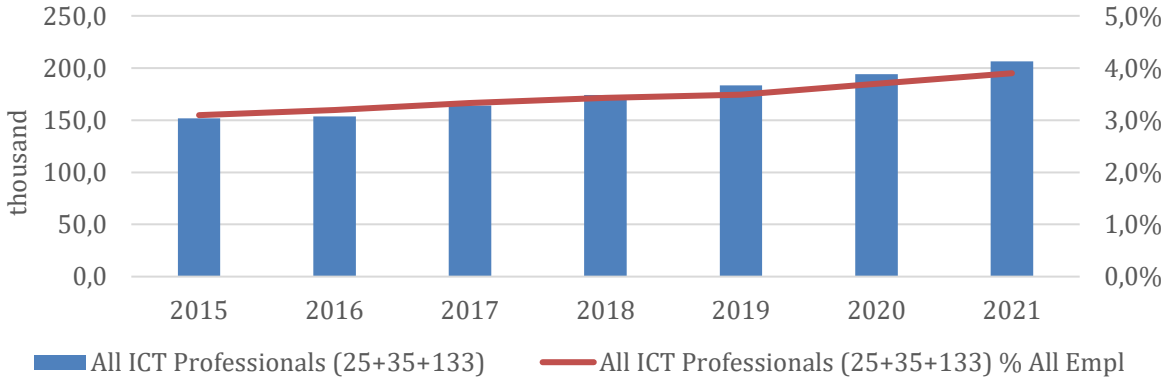
Fig. 1: Total Number and Share of ICT professions from the Total Number of Employed Persons in the Czech Republic



Source: authors

The Fig 2 is confirming that not only absolute number of ICT Professional in the economy is increasing but the share of ICT Professional on all employees in the Czech economy is increasing too.

Fig 2: Share of ICT Professionals from the Total Number of Employed Persons in the Czech Republic



Source: authors, data (CZSO, 2023)

In the year 2015, there were 152,000 active IT professionals, which means 3,1% of all employees. The year 2021 was a little bit different, total number of active IT professionals was 206.500, which was 3,9% of all employees in the Czech Republic. These professionals worked practically worked in all sectors of the economy. The data for year 2022 are not yet available in May 2023, data for 2022 will be available hopefully during August/September 2023.

2 Problem Formulation

As part of the research conducted at the Faculty of Informatics and Statistics, we analyzed different aspects of information and communication technology and their microeconomic and macroeconomic impact on human society. We present the analysis of the wages of ICT Professionals in the Czech economy, in particular the trend in the wages of ICT Professionals in general and by profession where we focused on two groups based on the

CZ-ISCO methodology, i.e., ICT Specialists (CZ-ISCO 25), ICT Technicians (CZ-ISCO 35) and ICT Managers (CZ-ISCO 133). We also analysed the wages of ICT Professionals by gender and sphere employment. We analyzed only their nominal wages (we did not take into account the inflation rate during this period and its impact on real wages). We analyzed these wages for the period of the last five years - 2018-2022.

3 Methodology

We did the deep analysis of the data from various publicly accessible databases of the Czech Statistical Office, Eurostat, OECD, the World Bank, Ministry of Labor and Social Affairs of the Czech Republic. For our research and analysis of the gross wages of ICT Professionals in the Czech Republic, we used the international accepted methodology of ICT professions classification - CZ ISCO. The classification of ICT Professionals is provided below.

3.1 ICT Managers, Specialists and Technicians

Based on the generally used methodologies, such as CZ-ISCO, ICT work positions are divided into three groups of professions (CZSO, 2022):

- Specialists,
- Technicians and
- Managers

Detail description of above mentioned professions can be found in (CZSO, 2022).

3.2 Data and Analytical Tools

We analyzed the data using Microsoft SQL Server, SQL Server Data Tools, Python, MS Excel tools and its statistical functions.

The analysis results are based on the data sources covering years 2018 - 2022. The results are presented in CZK.

The detailed numbers of analysed data are shown in following Tab. 1. The "Sample Employee - All" describes number of all respondents in all professions in the survey. "Sample Employee - IT" describes number of respondents in ICT professions, which in our case means ICT Specialists, ICT Technicians and ICT Managers that are described in the Methodology. Column "All Employees" is presenting number of all employees in the Czech Republic and help us understand reliability of the presented results. Based on the numbers in the table bellow we see that the survey contains data from more than 40% of the employees working and paying taxes in the Czech Republic.

Tab 1: Number of Respondents in the Survey

Year	Sample Employee - All	Sample Employee - ICT	All Employees
2018	2.237.108	63.563	5.160.200
2019	2.279.413	67.257	5.171.300
2020	2.259.750	70.494	5.212.600
2021	2.297.132	73.701	5.295.900
2022	2.327.547	79.068	5.289.200

Source: authors

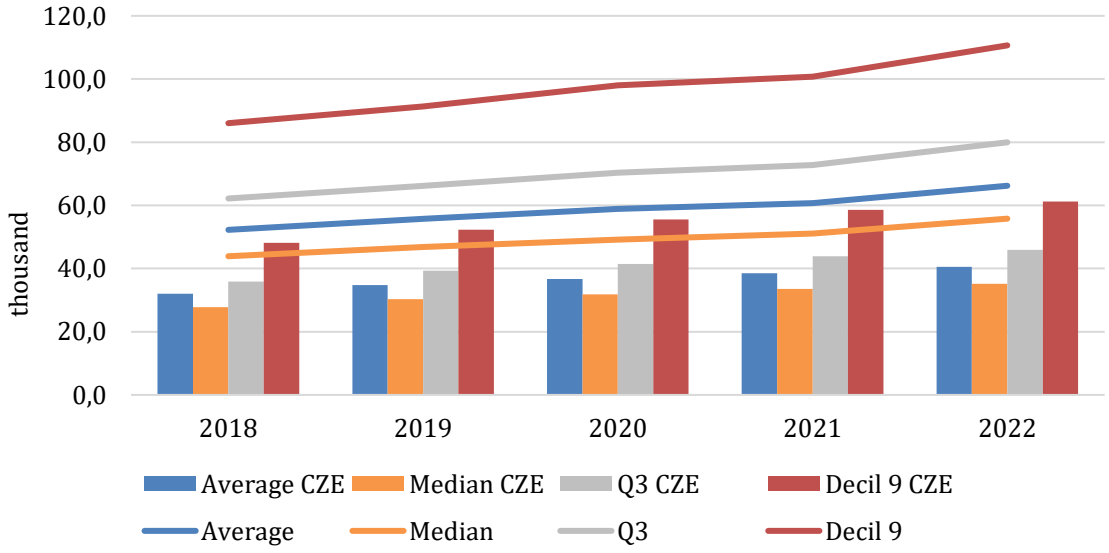
4 Results

The first overall results show trends in nominal wages development for all ICT professions. Wages are presented as a sum of wages for ICT Specialists, ICT Technicians ICT Managers hereinafter called as ICT Professions.

The Fig. 3 describes four different measures of wages per month: average, median, Q3 - quartile 3 and decile 9, that described 10% of highest wages. All the measures are showing increase of wages every year. Speed of growth is similar for all the measures and this growth is between 3%-10% per year.

Important is a comparison with growth of wages in the Czech economy. As shown in the picture we see that wages of ICT professions are growing faster compared to the wages in the Czech economy.

Fig. 3: Trend in the Wages of ICT Professionals - Key Indicators



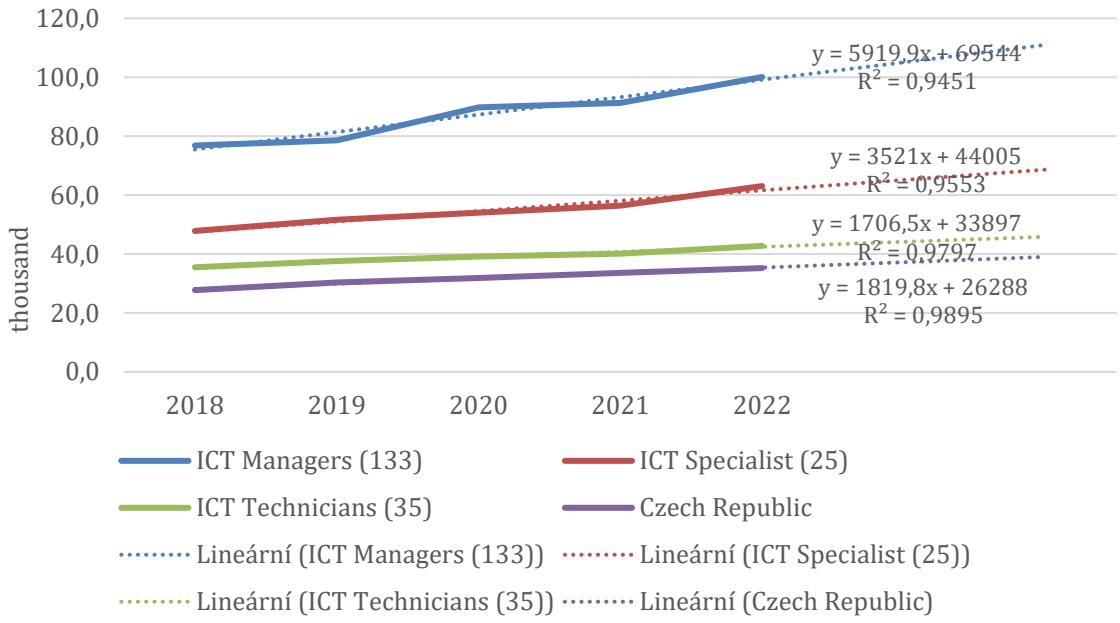
Source: authors

4.1 Median Wages of ICT Professionals

Very interesting results are shown in following Fig.4 where are compared ICT professions separately together with wages in Czech economy. There are compared median wages in the following chart. The trends are saying that the fastest growth of wages haveICT mangers. Interesting trend presents wages of ICT Technicians that are growing slower

compared not only to other ICT Professions, but also to wages in the whole Czech economy.

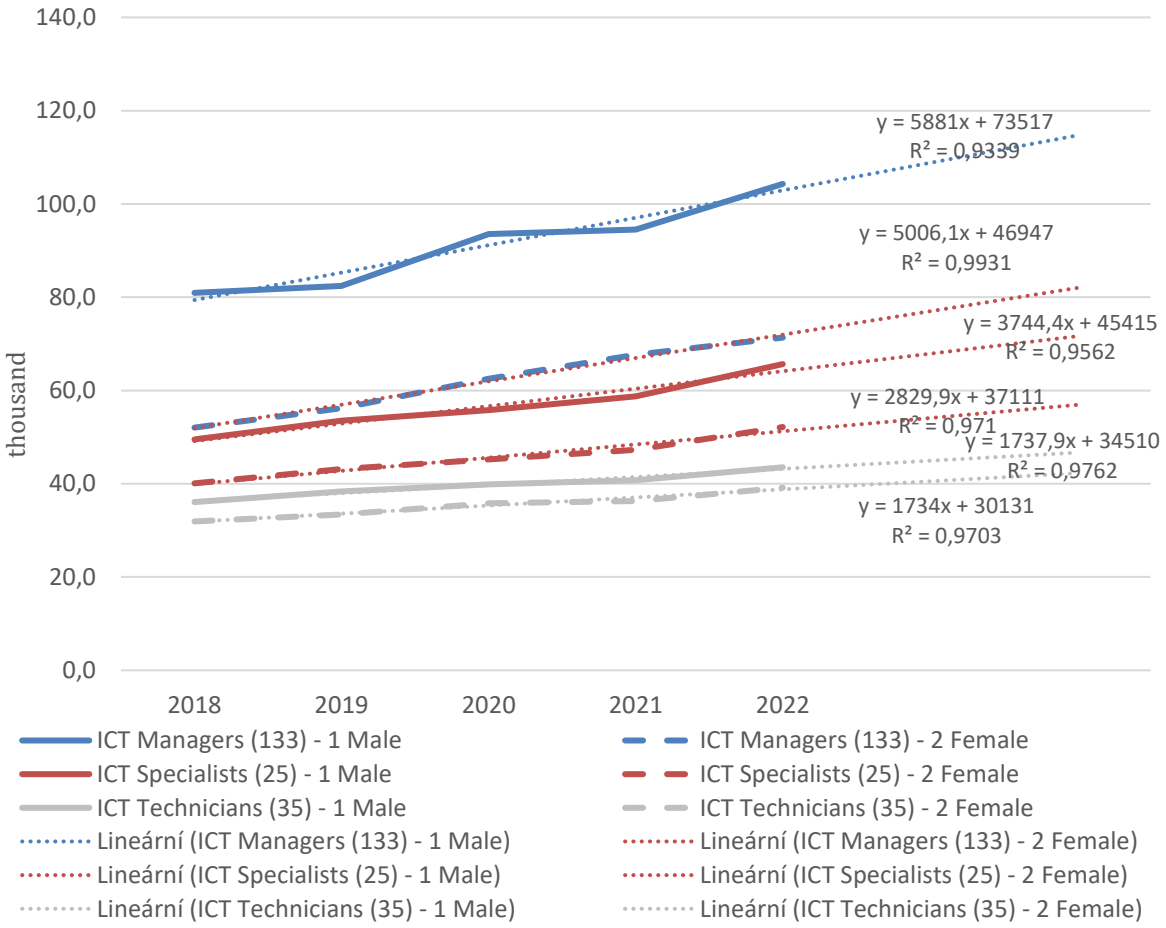
Fig. 4: Trends in the Wages of ICT Professionals



Source: authors

The following Fig. 5 add additional dimension to the Fig. 4. This Figure represents the gender dimension of wages - the gender pay gap in fact. The figure is showing difference between wages of ICT Mangers, ICT Specialists and ICT Technicians based on gender. We see significant difference in median wages of ICT Managers. The difference was 155% in 2018 and 146% in 2022, which means in absolute numbers difference 29.000 CZK/33.000 CZK. Based on the equation of linear trend we can say, that the wages of male/female will never intersect. But we are talking about the long future. This difference is the biggest difference among all analysed ICT roles. Difference for other ICT roles (ICT Specialists, ICT Technicians) are smaller and the lowest difference has ICT Technicians.

Fig. 5: Trend in the wages of ICT Professionals - Gender Aspect

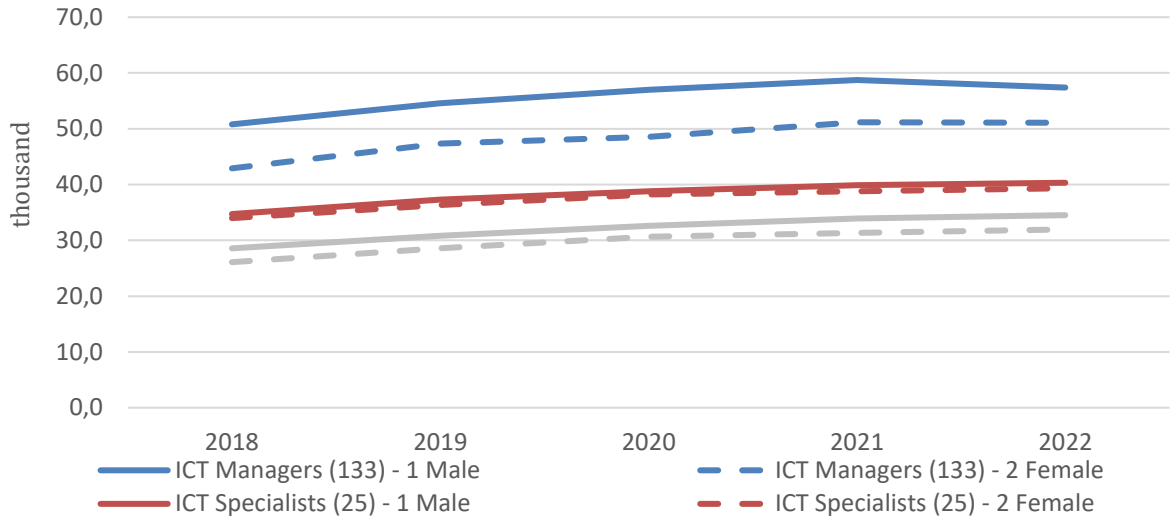


Source: authors

The data from Fig. 6 show very interesting findings in case of analysis in public sector considering gender. We would expect that public institutions will be giving similar salary to male and female working on the same position. This assumption is fulfilled for the role ICT Specialists only where the salary is similar for male and female. We identified the biggest gender pay gap in wages in public sector and on the position of ICT manager. The difference between wages is 118% in year 2018 and 112% in year 2022 (positive trends- the gender pay gap is very slow decreasing) and in absolute numbers are the differences approx. 7.900 CZK/6.300 CZK. What should be taken into account are wages in public and private sector. Comparing Fig. 6 and Fig 5. are shown in following table.

The following Tab. 2 shows significant differences among wages in public and private sector valid for both male and female. Important finding is, that difference is increasing in time and for example in case of ICT Mangers the difference is 182% for male and 140% for female. This difference means, that it will be difficult for public institutions to find experience ICT Managers that will be working for significantly lower wages.

Fig. 6: Trend in the wages of ICT Professionals in Public Sector - Gender Pay Gap



Source: authors

Tab 2: Comparison of wages in Private/Public Sector Gender Pay Gap

	ICT Managers (133)		ICT Specialists (25)		ICT Technicians (35)	
	1 Male	2 Female	1 Male	2 Female	1 Male	2 Female
2018	159%	121%	143%	118%	126%	122%
2019	151%	119%	143%	119%	124%	117%
2020	164%	129%	144%	118%	122%	117%
2021	161%	132%	147%	122%	120%	116%
2022	182%	140%	163%	133%	126%	123%

Source: authors

Conclusion

The overall findings, although for a rather short time, show the disparity in the wages in ICT professions. The research findings mentioned at the beginning of this article show a stable increase in the number of ICT Professionals in the Czech economy during the period 2015-2021. We can thus say that it shows a steady growth trend. When analyzing the trend in the wages of ICT Professionals we reached the following conclusions:

- ICT Managers earn the highest wages; their average month wage is higher by approximately 29,000 CZK in 2018 and 37.000 in 2022 than of ICT Specialists.
- When comparing wages by gender, we can conclude that the highest difference in wages is identified for role ICT Manager when the difference is approx. 30.500 in 2018 and 35.000 in 2019 in private sector and 7.900 in 2018/6.300 in 2022 in public sector.

Unfortunately, similar results for gender aspect were mentioned in (Marek, 2008) in 2008 and during last 15 year almost nothing has been changed in respect of this inequality.

As part of the examination of the problem area, we will further analyze the effects of inflation on wages in total, in individual categories of IT professionals and gender pay gap development.

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Artificial Intelligence in Business Centres: A Case Study of 3 Business Centres in Slovakia

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Abstract

Shared service centres and business centers are a technique that multinational organizations may use to boost the effectiveness of their company operations. Even business centers and Shared Service Centers are impacted by global developments and are continuously seeking new methods to develop, offer services more effectively, and maintain their competitiveness. Artificial intelligence is now having a big influence on how business centers operate and is becoming more integrated. This article's objective is to investigate the potential uses and existing status of artificial intelligence in business centres in Slovakia. A case study based on several cases was used as part of a qualitative approach to process the empirical portion of the paper. Based on the research, it can be concluded that in the case of business centers in Slovakia, it is not possible to determine a uniform state and level of implementation of artificial intelligence. The status and possibilities of implementation are largely influenced by the activities that the centers perform - or the service they provide. The centers provide various types of services, while in some services the human factor cannot be replaced by artificial intelligence (human resources, more serious decisions in the field of finances, etc.). The limitation of our research is the examination of selected three business centers operating in the Slovak market. In the future, this research can be expanded to other centers in Slovakia as well as in other countries.

Key Words

Business centres, case study, Slovakia, artificial intelligence

JEL Classification: L80, L84, D80

Introduction

Global market players are impacted by a variety of trends, shifts, and forces. The integration of artificial intelligence into corporate operations is one of the current trends. According to Antonescu (2018), artificial intelligence is the study of concepts that allow computers to do tasks that make humans believe they are clever (intelligent), such as natural language processing, knowledge representation, and automated reasoning to utilize information. Su (2018) asserts that artificial intelligence has an impact on all economic sectors that produce large amounts of data (big data). From a business standpoint, artificial intelligence and data analysis systems enable people to systematize information, which is typically already available on the market in a disaggregated way, turning data into business decisions. As a result, only those tools are taken into consideration that are helpful to speed up the decision-making processes within a company (Sestino and De Mauro, 2021). Žager et al., (2020) state that an organization's organizational structure and scale are what most influence the decision to use artificial intelligence. Discussed from the perspectives of sustainability, resilience, and the environment is the incorporation of artificial intelligence into the centers. The ITAPA

organization in Slovakia gives artificial intelligence significant consideration to sustainability in business centers (ITAPA, 2023).

Although artificial intelligence is still in the very early stages of development, it will create new winners and losers in firms, industries, and probably in countries (Daugherty et al., 2019). Business centers, a more advanced version of shared service centers (Rusiňák, 2023) are one such industry where the use of artificial intelligence is a key instrument for maintaining competitiveness. According to Wang and Wang (2014), these centers offer one or more types of shared services more affordably and effectively. It is a semi-autonomous business unit that runs consolidated support activities such as accounting and human resources and provides services to internal clients (Brenner and Schultz, 2010). They are a special form of centralization of sub-functions in which the tasks of different bodies are merged or combined (Schuppan, 2019).

Standardizing and streamlining procedures is the main objective of shared service centers (Deloitte, 2021). In the centers' priority list, cutting expenses was originally rated second from the bottom. Achieving corporate values is the third goal of the centers, according to this poll. Several contemporary developments in the researched industry may also be seen, in addition to the aforementioned changes in the strategic aims of shared service centers and business centers. To lower the cost of the centers, one of them is the ongoing use of digital technology and the introduction of innovations. on the aforementioned information, we determined the article's primary objective to be a survey of business centers operating in Slovakia's Central and Eastern European markets under the impact of artificial intelligence. The article aims to identify the impact of artificial intelligence on the activity of centers in the Slovak market based on the examination of the current state of artificial intelligence in business centers.

1. Methods of Research

Local and international theoretical materials that have been indexed in the Web of Science or Scopus databases as well as the official website of Deloitte represented the basis for processing the introductory part of the article and defining the literature gap and selecting methods. Interviews with the directors of the specified centers served as another crucial source from which we gleaned crucial data for processing the empirical portion of the study. Interviews were placed in November 2022 and April 2023. Based on the agreement between the authors and the researched centers - in the article, we do not mention the names of the researched centers or the names of the persons who provided us with the information necessary for the processing of the article. We added information from the official websites of the firms under investigation or information from the official websites of the organizations in charge of creating an advantageous business climate in the Slovak Republic to the information obtained from the interviews. After being included in the case studies that were provided, the data obtained from the institutions' official websites was reviewed and authorized by each of the institutes that are the focus of this article's inquiry.

We processed the empirical portion of this research based on the aforementioned data and employed the qualitative case study approach based on three instances of chosen business centers in Slovakia. The primary topic of the activity was taken into consideration by the article's authors while selecting the centers. These are financial or IT centers in the instances we looked at, which constitute the majority of centers in

Slovakia in terms of the activity they do (BSCF, 2022). Additionally, we promoted variety by choosing centers with various numbers of employees and, to a lesser extent, based on the year of inception, in various regions of the nation. The case study method was also implemented by Marciniak (2020), who investigated the Impact of Industry 4.0 technologies, and Anagnoste (2017), who investigated Robotic Process Automation in the example of business centers. A case study, according to Yin (2014) is an empirical approach that explores current phenomena in real-life environment. A case study is a research strategy that combines many research methodologies, each with its approach to data collecting and analysis. Based on the foregoing, it is possible to infer that the case study is more than just a data-gathering technique or a design feature. It is a sophisticated research strategy. For the sake of digesting this post, we used the case study technique using three examples.

2. Results of the Research

The 65 business centers or shared service centres do business in Slovakia (to September 2022, when the last survey of centers in the country under review took place) (BSCF, 2022). These facilities range in size according to the number of people, the number of years they have been operating in the nation, the type of work they do, and other considerations. The main characteristics of the business centers that are the focus of the case studies in this section of the article are summarized in the table below.

Tab. 1: Basic information about selected business centres

	BC 1	**BC 2**	**BC 3**
Establishment	2002	2005	1992
Location of the centre	Bratislava	Bratislava, Košice	Bratislava, Košice, Banská Bystrica
Location of the MNC	Germany	Switzerland	USA
Main Activity	Financial services, IT services	Insurance services and IT services	Financial service, Sale support
Number of employees	More than 2 900	370	More than 1000

Source: processed by the authors

In the text that follows, we will examine the similarities and differences of these centers from the perspective of the introduction and use of artificial intelligence in their processes, in addition to the above-mentioned differences and similarities of the three business centers under examination, which can be defined as their basic attributes.

Business Center 1

Business center 1 in the Slovak Republic has been chronicling its history for more than 20 years. This facility might be referred to as a global business hub that provides a wide range of financial and information technology services. Additionally, they offer services for international marketing, sales, technical support, and business operations assistance. From the standpoint of a global corporation, or the parent company, the center in Bratislava plays a key role. All business is done at the MNC 1 group's headquarters in Bratislava. The most crucial activity in the financial services sector is financial planning, which employs around 250 people out of the 1,200 people working in the Bratislava center. The business center does not actively do research and development, but they are always searching for methods to enhance and streamline their processes. Using artificial

intelligence in its business processes is one approach to do this. Four years ago, the center actively began discussing artificial intelligence. (Anonymous Informant #1, 2023).

The automation of tasks that were previously undertaken mostly by humans is a crucial activity in this setting (Anonymous Informant #1, 2023). It may be inferred that these are financial services based on the main operations of this facility, which we have outlined in Table 1. The reporting process at business center 1 in Bratislava was significantly impacted by artificial intelligence. The task that was before handled by a human factor is now entirely automated. Automation of services provided within the scope of valuation is another illustration of the penetration of artificial intelligence in business center 1. But in this instance, it's crucial to emphasize that not all aspects of the appraisal process are carried out by artificial intelligence. In this procedure, a cap (maximum amount) is established for the machine's ability to independently estimate the price. It is vital to incorporate the human factor, which decides on bigger amounts, if this limit is exceeded (Anonymous Informant #1, 2023). Even though business center 1 has new information and has integrated it into business operations, the center still trusts its workers to handle more difficult tasks. The center and the whole company do not lay off workers who performed tasks now carried out by artificial intelligence, notwithstanding the deployment of robotization, automation, or artificial intelligence (for instance, in the form of GPT). He gives these workers the more difficult tasks to do to advance (Anonymous Informant #1, 2023).

Business Center 2

This center, along with the other five MNC 2‘s centers (located in Europe, North America, and South America), has unique characteristics in terms of competencies and conducted activities. Actuaries presently make up the majority of the center's staff in Slovakia and are based on the primary activity the center does, which is the supply of insurance and information-technology services. Employees who provide services in the area of information and communication technology make up the second segment. Additionally, the so-called back-office tasks control the information flow between the Bratislava center and partners in nations where the business has no representative offices (Anonymous Informant #2, 2023). According to the parent firm, the goal of a business center 2 in Bratislava is to establish a competence center that will offer services with better-added value. Given that everything the center performs is on behalf of the entire firm, it may be viewed as an organizational part of the business. While the administration of these teams is situated in different nations and has a direct connection to the Swiss headquarters, they also operate in the Bratislava business center (Anonymous Informant #2, 2023).

There isn't a specific division at business center 2 in Bratislava that is solely responsible for developing new technology, methods, or processes. Applications and technologies are being created to assist and increase the efficiency of tasks as demands on personnel grow. An illustration of this is the development of a parking spot or dining room reservation application that was later transferred to other locations within the MNC 2 group (Anonymous Informant #2, 2023). Despite all the efforts the center is making to increase the effectiveness of its operations, artificial intelligence is not being used in this situation. In this instance, not even the conventional chatbots utilized by other centers in the Slovak Republic are put into service. But business center 2 is currently looking into the advantages of adopting programs like Chat GPT. Robotics and artificial intelligence are the only focus of the team that the business formed in Estonia, which might be used by the business center 2 to increase the effectiveness of the tasks it completes (Anonymous Informant #2, 2023).

Business Center 3

The main driver behind MNC's 3 decision to open a center in Slovakia was the desire to reduce the administrative burden on the entire company. Here, phone centers were originally built; subsequently, the country formed a larger finance department. Over time, they performed increasingly difficult jobs at the Slovakian center, and business center 3's significance to the whole organization increased significantly. Presently, providing financial and accounting services is the third most important role of business centers in Slovakia. Additionally, it emphasizes the preparation of documents using standards-based procedures before sales, client communication, management of the majority of business center 3 applications, and purchasing, sales, and services in the human resources industry (Anonymous Informant #3, 2023).

Business center 3 is developing its artificial intelligence to simplify operations. This includes algorithms that can create graphics based on text descriptions in addition to GPT chat, which is a key tool in the competition. Another illustration is when a robot does the most repetitive (repetitive) duties. Such a task may be the mailing of an invoice, which was previously entirely carried out by a human component. Even in this instance, artificial intelligence is used to complete the task without the involvement of a person. Processes become automated as a result, which reduces the demand for the labor force, and the human aspect (Anonymous Informant #3, 2023). In addition to the aforementioned tasks, in the case of this business center, there is the potential for several other simpler tasks to be automated entirely using artificial intelligence, including the provision of employment confirmation and the transfer of employees between departments. Artificial intelligence is still not at the point where it can perform these tasks with the same degree of proficiency as a human employee. These services are generally in the area of human resources and may involve evaluating the workforce's productivity, makeup, and other factors (Anonymous Informant #3, 2023).

3. Discussion

The business centers that were the subject of research in the previous part of the article show different characteristics in the field of implementing artificial intelligence into their strategy and processes. Table 2 provides an overview of key information.

Tab. 2: Artificial intelligence in selected Business centres

Centre	Specifics from the point of view of artificial intelligence
BC 1	- Implementation of artificial intelligence within financial services (reporting and valuation); - Identification of the boundary between the possibilities of artificial intelligence and the capabilities of the human factor;
BC 2	- Competence center that provides services with higher added value; - They did not implement artificial intelligence related to the center's main activities; - Creation of an application for reserving parking spaces, and tables;
BC 3	- Building your own artificial intelligence Chat GPT, programs that can generate images based on text ; - Artificial intelligence replaces simple activities (billing); - They do not plan to replace human resources activities.

Source: processed by the authors

According to Table 2, there are certain distinctions between the Slovakian corporate hubs under consideration in terms of the use of artificial intelligence. One of the biggest ones is that, in one case, the business center hasn't yet incorporated artificial intelligence, which would be a part of the procedures associated with the center's main role. This center differs from the other two centers in that it provides services related to insurance. It is possible to see the integration of artificial intelligence into tasks that also serve as the centers' primary activity in the cases of business center 1 and business center 3. It is artificial intelligence in the financial services industry in both instances. They were able to use it to replace the human element in these centers with artificial intelligence. The expansion of artificial intelligence in financial services can also be confirmed by examining other authors. Artificial intelligence makes it easier for accountants to accelerate and simplify various data-related tasks – bookkeeping and transaction coding (Žager et al., 2020). Currently, identifying each accounting transaction from the perspective of financial statements and tax returns may be done with the help of artificial intelligence. Technology based on artificial intelligence even can change accounting organizations. Technology and automation have fueled innovation, efficiency enhancements, and cost savings in the accounting and finance profession throughout the past 50 years (Brands & Smith, 2016). When faced with increasingly challenging duties or, if necessary, more important decisions, they frequently turn to their workforce or their workers. In one instance, the business center under inspection even attempted to create its artificial intelligence. In the second case, artificial intelligence is used outside of its intended context.

It is crucial to monitor and anticipate any potential employment effects that the use of artificial intelligence in business centers may have in the future, given that the business service industry is Slovakia's second-largest employer. According to Forbes (2023), artificial intelligence will replace 30% of workers who don't deal with customers in the next five years. The division in charge of human resources is one of the weakest. As the first MNC, for instance, inside the firm that manages one of the largest business centers in Slovakia, they will digitize human paperwork. On the other hand, employees who come into contact with customers or work in the field of research and development do not have to worry about losing their jobs in the coming years.

Conclusion

Business centers can employ a variety of solutions to standardize and simplify operations, which they have identified as their primary objectives (Deloitte, 2021). Artificial intelligence is one of the instruments, and it produces new winners and losers in businesses, sectors, and maybe even nations (Daugherty et al., 2019). There isn't a single universal paradigm that would apply to all business centers when artificial intelligence is included. We found some commonalities and variances in the business center investigations. We discovered the next two models:

a) Artificial intelligence integration into business operations;
- These are business hubs that are predominantly devoted to activity in the financial services industry;
- Processes that might be defined as ordinary, less challenging operations were added to artificial intelligence.
- Their administration of artificial intelligence performance is more effective, quicker, cheaper, and error-free;
- We have also noted instances in which human intervention, in the form of employees, is required for more important decisions since artificial intelligence can only fully automate some tasks (or tasks up to a particular value).

b) The major commercial operations do not use artificial intelligence;
- This center's main business is the supply of insurance services, particularly those with higher added value;
- They don't even employ conventional methods used in other Slovakian centers;
- implementation of applications to make employee care-related tasks simpler.

Therefore, it can be claimed that artificial intelligence is used in places or in processes where the human aspect still plays a significant role while being less demanding and more serious. The use of artificial intelligence in business center procedures promotes sustainability and resilience when seen from the perspective of the human component. The workforce has been replaced by artificial intelligence because it is less harmful to the environment, does activities more quickly, effectively, and accurately, and uses less fuel, energy, and other resources. We take into account the fact that just three centers were chosen for our study. In the future, our research may be extended to other facilities whose primary function is to provide services in different fields, such as human resources, research and development, or customer service, among others. At the same time, the fact that we concentrated on places with a Slovak market is a constraint of our research. Our research can be broadened in the future to include a comparison of the state of artificial intelligence in Slovakian business districts with that of comparable districts elsewhere.

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Non-Fungible Tokens and the Threat of Wash Trading

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Abstract

Non-fungible tokens are a revolutionary concept that combines art, authenticity, proof of ownership and enables large-scale commerce. Their value does not come from their use in financial transactions, but from the fact that they are linked to specific assets, whether digital or real. Non-fungible tokens thus represent a new driving force in the areas of digital ownership. Owners of these tokens can earn huge sums at a time when the art market is on the verge of revolution. The non-fungible token market experienced enormous growth in 2021 with traders investing a huge amounts of billions of dollars worth of cryptocurrencies into digital collectibles. Since 2021 the transaction activity in this area cooled, although the number of active investors continued to grow in 2022. While the popularity of certain non-fungible token collectibles can fluctuate depending on market conditions, some traders may try to manipulate the prices of certain non-fungible tokens to make them appear more valuable. The token will be sold at a higher price to a new wallet, which is also controlled by the original owner. Transactions between wallet addresses are saved on a blockchain and can be accessed publicly, so that anyone can see when the token was traded and for how much it was sold. However, wallet addresses contain no identifying information making it very difficult to discern who is behind a transaction and whether two addresses are owned by the same individual. This process is called wash trading and its analysis is a goal of this contribution.

Key Words

Non-fungible tokens, crypto-assets, risks, wash trading

JEL Classification: G19, G23

Introduction

Non-fungible tokens (furthermore as „NFT“) are a specific type of intangible asset in the early stages of development, offering enormous potential but also uncertainty. Currently, there are not enough relevant materials and data for research that would support a higher number of professional studies. On the other hand, it is also the fact that NFTs include several areas that every researcher should be aware of. These are informatics, economics and finance, and law (Yue et al., 2021). There have been done many studies on various aspects of commonly known cryptocurrencies. In contrast, there are relatively few studies on NFTs despite the need of understanding the price dynamics of these assets for policy formulation and trading terms. Their value does not come from their use in financial transactions, but from the fact that they are linked to specific assets, whether digital or real (Dong et al., 2022). NFTs are a special class of cryptographic assets representing various intangible digital entities, artworks, images, videos, game items, special tweets and many others (Nadini et al., 2021). Their irreplaceability makes them a unique asset. NFT sales reached approximately 2.5 billion USD in the first quarters of 2021, while in 2020 the value was approximately 95 million USD (Howcroft, 2021). The NFT market

experienced significant growth in 2021. NFTs thus represent a potential driving force in areas of digital ownership. In 2022 there was a slight decrease to 24.7 billion USD according to the portal Dappradar.com which monitors NFTs situation.

This paper addresses the development of the fraudulent act of „wash trading" in the field of NFT transactions in the world. For that purpose were chosen two trading platforms OpenSea and LookRare which were analyzed concerning the number of fraudulent acts per total American dollar volume. The aim is to determine which of the used online platforms faces a more significant number of „wash trading" transactions, therefore is less secure for potential investors.

1. NFTs and wash trading

NFT products were first noticed at the end of 2017 (Wang et al., 2021), when the game CryptoKitties was founded on the Ethereum network, but the massive growth of the entire market was closely related to the emergence of the COVID-19 pandemic. Current studies found that cryptocurrency market liquidity rose significantly after the WHO identified a global pandemic (Corbet et al., 2022). During the pandemic, investors focused on cryptocurrency and NFT markets due to the significant drop in interest rates in the global market (Aharon & Demir, 2022). Because during the COVID-19 pandemic, frequent government restrictions were limiting the movement of people, digital investment was strengthened, resulting in the growth of the potential of digital assets such as NFTs. Along with the expanding trade of NFTs, there was also an expansion of professional research in this area. However, compared to the extensive research in the field of Bitcoin. Ethereum and other cryptocurrencies, scientific research has been relatively small (Bao & Roubaud, 2022). Aharon and Demir (2022) examined the interconnectedness of NFTs with cryptocurrencies, bond and stock markets and conventional currency using a time-varying vector autoregression framework. The findings revealed that NFTs acted as risk spillover absorbers and offered diversification benefits during the COVID-19 pandemic. The findings of (Karim et al., 2022) further confirmed the benefits of NFT diversification. They documented that NFTs offer risk-bearing potential to mitigate the risk of DeFis and conventional crypto-assets for risk-averse investors, as demonstrated in the Diebold-Yilmaz spillover analysis.

NFTs have high profit potential, but are on the riskier side due to the volatility that tokens can be subject to. Thanks to the fact that their correlation with other investment assets is very low, they become suitable means of diversifying an investment portfolio (Griffin, 2022). Another advantage is the low entry barriers to the digital platforms on which NFTs are traded (Corbet et al., 2022). The NFT market is vast with endless potential due to the uniqueness of individual NFT assets (Yue et al., 2021). The top three art markets, the US, Great China and the UK, continued to account for the majority of sales in 2021 with a combined share of 80%. There are no signs that interest in NFTs will abate in 2022. Many HNW investors are interested in purchasing NFT-based artworks even in the future (Boido & Aliano, 2023). On the other hand, there are also negatives associated with NFT ownership, such as the quality of ownership. Owning a token does not automatically mean that the individual also owns the object that the token represents. Tokens are also demanding energy consumption, they cannot always be purchased using any currency, and their uniqueness combined with irrationality can cause volatility of up to tens of percent (Johnson, 2021).

The main risks associated with NFTs are price volatility, risks of creating NFTs, energy consumption, pretending to be another identity, or the problem of decentralized finance and fraudulent actions in the form of "wash trading", which will be given further attention (Tariq & Sifat, 2022). Risk is the possibility that an event that is considered undesirable will occur with a certain probability. Risk is always derivable and derived from a specific threat. The degree of risk can be assessed based on a so-called risk analysis (Crovini, 2019). The biggest ethical problem for NFT buyers is the significant presence of fraud in the crypto world. One well-known form of fraud is called "wash trading", when an NFT creator or seller inflates the price of their NFT. The scammer creates a false appearance of demand by selling and buying NFTs from multiple fake accounts with prices increasing with each transaction. This is a process commonly found in financial markets. Tariq and Sifat (2022) subjected all NFT transactions on the Ethereum and Wax blockchains to a trio of statistical tests: testing whether these transactions obey Benford's law, testing the presence of clusters in transaction prices, and finally testing the presence of herding behavior based on the Pareto–Levy test. Each of these tests suggests that laundering is present at significant levels. In traditional markets (Khodabandehlou & Alireza Hashemi Golpayegani, 2022) this is an illegal act, but in the case of NFTs, the problem is in the little regulation and the non-definitive decision about which asset class exactly it belongs to. Furthermore, it has also been shown that money laundering exists in a non-negligible amount in cryptocurrency markets as well. Pennec et al. (2021) examined the Bitcoin, Ethereum, and Ripple blockchains and identified a significant number of suspicious "wash trading" transactions in each. Some traders try to make their NFT collections more attractive by trading these tokens with their wallets. The resulting "wash trading" transactions temporarily distort trading volumes and "fair" market prices. Due to the nature of blockchains and the fact that users can create new wallets at will, wash trading in NFT markets can be easily done (Serneels, 2023).

2. Methods of Research

The importance of the role of "wash trading" will be analyzed on the example of two online platforms used for NFT trading. These are the OpenSea and LooksRare portals. Within these two portals, the volume and significance of "wash trading" transactions that took place in the period from January 3, 2022 to May 1, 2023 will be evaluated. The necessary data was obtained as secondary data from the dune.com portal, which monitors the development of transactions on all platforms used for trading with NFTs. From this data, transactions marked as "wash trading" for the given online platform were generated and recorded. According to the dune.com portal, "wash trading" transactions can be generated based on four monitored parameters, namely by checking whether the buyer was not a seller at the same time, whether there was resale back and forth between two different crypto wallets, whether the same address did not register 3 or more purchases of the same NFT and the last parameter tracked for every buyer and seller who was the first to fund a wallet using Ethereum. The obtained data were subjected to a time series investigation and descriptive statistical methods. The aim was to answer the following research questions.

RQ1: *What was the trend of fraudulent transactions, particularly „wash trade“, in 2022?*

RQ2: *Which of the analysed trading platforms was exposed to the higher level of fraud rate relative to the number of total transactions?*

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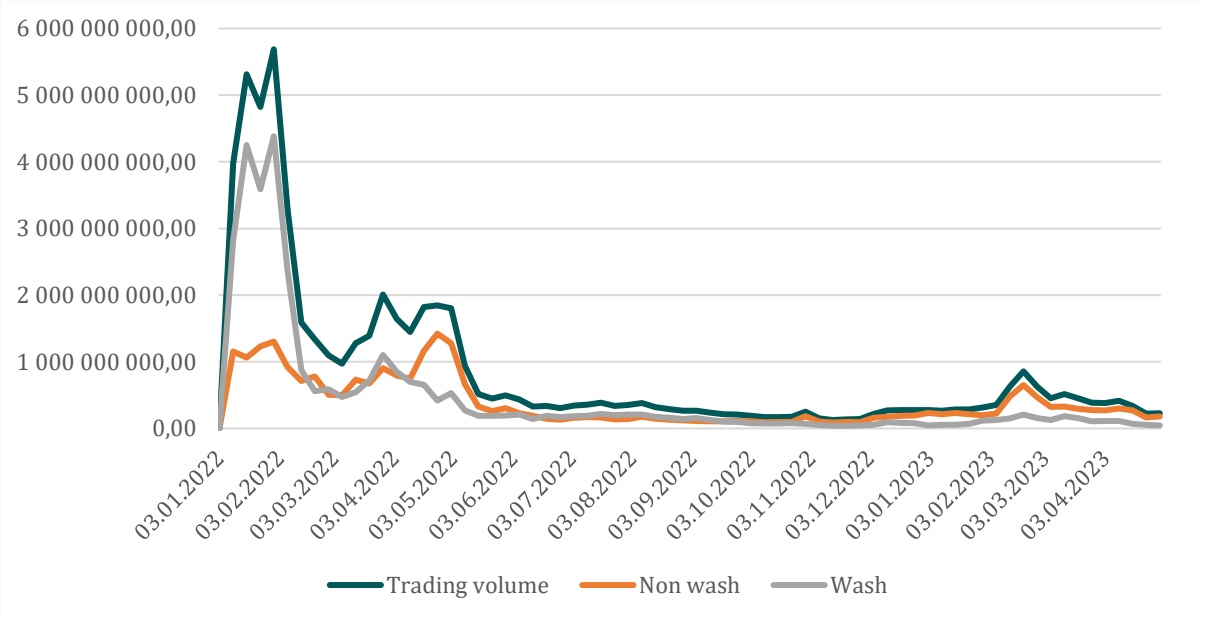
RQ3: *To what extent was the LooksRare portal affected by „wash trade" in 2022 and in the period 01-05/2023?*

3. Results of the Research

Figure 1 shows the total trading volume of NFTs in the period from 03. 01. 2022 to 01. 05. 2023 adjusted for „wash trading" transactions there were generated from the monitoring portal dune.com.

Fig. 1: Total NFT trading volume and „wash trading" transaction globally 01/2022-05/2023



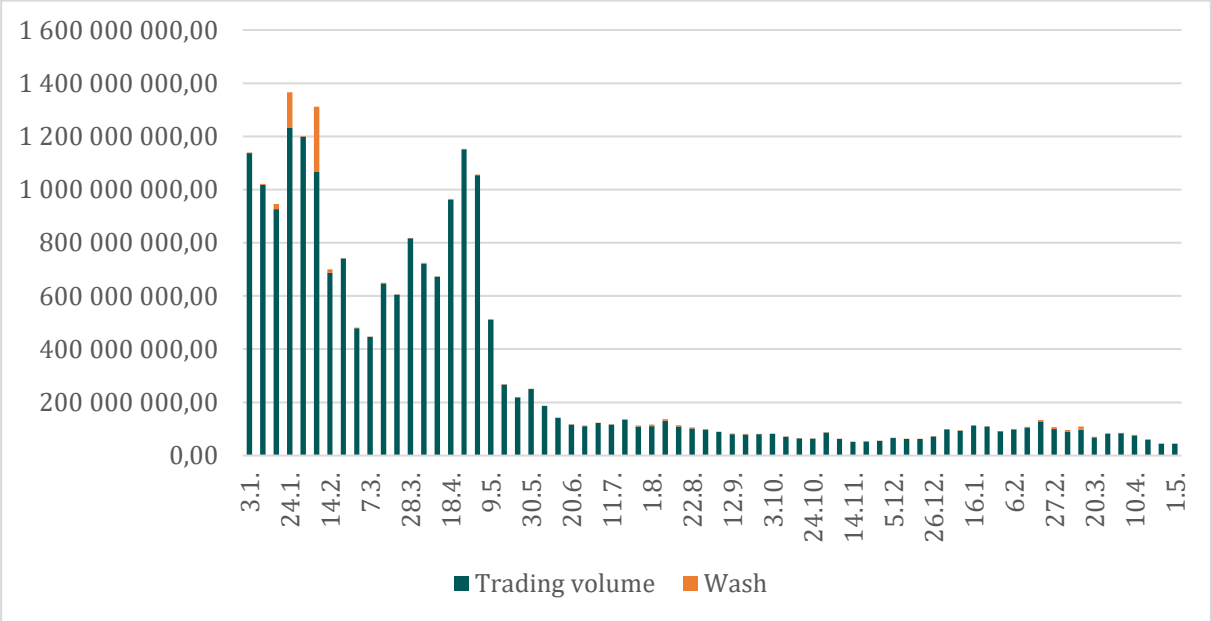
Source: authors' work, data from (Dune.com, 2023)

To adress RQ1 it is necessary to look at Figure 1. There can be seen of decreasing trend in trading volume of NFTs since the large boom in 2021. There is even a correlation between the total trading volume and „wash trading" transactions. From Figure 1 it is possible to see that the development of the „wash trading" curve copies the development of the curve of the total volume of NFT trading, therefore as the number of NFT transactions increases, so does the number of fraudulent activities. On 03. 01. 2022 the data show that the total trading volume of NFT was about 3,942,647 USD and a number of „wash trading" transactions related to this date was approximately 2,785,017 USD. The peak has been reached on 31. 01. 2022 when the total trading volume was 5,687,643,994 USD and a number of „wash trading" transactions was about 4,383,628,770 USD. So about 77 % of the global trading volume of NFTs was a fraudulent act due to the weak security systems and growing fondness for this act. Since that, the number of NFT trading volumes started to decrease and so did the number of „wash trading" transactions. Having look to May 1st, 2023 the trading volume experienced an amount of approximately 225,826,506 USD and related „wash trading" volume was about 47,655,142 USD globally among all available NFT platforms. The trend of fraudulent acts was decreasing throughout the year due to the global decrease of NFT trading and better awareness and security systems.

Having looked to the volume of „wash trading" on two specified platforms for NFTs – OpenSea and LooksRare portal – it is possible to see whether the transactions on these

platforms were made mainly as fraudulent acts or not. Figure 2 is showing the detail of transactions made via the OpenSea portal. From this figure is clear that the volume of fraudulent transactions was much lower than the total volume of NFTs traded via OpenSea. OpenSea portal is the largest trading platform for NFTs in the world, therefore it is offering a better level of security and reliability than other accessible platforms. The peak of „wash trading" transactions can be observed on 07. 02. 2022 when its level reached about 245,657,289 USD. Then the trend follows the trend of total NFT trading volume in the world which was shown in Figure 1.

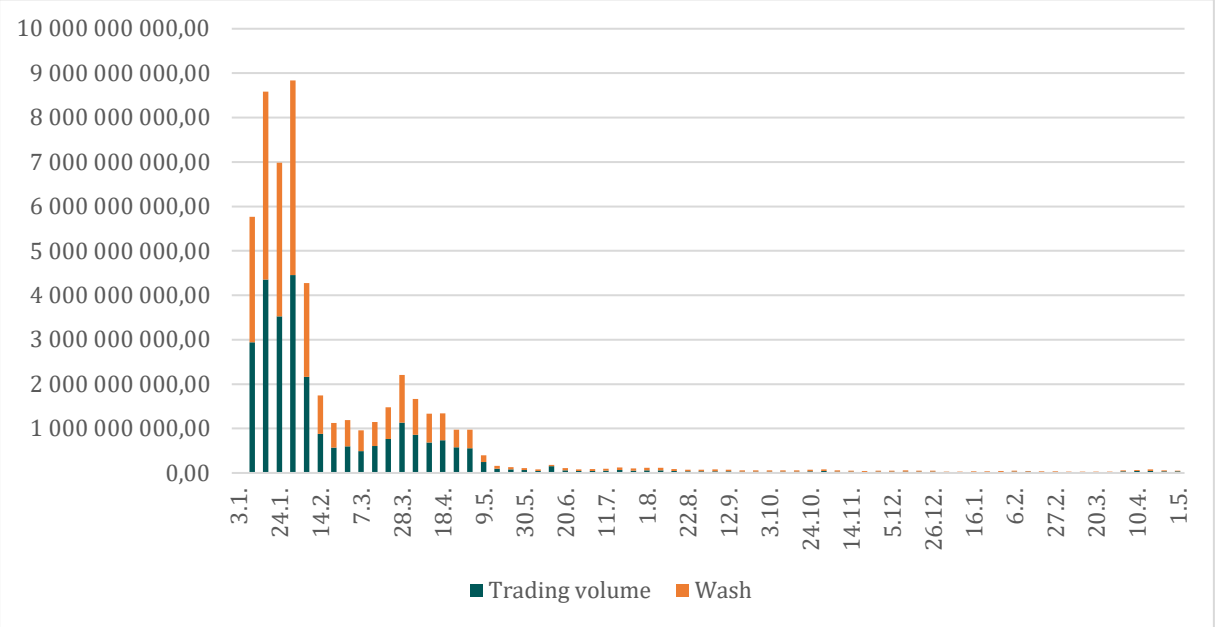
Fig. 2: Trading volume and „wash trading" transaction on OpenSea platform 01/2022-05/2023



Source: authors' work, data from (Dune.com, 2023)

On the other hand, the portal LooksRare which was started in 2021 captures a totally different situation. Competing with an OpenSea portal could be very difficult for a new starting platform. The data demonstrate the fact that more than 90 % of transactions made via LooksRare in the period from 10. 01. 2022 to 11. 04. 2022 were „wash trade". For instance on 31. 01. 2022 the level of „wash trading" transactions was 4,379,978,340 USD out of 4,455,093,739 USD of the total trading volume. In 2022 the NFT market became hyper-competitive with many new platforms launching constantly. For all these subjects to overcome this competition, many have relied on the trading volume of a platform as a critical metric to evaluate its health and traction and as a proxy to compare the usage of different markets. At that time online platforms started enticing traders with token rewards. LooksRare portal was the one that made token rewards ($LOOKS, X2Y2, $X2Y2) as a central point of their strategy. Investors realized the great potential of high profitable trading strategy of these programs and started the „wash trade" of these tokens. Looking before 2022, „wash trades" were rarely more than 10 % of the total volume but with the year 2022 number of „wash trade" transactions increased enormously. The trend of a high volume of fraudulent transactions continued until May 2022, when it started decreasing. On 01. 05. 2023 captured about 49 % „wash trade" transactions out of 34,601,334 USD total volume via the LooksRare portal. Therefore it is clear that the LooksRare portal is exposed to the higher level of fraud rate relative to the number of total transactions, answering RQ2.

Fig. 3: Trading volume and „wash trading“ transaction on LooksRare platform 01/2022-05/2023



Source: authors' work, data from (Dune.com, 2023)

Online platform like OpenSea are „wash trades“ just an insignificant contributor to their volume and transaction counts. On the other hand platforms like LooksRare are very dependent on „wash trades“ for their volume. LooksRare can be called as a „wash trade central“ with a large volume driven by the fraudulent transactions. From Figure 3 it is feasible to asnwer RQ3. In 2022 LooksRare portal was affected by „wash trade“ transactions by 84,24 % on average, so about 84,24 % were recorded and traded as fraudulent. On the contrary, in the period from January to May 1, 2023 the portal was affected „just“ by 66,32 % which can be considered as a favorable trend.

Tab. 1: Basic statistic characteristics of „wash trade“ transactions on selected NFT portals from 01/2022 to 05/2023 [in total USD]

Indicator	Standard deviation	Mean	Median
Aggregate market	893 878 269.98	456 774 539.99	157 056 872.00
OpenSea	32 643 954.76	7 684 039.50	1 569 720.50
LooksRare	902 334 992.90	376 301 706.47	33 923 267.50

Source: authors' calculations

From the descriptive statistic characteristics in Tab. 1 is it clear that on average, portal LooksRare is much more exposed to „wash trade“ practices, therefore has a higher fraud rate relative to the number of total transactions than the OpenSea portal. LooksRare portal is one of the most affected portals by fraudulent acts, which corresponds to the calculated mean. Also, the calculated median of „wash trade“ transactions on LooksRare is more than 21,6times higher than the more reliable OpenSea, and so is the high level of deviation from the mean which was mainly due to the extreme values in the first quarter of 2022 when the boom of „wash trade“ began.

4. Discussion

As it was analyzed in sectiones above the trend of „wash trade“ transactions on NFT markets started on an enormously high level at the beginning of 2022 as confirmed by Dune´s statistics or CoinGecko, Footprint Analytics following the period from January 2022 to February 2023 (Qian, 2023). The analytics shows a similar to the one constructed in Fig. 3. The highest peak was recorded in the first quarter of 2022 followed by a significant decline that continued until the end of the year. One of the largest representations of „wash trade“ transactions was detected at the LooksRare portal. LooksRare accounted for over 90 % of NFT „wash trades“ from January to April 2022 based on the analyzed dataset. According to Williams (2022) only 25 % of total trades via LooksRare are washes, even though this portal depends on wash trading with about 98 % of its respective volume. This view might be due to a different breakdown of fraudulent transactions using parameters other than those used here in this paper. „Wash trade“ transactions were generated based on four parameters very similar to those used by Serneels (2023), who described three of them, the last one was added by the portal dune.com which was monitoring for every buyer and seller who was the first to fund a wallet using Ethereum. The slight difference between the result might be caused by the fourth monitored parameters and by the number of measured NFT marketplaces. The results of the contribution were based on the secondary data from portal dune.com which monitors up to 25 NFT marketplaces. Bonifazi et al. (2023) also examined „wash trading“ trade on NFTs and developed machine learning algorithms for prediction of „wash trades“, their analysis also confirmes the trend of this fraudulent act. For further investigation, it might be helpful and useful to develop an algorithm monitoring NFT „wash trades“ in the Czech Republic even though the total volume of NFT trade is low and there is a lack of statistics and studies dealing with the devolvement of NFT sales volume.

Conclusion

NFTs are quickly evolving and maturing trend. With the start of 2022 NFT Marketplace became more competitive than ever before. The priority became the capturing of trade volume market share. Well-prepared and constructed schemes as an incentive to usage quickly emerged as a way to pull ahead in the race to attract the largest trade volume and become the most successful marketplace. As a by-product of this race, there has been the rise of „wash trading“ as a fraudulent act, which is still in a gray area of the law and distorts key metrics used by analysts to measure the usage and performance of NFT marketplaces. To prevent this distortion analysts started using methods to filter and classify each transaction as organic or „wash trade“, like the four factors mentioned in part 2. The aim of the paper was to determine which of the used online platforms faces a more significant number of „wash trading“ transactions, therefore is less secure for potential investors. All NFT online platforms are to some degree affected by „wash trade“, but by far one of the worst affected is the LooksRare portal, about 84,24 % transactions in 2022 were fraudulent. Nowadays there is not anything currently stopping people from „wash trading“ at all aside from the speculation that legal regulations are coming. If that is the case, they may succeed in reducing the amount of fraudulent transactions. The problem is still the fact that not all possible jurisdictions will be applied as well as many people will either ignore these restrictions or find some way to evade them. However, it is expected to see an ongoing evolution of methods that recognize „wash trade“ transactions to maintain futureproof of NFT marketplaces.

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Options for Measuring Legal and Financial Literacy

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Abstract
The definition of financial and legal literacy is still evolving. In today's uncertain times, it is particularly important to define and understand financial and legal literacy correctly. Their focus is seemingly different but they have much in common. Lack of legal literacy can affect financial behaviour and contribute to increasing financial insecurity. According to research, respondents with different levels of legal literacy exhibit different legal behaviours. A properly established measurement of these two areas is the basis for their awareness and proper use in future decision-making. However, we need to know whether and which methods can be used to examine the level of financial and legal literacy in society, and for what purpose they will be composed. The aim is to help quantitative research to find a method of investigation such that its measures assess the level of both financial and legal literacy. The methods are presented to highlight the possible shortcomings and limitations of these methods, and the interpretation of the indicators and results.

Key Words
case study, experiment, financial literacy, legal literacy, questionnaire

JEL Classification: G53, K10

Introduction

Financial and legal literacy plays an important role in our daily lives. Financial literacy is not only limited to finance and financial products, but also includes financial law and related legal literacy. Both are covered by the broader concept of economic literacy. In addition to financial literacy, this includes the ability of citizens to secure their income, to anticipate the consequences of their decisions such as the impact on current and future income and expenditure, and to navigate the job market, among many others. (Ministry of Finance of the Czech Republic, 2023). Ševčík (2014) distinguishes sub-areas within economic literacy: money literacy, price literacy, budget literacy. Johnson and Sherraden (2007) define financial literacy as the ability to practically apply financial awareness. Financial literacy is not only about financial awareness but also about the skills to apply this knowledge in practice. Lusardi and Mitchell (2014) Promote financial education and define its positive outcomes. On the other hand, Willis (2008) believes that the costs of financial education for the population outweigh its potential positive effects. Fernandes et al. (2014) assessed studies that approached financial literacy together with financial education support or measured financial literacy using well-known psychometric scales. Thus, financial literacy is not just about analysing an individual's income and expenditure it is a comprehensive view of the financial situation and structure of individuals. Legal

literacy is defined by Urban et al. (2015) as the ability to understand words used in a legal context, draw appropriate inferences from them, and then act appropriately on those inferences, based on the Canadian Bar Association's definition. The definition expresses not only knowledge and awareness of the law, but also includes the important area of acting in accordance with the law, or knowing how to exercise and enforce one's rights. Legal skill is not automatic; it does not mean that law students will have better legal skills than students in business or other faculties. For legal skill means not only knowing and mastering the law, but also being able to evaluate situations and apply those skills in practice. And that is what needs to be learned. Mulyani (2019) In her article, she reflects on the importance of developing soft skills in law students. Teachers' knowledge and roles in teaching legal literacy are also significant (Friedel and Krupova, 2015).

Legal and financial literacy go hand in hand, they have a lot in common. Lack of legal literacy can affect financial behaviour and contribute to increased financial insecurity. In order to develop and teach financial and legal literacy in the right direction, it is important to understand it and to be able to check that the practices in place (e.g. teaching practices) are set up correctly. The question then is how to measure financial and legal literacy, if at all. The aim of this paper is to identify methods that can determine the level of financial and legal literacy, to evaluate these methods, and to highlight the possible shortcomings and limitations of these methods.

1. Methods of Research

In order to achieve the stated goal, the methods of scientific work based on induction, deduction, analysis and synthesis were used. The methods used in the assessment of legal and financial literacy were identified based on a search of sources. Financial and legal literacy do not have any specific set threshold at which a person is considered literate or not. We can conclude that in a way every person is legally and financially literate. But what we are interested in is the objective measure/level of perceived literacy and whether it can be measured or assessed. Possible methods identified by the research were: analysis or comparison of available materials and statistical data, questionnaire survey, experiment, case study, game testing, cluster analysis, decision trees, Conjoint analysis, ANOVA.

2. Results of the Research

Analysis of publicly available materials and statistical data is used to map the legal and financial literacy of the public, which is then evaluated in context and relationships. This is a very important element in the assessment of both literacies. The environment, persons, economic, political and socio-economic aspects have an impact on the formation of overall literacy. This is supported by the study of Drever et al. (2015)who explain the influence of the environment, and parents in particular, on the development of financial skills at different stages of a child's life. Studying available documents can also provide suggestive data for further disaggregation and exploration of literacy. Urban et al. (2015) map the legal literacy of young people by studying publicly available documents, specifically studies by the Ministry of the Interior, studies of related knowledge and skills in reading or mathematics, high school graduation results, young people's political participation, voter turnout, and add strategic materials from ministries or organizations.

The measurement of financial literacy is addressed by a number of national and international institutions and the results of studies (Messy and Atkinson, 2012) offer national and international comparisons. Messy and Atkinson (2012) focus their analyses on differences in financial knowledge, behaviour and attitudes between and within countries according to socio-demographic data. The 2012 PISA International Survey assessed the financial literacy of 15-year-olds. The format for testing was chosen as a test, with test questions grouped into thematic units (mathematical, literacy and financial literacy). As part of the overall assessment, test scores on financial literacy were then put in relation to reading and mathematical literacy and other variables such as the Index of Economic, Social and Cultural Status. It defines, for example, how supportive the home environment is for individuals; the more supportive the home environment is, the better the financial literacy results can be achieved. (Řezáčová, Palečková and Tomášek, 2014) The so-called PISA rating, which was most recently conducted in the first half of 2018, represents the ability to use skills and knowledge in managing one's financial resources to achieve maximum well-being. Based on data available from PISA 2015 measurements in selected OECD countries, the results are interpreted by Mihalcova et al. (2020) using cluster analysis. For financial literacy, a number of tests can be found that are based on different principles and test knowledge, skills, e.g. The "Test of Financial Literacy" (TFL) (Walstad and Rebeck, 2017) prepared for high school students. The authors Förster et al. (2017) then tested the American Test of Financial Literacy (TFL) for use in Germany (TFL-G). Ministry of Finance of the Czech Republic (Ministry of Finance of the Czech Republic, 2023) has prepared two online tests on its website focusing on financial knowledge and financial responsibility in which citizens can test their level of financial literacy. The evaluation will show how they compare to others who have taken the test.

The most common method used to investigate financial and legal literacy is a **questionnaire** survey (Krupová, 2017; Ministry of Finance of the Czech Republic, 2023). It is one of the most commonly used research methods in other fields as well. It can serve not only for initial new analysis and surveys, but also as a feedback loop if we have already implemented a measure. A questionnaire survey can take countless forms and modifications. For example, it can be: structured, semi-structured or unstructured. A questionnaire survey can also contain open or closed questions, which the questionnaire author can combine or use only one type. Its versatility allows us to use it to link financial and legal literacy. The questionnaire survey provides an overview of the answers to each question, allowing us to analyse each question separately and the questionnaire as a whole. The questionnaire survey provides quantitative results. It aims to obtain a relatively small amount of information from a large number of respondents. It involves a precise process of hypothesis formulation, detailed observation, data collection, data analysis and acceptance or rejection of the hypothesis. The difference between the qualitative and quantitative methods is that qualitative research focuses on explaining human behaviour using cause and effect analysis. Krupova (2017) used a questionnaire survey method to investigate the relationship between legal literacy (or orientation to law) and law teaching at university. Csikósová and Antošová (2014) analysed the state of financial education in Slovakia and the financial literacy of university students by questionnaire survey. The link between legal literacy and higher education is also discussed in Friedel and Krupová (2015), where they point to the collaboration of all levels of study and the importance of the teacher/academic in social science literacy. Gealfow, J. A. in Nekvasilova (2021) mentions that much research on legal literacy tests encyclopedic knowledge and says little about actual legal awareness.

Financial literacy can be taught and **tested through games**. Platz and Jüttler (2022) explain the importance and effectiveness of games (board and digital) in learning financial literacy. In the Czech Republic, the board game Financial Freedom is recommended for teaching in schools. The US version of Financial Freedom is played in schools in Texas, New York and is used in Singapore to increase children's financial literacy (Financial Freedom, 2023). Other board and online games are available on the market according to the age group of the students. Games specifically targeting legal literacy are not common. There are quiz-type games on the market focusing on history, culture, nature, science, technology, geography and other areas (e.g. Ten, Czech Republic Q&A), which also include questions on civics and basic law and are more designed to develop general knowledge.

In marketing, we can also encounter the application of **cluster analysis**, which is most often used to identify and define individual customer segments. However, cluster analysis has been developed in various specialized disciplines, such as biology, medicine, geography, computer science or psychology. In economics, the results can therefore be used not only in marketing to divide customers into market segments, but also, for example, for market segmentation, for business management, for identifying target markets or new product development, etc. The essence of cluster analysis is the classification of objects into groups, called clusters. The aim of clustering is to make the objects in the same cluster as similar as possible and objects from different clusters little or not similar at all. These are objects for which a larger number of features are measured. Thus, which can be applied also to the investigation of financial and legal literacy, which are characterized, measured and evaluated on the basis of several features. As an example of the use of cluster analysis in the field of financial literacy, we can mention the research conducted by Mihalca, et al. (2020) where they analysed the financial literacy of 15-year-old students in order to perform a cluster analysis based on data available from PISA 2015 measurements in selected OECD countries. Furthermore, Bahovec, et al. (2015) uses cluster analysis to categorize financial literacy and to determine whether respondents' financial literacy differs by gender and disposable income**.**

Decision trees can be used in dynamic decision making. It is a method that allows to determine the optimal strategy also in multi-stage decision making (Rivera-Lopez et al., 2021). This method is also easy to graphically display. The graphical display capability makes it easier to drill down into the results. The tree, bounded by rules, contains nodes and edges. For each node, the courses of action corresponding to the edges cover all possibilities and are disjunctive with respect to each other, that is, they have no common element. The formation of decision trees has its own rules and there are various algorithms that help in forming a proper and adequate decision tree so that its results meet the necessary requirements. Some of these algorithms include CART which is also in SPSS as well as CHAID and QUEST. For the assessment of legal and financial literacy, by selecting an appropriate algorithm, we can examine the dependencies of each variable that may affect the awareness of the selected literacy areas. We can apply decision trees to the results of cluster analysis. With cluster analysis, correct interpretation of the results is crucial, which is not always entirely easy. With the structure of decision trees, we can better interpret the results of cluster analysis.

Other methods that can be used to investigate financial and legal literacy are **experiments, case studies.** Experiment is a quantitative method and on the other hand case study is considered as one of the qualitative methods. **A case study** is one of the qualitative research methods that allows to explore a selected phenomenon in depth. This method can be used to examine individuals and their unique awareness of financial or

legal literacy and then draw overall conclusions to help generalize the results of individuals. The case study also has the advantage of its ability to educate, aided by an appropriately constructed example and subsequent interpretation of the correct results. The case study offers many possibilities, but in order for the results to be valid certain procedures should be followed. When constructing a case study, it is important to go through all the phases step by step and not to skip any. These phases range from the plan, the project through preparation for data collection to subsequent data collection, its evaluation to help analysis. The results after analysis can be published and also commented. One of the possibilities of using the case study is the "problem based learning" approach, thanks to this approach it is possible to use the case study as an evaluation tool but also as an educational tool. The method is often used in medicine but also in economics, law, psychology or criminology. This list of different fields of application confirms the versatility of this method.

The method of experimentation allows to simulate different situations in the legal and financial field and to draw results from them. Thanks to the experiment we can investigate different relationships between variables. This distinguishes it from regression and correlation analysis, as these cannot specify causal relationships between variables. To investigate possible causality, conditions must be met to ensure validity. Disman (2021) however, points out the problems with the interpretation of the results. The experiment can also be supplemented, for example, by in-depth interviews with individual users of the experiment, and through this the added value of helping feedback can also be created, and interesting suggestions for improving or moving the whole experiment forward can emerge. Validation and feedback can also take place with the help of a suitably designed questionnaire survey where participants complete certain questions. This can also provide suggestions for improvement.

Another method that could be used to examine financial and legal literacy is **Conjoint Analysis**. This is an advanced method that allows to find out what is most important to customers in a selected product. It helps to monitor customer decision-making by using individual attributes. Financial and legal literacy is also related to the financial and legal products that are on the market and therefore it would be possible to evaluate these products using this method and also define their level in the activities under study.

ANOVA otherwise known as analysis of variance. This method can be used to compare multiple means and is also useful for assessing what factors influence the variability. ANOVA evaluates the relationships between the variability of samples. In order to use this analysis, the following prerequisites must be met. The sample must satisfy independence of measurement, normality, and also at least approximate homogeneity of variances. For example, we can use the F-test or t-test to evaluate this. The benefit of this analysis is that it is able to show the interaction between the individual factors on the dependent variable. We see the ANOVA method as suitable to be combined with other methods.

However, there are other applications of the methods to test legal and financial literacy or to interperetate the data collected. For example, Bugakova et al. (2019) chose a different alternative for the assessment, developing a ratio of legal literacy criteria and assigning coefficients to the selected criteria, whose values then determine legal literacy as a whole. They tested the given system for the development of students' legal environmental literacy in the environment of a technical university.

3. Discussion

Both descriptive statistics and analytical tools can be used to measure financial and legal literacy, which also explain the nature or cause of a particular phenomenon. Questionnaire surveys are one of the most widely used in assessing financial and legal literacy. But it also has many pitfalls. One of them is the appropriate selection of respondents and the return rate of questionnaires. If the wrong sample of respondents is selected, the information may be skewed, incomplete or overwhelmed. When designing a questionnaire survey, it is important to keep in mind what information the questionnaire seeks to elicit. This is based on the definition of the problem and the objectives of the research. The output is a list of basic questions that are necessary and appropriate for the research. Redundant data means financial and time loss. Therefore, maximum effort must be devoted to the objectives, the research questions and consequently the design of a suitable questionnaire. Gealfow in Nekvasil's article (2021) mentions that many legal literacy surveys test encyclopedic knowledge and say little about actual legal awareness. A combination of quantitative and qualitative research is also an appropriate compromise. However, a questionnaire survey may be a suitable method for obtaining input data that can be used in other methods.

Less used methods are experiments and case studies, these methods are more time-consuming both to prepare and to carry out. However, the advantage may be that they can be used not only as an evaluation tool but also as an educational tool. Some methods, such as cluster analysis, exhibit considerable difficulty in interpreting the results. Other methods, such as decision trees, can also be used to interpret the results of cluster analysis. Comprehensive results can be achieved by combining the results of questionnaire surveys, case studies or experiments related to different indices. The authors consider it important to combine the methods with the analysis of available materials and statistical data. This leads to a more holistic explanation of the results in relation to the economic environment, the political environment, and socio-economic aspects.

Conclusion

While the concepts of financial and legal literacy are closely related, they should not be confused. Both concepts are different in nature, but their measurements ultimately pursue the same goal, namely the respondent's level of knowledge in a given area. In the opinion of the authors of this article, a high level of financial and legal literacy in society is crucial for its dynamic development. It is no different in the case of determining its level. The assessment of the level of knowledge will always be subjective. Also for the fact that it is not possible to simply determine the threshold when the level is already sufficient. It cannot simply be said that whoever answers the questions best has the highest level of literacy of all. It will depend very much on the sample of respondents, the questions asked and, last but not least, whether the respondent has already answered similar questions. The most widely used method of assessing the level of financial and legal literacy is a questionnaire survey. Firstly, it is the easiest method in terms of dissemination among respondents, and it is possible to compare the level of financial and legal literacy not only between different groups of respondents but also across time using the same sample of questions. However, the authors see as problematic the fact that, if the form of the survey questions is incorrectly chosen, they often test only academic knowledge, while the actual application of financial and legal knowledge in practice may be at a completely different level, both higher and lower. Some respondents may not be able to name individual

concepts, but they know how to behave in a given situation because they use positive role models from school, family, friends, etc. Conversely, someone may have academic knowledge of financial and legal literacy but not be able to use it in practice. Thus, even the results of a questionnaire survey obtained in this way may end up being biased. However, this does not detract from their weight, since their evaluation can be carried out with this in mind. Moreover, questionnaires cannot be taken away from the fact that, given their form, they have the potential to have the greatest impact.

If we were to choose a different method of measuring the level of financial and legal literacy, we would encounter limitations in the form of financial and time demands and the associated limited number of results obtained, where the results may not be sufficiently indicative of the overall level of literacy in a given society. According to the authors, it is also desirable to determine the level of literacy in a specific group (e.g. by age, region or even by education) in order to develop specific methods and training programmes for a given target group.

The presented methods may not only be used to determine the level of legal and financial literacy, but can be applied to measure literacy in a specific area. Considering the theme of the conference, for example, we can mention the survey of environmental literacy (Bugakova, Pelmenev and Titova, 2019) or legal literacy focusing on fraudulent actions in society.

In this article, we have focused exclusively on identifying methods and their interrelationships in examining legal and financial literacy. Each of these methods deserves a thorough research, description, analysis, and evaluation of the use of that method in assessing literacy (the authors of this article will present the results in subsequent articles).

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Values Endorsed by Top Responsible Large Czech Companies – Existent and Inconsistent?

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Abstract

The sustainability command is embraced by businesses in the 21st century and is projected in their corporate social responsibility (CSR). The need of the employment of a multi-stakeholder model leads to a focus on common principles and priorities, i.e. creating shared values (CSV). The EU, with EU law, supports it, while various policies and organization reward it, such as the Czech organization Business pro Společnost, which, based on its synthetic index, selects the Czech TOP 25 most responsible companies. These companies have different countries of origins and operate in diverse industries, but they all are pro-sustainability. The question is whether they endorse the expected cultural, legal and social values (H1) and, if yes, whether there is a consistency and/or patterns (H2). Based on a sustainability, CSR and CSV review, a set of cultural, legal and social values are identified in order to be used in a case study. A pool of 36 large Czech companies from these TOP 25 in 2018-2022 is examined based on their BpS synthetic index, their country of origin´s Hofstede LTO and IDV and their advancement of internal reactive legal and social values (solidarity, respect) and external proactive legal and social values (equality, no waste) via their domains. These four legal and social values are ranked by an independent panel using a modified Likert scale and a manual Delphi approach. The yielded results are juxtaposed via a chart to allow pioneering propositions about the existence (H1) and inconsistency (H2) of values endorsed by top responsible large Czech companies.

Key Words

Creating Shared Values (CSV), Corporate Social Responsibility (CSR), European Union (EU), sustainability.

JEL Classification: D22, L21, M14, Q56

Introduction

The concept of sustainability has millennial roots going back to the Bible and Roman law and is deeply embedded in the current global society (MacGregor Pelikánová et al., 2021a). Since the 18th century it is perceived as an outcome of German economic pragmatism, *Nachhaltigkeit*, while, since the 20th century, it is expanded as well in the social and environmental dimension, see the UN Universal Declaration of Human Rights from 1948 and the UN Brundtland Report from 1987 (MacGregor et al., 2020). From the linguistic point , the meaning of „sustainability" moved from „bearabel" in the 17th century over to "defensible, capable of being upheld" in the 19th century then to "capable of being continued at a certain level" in the 20th century. Arguably, its current meaning remains ambiguous (White, 2013) and it is perhaps becoming a cliché or even turning into an almost empty word. Nevertheless, the International law and the UN Agenda 2030 with its 17 Sustainable Development Goals (SDGs) provides a clear visualization of the modern concept of sustainability by referring to three pillars (economic, environmental and social) and/or a diagram with three overlapping circles matching these three pillars with

three intersections (bearable, equitable, viable) and one super intersection (sustainable). Regarless of the selected visualization, the feasibility of the respect of the sustainability and of meeting these 17 SDGs is dependent upon the involvement and commitment of all stakeholders, i.e. sustainability cannot be truly effective and efficient without the endorsement by businesses. Especially larger businesses taking the corporate form, should be ordered or motivated or induced by national law or otherwise to behave in a manner responsible vis-à-vis the entire society.

The corporate form of business means that a corporation or company is established and operates as a legally distinct entity, has its own legal (juridical) personality, is subject of law, has a legal capacity and so can acquire rights and duties and dispose with them based on its own will. Therefore, the corporation is a legal fiction, aka an artificial and intangible being existing only in the contemplation of a (national) law (Burkhardt, 1923). It can have an eternal life and its creators, partners, associates and/or shareholders are neither its owners nor its creators of will nor decision makers nor its co-debtors or co-creditors. The corporate form has roots going back into antiquity, see the *Commentaries* of Gaius and *Digesta Seu Pandectae* regarding the formation of private corporations (Burkhardt, 1929). By the end of the 19th century it became clear that markets were becoming concentrated and that the *laissez-faire* approach had disastrous consequences for the society. The academic silence about it ended via Howard R. Bowen, with his influential book, Social Responsibilities of the Businessman, in 1953. He clearly pointed out that the largest US businesses, typically taking the corporate form, are centers of power and decision making and affecting the lives of all, i.e. the entire society (Carroll, 2016). This creates the current dichotomy regarding what is the primary responsibility of a corporation – returning the value to shareholders as described by Milton Friedman or to engage with Corporate Social Responsibility ("CSR") (Porter & Kramer, 2006), which reflects all three pillars of sustainability (MacGregor Pelikánová et al., 2021a). This dichotomy is magnified during crises (MacGregor Pelikánová et al., 2021b), which inherently bring both challenges and opportunities (D´Adamo & Lupi, 2021).

In order to boost the CSR, the EU updated, through the Non-Financial Reporting Directive 2014/95/EU, the Accounting Directive 2013/34/EU, while imposing upon certain large public interest companies that they provide non-financial reporting covering several categories of information (environmental, employees, social/community, human rights, no bribery) (MacGregor Pelikánová & MacGregor, 2020). In addition, the EU recently added Regulation (EU) 2019/2088 on sustainability related disclosures in the financial services sector ("SFDR"), a pro-Green Deal Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment ("Taxonomy Regulation") and Directive (EU) 2022/2464. This amends the Accounting Directive, especially regarding the famous Art.19a Sustainability Reporting. Even more importantly, the CSR and reporting about it have become the reality in the EU (MacGregor Pelikánová & Rubáček, 2021) and they are observed even by subjects which are not directly ordered to do so by the EU law, i.e. other than large strategic businesses (MacGregor Pelikánová & MacGregor, 2020). Such a CSR reporting is materialized in various forms, including the e-Justice portal and their own domains (MacGregor Pelikánová & Rubáček, 2021). The sustainably and CSR belong in an ethical dimension which is an integral and inherent part of the business conduct (Balcerzak & MacGregor Pelikánová, 2020). Boldly, the question is no longer about whether businesses recognize their CSR and report about it, instead what kind of CSR do businesses endorse and for what values do they strive?

This evolutionary trend from the "macro-economic" sustainability to "micro-economic" CSR appears to reach another milestone demonstrating the modern focus on co-operation, reconciliation and can-do win-win attitude. A growing tenor suggests that CSR is not so much about tensions, trade-offs and preferring something over 'some-thing', i.e. CSR is not a (self)imposed expense for businesses, i.e. rather a shared investment with the potential for a high return based on the multi-stakeholder model (Hála et al., 2022). CSR is about an integrated, unified whole, one which creates a sustainable stakeholder framework (Carroll, 2016) and brings opportunities and a competitive advantage potential – CSR should lead to the creation of shared values, aka CSV (Salonen & Camilleri, 2020). CSV should "unlock the next wave of business innovation and growth" and at the same time "reconnect company success and community success" (Porter & Kramer, 2011) and cultivate the entrepreneurial ecosystem (Royo-Vela & Lizama, 2022). CSV is about the legitimacy and effectiveness, i.e. about the generation of "the right kind of profits" (Porter & Kramer, 2011). It might be argued that CSV is a more collaborative (MacGregor Pelikánová & Hála, 2021) and thus ultimately more profitable version of the conventional CSR (Salonen & Camilleri, 2020). Both, CSR and CSV, are about the sustainable use of resources in a well informed and mutually accepted manner, which means that there are underlying, recognized and shared values. These values are critical for the foundation, assessment of the operation and behavior of an artificial being, a company as well as for the feasibility of a legitimate, effective and efficient multi-stakeholder construct supporting the sustainability. Hence the questions are: what are these values and are they consistent in the light of the well-established value categories? These questions can be legitimately answered by companies which are manifestly socially responsible, pro-CSR and pro-CSV, proudly report about it and ultimately are publicly recognized as the leaders for socially responsible business conduct. Therefore, such companies are to observed regarding their responsibility ranking, national cultural background, and their endorsement of legal, social, and cultural values via their internal domains. Does the juxtaposition of such a synthetic index, Hofstede cultural dimensions and recognized CSR/CSV suggest the presence (H1) and consistency (H2) of these values by responsible large Czech companies?

1. Methods of Research

The aim of this contribution is to observe the endorsement of cultural, legal and social values by socially responsible businesses via a Czech case study. In particular, the goal is to assess whether responsible large Czech companies proclaim these values in a consistent and patern-oriented manner. Both the aim and goal are materialized by addressing two hypotheses – about the existence (H1) and consistency (H2) of these values as proclaimed by responsible large Czech companies via their domains.

For two decades, a Czech not-for-profit organization, Byznys pro společnost (BpS), aka Business for society, assesses and rewards Czech companies for their responsible and sustainable business conduct. BpS creates the largest information platform for responsible business conduct in the Czech Republic, helps to advance sustainability and CSR, involve a big part of the most important companies and co-operates with key state authorities and pro-sustainability and pro-social entrepreneurship associations. BpS enjoys national as well as international recognition and has become the official Czech partner of CSR Europe. One of the many endeavors of BpS is to enhance awareness and find the most responsible Czech businesses in various categories. In order to do so in a transaparent manner, BpS does its rating on a percentage basis, %, aka the BpS index of

small, medium sized and large Czech companies. It is based on their long-term and strategic commitment to sustainable business conduct, their positive contribution for employees and the society, their reduction of their impact on the environment and their capacity to bring forth innovative solutions (BPS, 2023). For 2022, 67 companies with over 166 strategies and projects have participated and traditionally the panel of independent experts selected, in the main category, the „BpS Top responsible large company – TOP 25" („TOP 25"), in total 25 companies operating in the Czech Republic and employing more than 250 employees and/or having an annual turnover over EUR 50 million and/or with assets over EUR 43 million, which reached the highest BpS synthetic index. The calculation of each of the five criteria segments of the BpS synthetic index is always done in % on the scale 0-100: (i) sustainability and CSR strategy, (ii) responsible approach to employees, (iii) integration across supply chains, (iv) environmental responsibility, and (v) support of communities and involvement of employees. The rating is made in two rounds and its results are posted online along with the identification whether this BpS synthetic index of such a company has increased or decreased as compared to the prior year. In total, 36 large Czech companies managed to appear among these TOP 25 during 2018-2022, i.e. there are very little differences between years and every year the 25 large Czech companies with the highest BpS index are almost always the same. In sum, each of the 36 observed is a large company with appropriate resources which was officially recognized as highly responsible and pro-sustainable during the last five years and, considering the current trends, it is (or should be) the leader regarding both CSR and CSV in the Czech business arena. Thus, these 36 companies constitute a relevant pool to be examined in order to see whether they endorse values linked to the sustainability, CSR and CSV (H1) and whether such an endorsement of values is consistent and pursuant to mutual trend patterns (H2).

A value is what a subject wants, desires or prefers, seeks, freely follows, and respects because it is worthy (valuable). Although a company is a legal fiction, the society assigns it a true will and stakeholders observe it and react accordingly. The will is a demonstration of an internal system of distinguishing what is good and what is bad, what is desirable and what not – values. Indeed, a company has its values, declares them and incorporates them in its daily operation. There are many types of values and, for the business conduct of a company, are particularly relevant cultural values reflecting the national particularities dimension, legal values reflecting the law dimension and social values reflecting the ethical and moral dimension

Culture means social behavior, institutions and norms of an, at least partially, homogenous group of subjects. The roots and glue of this group are cultural values, the preferences recognized and advanced by its members. Geert Hofstede observed the interaction and impact of a society's culture on its members and developed the cultural dimensions theory reflecting six key cultural values and grading them on a scale of 0 to 100 (Hofstede, 2001): (1) the power distance index (PDI) – authority acceptance, (2) individualism versus collectivism (IDV) – individual versus collective accountability, (3) masculinity versus femininity (MAS) – tendencies for the traditionally masculine or feminine traits of behavior, (4) uncertainty avoidance index (UAI) - certainty, (5) long term orientation versus short term normative orientation (LTO) – tradition versus evolution, and (6) indulgence versus restraint (IVR) – holding off on instant gratification. In the context of CSR and CSV, LTO and IDV are very interesting. Regarding LTO, it is about how the society is ready to evolve, i.e. it addresses how a society connects the past and future. Normative societies score low on the LTO because they prefer to maintain time-honored traditions and norms while viewing societal change with suspicion.

Pragmatic and pro-evolutionary societies score high on the LTO because they encourage thrift and efforts in modern education as a way to prepare for the future. Czech top socially responsible companies should target rather a high LTO. Regarding the IDV, the issue is the degree of interdependence and accountability of the members of the society, aka "I" versus "We". Czech top socially responsibly companies should be the leaders ready to pull the wagon and work toward both CSR and CSV for, and in the name of, the entire society (low IDV) regardless of the skepticism and passivity exhibited by many members of the society (high IDV). Boldly, they should aim at „ best practices", which could demand in the Czech Republic an individual independency (high IDV).

Legal values for Europeans, including European companies, are expressed by the primary sources of the EU law, i.e. by the EU constitutional triangle which includes the Treaty on EU (TEU), the Treaty on the Functioning of EU (TFEU) and the Charter of Fundamental Rights of the EU (Charter). These legal values are covered especially by Art. 2 TEU et foll. and Art. 16 et foll. Charter. According to the expected involvement and nature of induced behavior, they can be either passive and internally oriented or active and externally oriented: (1) Passive = Respect for human dignity, human rights, etc. = to tolerate and respect, aka to be in solidarity (2) Active = pro-sustainable development = to do good, aka going (taking measures) for equality.

Societal, aka social, values have developed significantly in the recent decades and they became pivotal for the CSR and CSV and their drive for „the right kind of profit". CSV builds upon and further develops CSR. Shared values are neither personal values nor values already created by the company and assigned for re-distribution, instead it is about *policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates* (Porter & Kramer, 2011). In sum, CSV means identifying and expanding the connections between societal and economic progress (Porter & Kramer, 2011). Four justifications leading to values for CSR include: (1) moral obligation (a company has a duty to be a good citizen and to do right things), (2) sustainability (a company has to secure a long term economic performance by avoiding waste and by being respectful), (3) license to operate (a company has to engage in a constructive dialogue to identify social issues which matter to stakeholders and make decisions about them, and (4) reputation (a company has to satisfy the external audience) (Porter & Kramer, 2006).

CSV addresses the current perception that businesses are a major cause of economic, environmental and social problems and are neither legitimate nor trustworthy (Porter & Kramer, 2011). CSV breaks the vicious circle and the perception that the more they embrace CSR, the more they are to be blamed for failures in the society (Porter & Kramer, 2011). Therefore, CSV means the exploration of the entire entrepreneurial ecosystem (Royo-Vela & Lizama, 2022) and calls to expand the above CSR focusses by: (5) the observation and reflection of societal needs, benefits and harms embodied in a company product (more effective and efficient product), (6) linking societal progress and productivity in the value chain (more effective and efficient production), (7) open-minded linking of other players and the infrastructure (more effective and efficient cluster co-operation) (Porter & Kramer, 2011). Regarding key words, these societal values are linked to terms such as trust/honesty, transparency, collaboration and respect, (no) waste, communication/dialogue, consciousness (Porter & Kramer, 2006 et 2011). There are many approaches how, in a multi-disciplinary manner, to summarize and categorize cultural, legal and social values and, following the methodology developed by the Dutch

school (Van Tulder & Keen, 2018), the distinction of internal/passive and external/proactive appears relevant for such an assessment, see Table 1.

Tab. 1: Selected cultural, legal and social values as projected internal reactive and external proactive actions with *key words*

	Cultural values (Hofstede)	**Legal values (TEU, Charter)**	**Social values (CSR/CSV - Porter Kramer)**
Internal reactive action (mitigating past)	IDV = individual responsivity (building own individual accountability)	*solidarity* (internal will to mitigate unfairness)	*respect* (internal personal understanding and respecting others)
External pro-active action (making better future)	LTO = long term orientation (activities with long term goals)	*equality* (changing future by treating others in a non-discriminatory manner)	*no waste* (internal processes to use resources well)

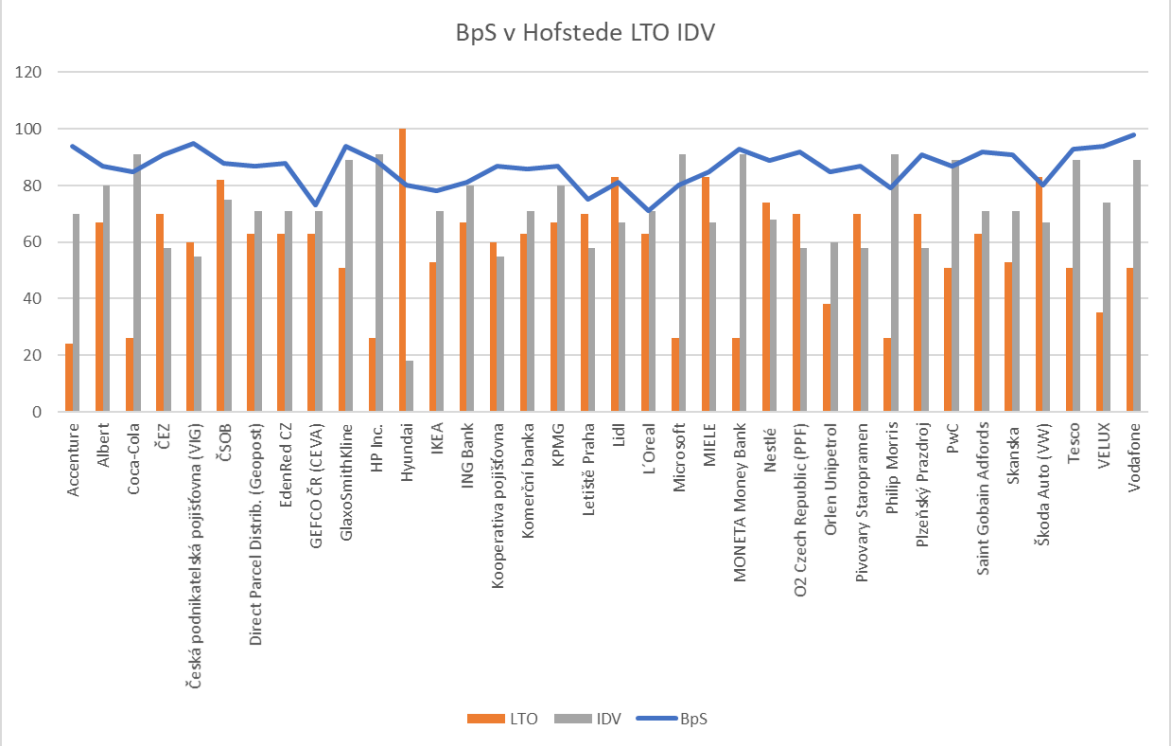
Source: authors 'own processing.

The endorsement of these values by the 36 pre-selected responsible and pro-sustainability Czech companies should be done on their information platform par excellence, their own domain with their own www sides (MacGregor Pelikánová, 2021). Such an assessment is to be performed by a panel of three independent critics using a Likert scale style scoring and Delphi manual approach with two rounds in order to boost the academic robustness and avoid discrepancies. Considering the ranking scope of the BpS synthetic index and of the IDV and LTO (0-100), the rating of these four values labelled by the key words *solidarity, equality*, *respect, no waste,* will be done on the same scale (0-100). These 36 Czech companies will be listed alphabetically along with their BpS synthetic index, then their country of origin will be indicated and, based on their national cultures' particularities, their Hofstede values LTO and IDV posted. Thereafter, via the manual Delphi, the values about *solidarity, equality, respect, no waste* will be added. In order to recognize trends and pattern, the data originally placed in the table will be used to build a chart, which will allow the presentation of the results and their discussion.

2. Results of the Research

All 36 companies are manifestly pro-sustainability, pro-CSR and pro-CSV, they declare it and earn recognition for that. They heavily refer to the term „sustainability" (as a part of their CSR) that is directed either to environmental causes (elimination of pollution, electromobility) and/or social aspects (diversity, inclusive approach). The (inter)cultural organizational values concerning sustainability are represented with temporal frames, the perception of time on a time line (past – present – future) and the level of individuality being promoted within the corporation. Along with the reflection and implementation of (inter)cultural values, current approaches to climate change and the perception of societal shifts are represented in these companies. The explicit verbal mentioning of sustainability does not always correspond with the values, since the specific value of sustainability is represented in every case, and appears to be dominating. In order to increase trend visibility, the data are projected in two charts, of which the 1st one juxtaposes the BpS index and two cultural values by Hofstede, LTO and IDV, see Figure 1.

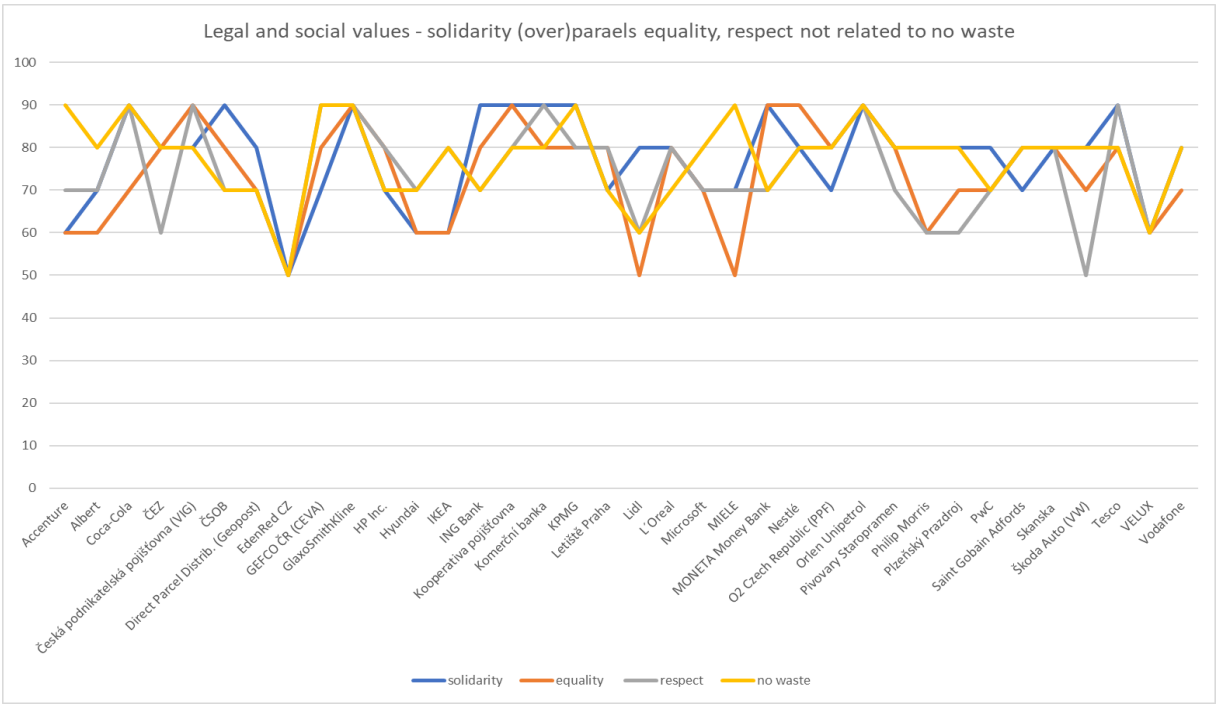
Figure 1: TOP 25 responsible large Czech companies and their BpS index, LTO, IDVs



Source: authors 'own processing.

Since the 1st chart (Fig. 1) does not reveal any obvious trends, it is necessary to move from the juxtaposition of BpS versus cultural values to the juxtaposition of legal values (solidary, equality) and social values (respect, no waste) as depicted in the 2nd chart, see Fig. 2.

Fig. 2: TOP 25 responsible large Czech companies and their legal and social values



Source: authors 'own processing.

Well, Fig. 2 is instrumental in finding very interesting indices of the correlation between legal values, but not between social values. Namely, the solidarity is over-paralleling the equality, i.e. the TOP 25 responsible large Czech companies endorse equality and slightly even more solidarity. To put it differently, almost each of these companies has a good endorsement of equality and even slightly better of solidarity. This suggests a slightly paternalistic if not patronizing attitude. However, this paralleling is not demonstrated by social values, i.e. the curve for respects often intersect the curve for no waste.

3. Discussion

The yielded results and their juxtaposition via charts allows for pioneering propositions about the existence (H1) and consistency and mutual trend patterns (H2) of the values endorsed by the TOP 25 responsible large Czech companies. Namely, Fig. 1 and Fig. 2 reveal clearly that each and every one of these 36 companies endorse cultural, legal and social values, as highlighted in Tab. 1, and this often in a very vigorous manner. To put it differently, each company ranking high on the BpS has its own domain where are posted the www pages proclaiming the commitment to all pre-selected values, i.e. regardless of the national background of the company (see values in Fig. 1 and especially Fig. 2, often way over 50). Thus the confirmation of H1 about the presence of cultural, legal and social values by all selected companies is obvious and beyond any reasonable doubt.

Regarding H2 about consisteny and mutual trend patterns, the situation is more complex and a careful study of the data visualization via two charts needs to be performed. The first chart (Fig. 1) juxtaposed the BpS index and the Hofstede cultural values represented by the LTO and IDV and has not revealed any trend indices, i.e. the national background by already responsible companies does not predicate the height of the BpS index and there is not a clear impact of cultural values represented by LTO or IDV on the BpS index or vice-versa or inter-relation. The second chart (Fig. 2) juxtaposed the quarter of pre-selected legal and social values and revealed a paralleling trend between legal values (solidarity and equality), but not regarding social values (respect and no waste) or any other combination. Hence, this suggests that the TOP 25 responsible large Czech companies endorse legal values in a concording manner, while slightly advancing solidarity over equality. However, there is not a clear inter- or intra-trend regarding social values. Thus the rejection of H2 about the consistency and mutual trend patterns of cultural, legal and social values by all selected companies is obvious and beyond any reasonable doubt.

These discrepancies with the only clear trend regarding legal values, especially of a rather passive nature, suggests cavalierly looking down. Indeed, the second round of review of www pages confirmed a slightly paternalistic, perhaps patronizing tenor. This indicates that these leading sustainability companies have a rather vertical approach to sustainability. This calls for a revisitation of the modern concept of sustainability which was, is and probably will remain, an elusive concept which means for different people different things (White, 2013). However, instead of giving up on searching for the meaning of sustainability, it is illuminating to observe the most recent trends, i.e. what are the current trends in its understanding. From the sociolinguistic point of view, the shift of usage within the *sustainability* term in the corporate terminology is obvious. Namely, it remains omnipresent and with a myriad of meanings, but the originally dominant aspects are getting overshadowed and the pressure to apply it loses its original urgency. Prior studies have suggested as the most popular underlying values were the environmental

protection, social welfare and economic prosperity and life balance, while growth and equity were on the lower end of the scale (White, 2013). Current studies suggest the shift from sustainability to justainability, i.e. the JUST sustainability. The center of gravity has been moving to new intersecting goals of social justice and environmental sustainability, and this in particular in the context of the post-Covid era (Maboloc, 2020) and other crises (D´Adamo & Lupi, 2021). How can a shared vision be achieved if there is no consensus about it? (White, 2013). Well, the first step in the right direction is to recognize and appreciate apparently inconsistent underlying values endorsed by allegedly the most pro-sustainability companies. The performed case study revealed that these companies shared various background and cultural values and endorse legal and social values. This is great. However, they do not agree about social value preferences and regarding legal values, they demonstrate a patronizing attitude, which is entirely in contradiction to the mutli-stakeholder model (Van Tulder & Keen, 2018). With a touch of exaggeration, the iconic sentence „*Sustainability: I know it when I see it*" (White, 2013) could, based on the performed case study, continue „*and I am better in it than you*.", i.e. we are not even, but I will graciously tell you and provide my solidarity support. Is this sustainable, justianable or just wrong? Perhaps, the first will be last and the last will be first …

Conclusion

The concept of sustainability is critically important, omnipresent and ambiguous. The literature review, prior studies as well as the newly reported case study about TOP 25 most responsible large Czech companies generate a number of hardly reconcilable information in this arena desperately needing a consensus for a common action via a stakeholder model. In particular, these leading companies achieve a high BpS synthetic index and via their own domain advance cultural values belonging in Hofstede cultural dimensions along with legal values and social values. Their recognized and advance CSR/CSV via underlying values in an obvious manner (H1). Although effective, the efficiency of this behaviors due to the dramatic fragmentation is crippled. Namely, there is strong inconsistency between values advanced by these companies (H2), especially social values such as respect and no waste. The only detectable trend of endorsement of good legal values is rather worrisome – solidarity over equality, because it contradicts entirely the foundation of sustainability and its underlying model. At the same time, it must be emphasized that only 36 large Czech companies were analyzed and thus a broader and multi-jurisidctional sample in a longitudinal manner should be explored to achieve more robust conclusions. However, already now, based on the performed pilot case study, it can be safely sugested that large responsible Czech companies, as selected by the official and well-respected ranking by BpS, proclaim cultural, legal and social values, but these proclamations lack consistency and lead to a tenor undermining the multi-stakeholder model for CSR and CSV. This deficiency needs to be corrected and definitely more listening, respecting and communicating by businesses would be the correct move in order to fix it and to boost the legitimacy and enforcement eagerness of the current system. Let´s move from inconsistent existence to consistent endorsement. Naturally, this call should be verified by deeper longitudinal studies involving a larger pool of companies from more jurisdictions. Nevertheless, a respectful communication is a good move in any case, considering the foundation of our civilization.

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Pension Fund Investment into Sustainable Assets: A Critical Review of Reporting Frameworks in Lithuania

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Abstract
In recent years, pension funds have experienced a noteworthy global shift towards integrating sustainability considerations into their investment strategies. This shift demonstrates the recognition of potential risks and opportunities associated with environmental, social, and governance (ESG) factors. This paper critically reviews pension fund sustainability metrics and reporting systems, focusing on the growing interest among pension funds worldwide in incorporating ESG factors into their investment strategies. It explores the motivations driving pension funds to invest in sustainable assets, the challenges they encounter, and the potential benefits associated with such investments. The findings indicate that pension fund investments in sustainable assets can significantly contribute to promoting sustainable development and responsible investment practices. By incorporating ESG factors into their investment strategies, pension funds can effectively manage risks, enhance long-term returns, and generate positive societal impact. However, to maximize the potential benefits of sustainable investing for pension funds and society at large, challenges related to measurement, limited investment diversity and expertise, as well as the standardization of metrics and reporting systems for sustainable investing, need to be addressed.

Key Words
Pension fund, sustainability, sustainable assets, investment, ESG.

JEL Classification: G10, 620, K20

Introduction

ESG investment has experienced significant growth in the past decade, becoming an essential aspect of the financial industry. Pension funds, as significant institutional investors, manage substantial financial assets held for future retirement and play a crucial role in generating a reliable source of future income (Autenne et al. 2021; Kopa et al. 2022). However, they face mounting pressure from rising pension risks attributed to declining birth rates and increased life expectancy (Krpan et al. 2019). In recent times, sustainable investments have gained prominence within pension funds, as they align with not only financial objectives but also social and environmental goals. Pension fund managers prioritize investments that demonstrate economic, social, and

environmental efficiency. This entails selecting options that benefit investors, society, and the environment (Buallay et al. 2021). However, there are a number of issues that prevent the full integration of ESG principles into investment strategies. What is missing is a focus on practical solutions, regulatory changes (Mitkova, Mlynarovic, 2021; Papik, Papikova, 2021; Krpan et al, 2021), meaningful engagement with investees, shareholder needs, and collaborative efforts to address financial industry-wide issues (Buallay et al. 2021; Castaneda et al. 2021). Sustainable investments in pension funds encompass companies addressing social or environmental issues, as well as investments in alternative and renewable energy technologies (Alda, 2019; Rempel, Gupta, 2020). Managers emphasize portfolio diversification and adherence to sustainability principles. By opting for sustainable investments, pension fund managers can achieve long-term stable profits that benefit both investors and society at large (Woods, Urwin, 2010). These investments are not only socially and environmentally responsible but also financially viable, making them a desirable choice for pension funds (Woods, Urwin, 2010). Accurate measurement and reporting of ESG factors and their impact on financial performance are crucial for effective decision-making (Castaneda et al, 2021; Buallay et al., 2021). Pension funds have two primary motivations for investing in sustainable assets: risk reduction and long-term return enhancement. By allocating funds to sustainable assets, pension funds aim to mitigate risk (Castaneda et al, 2021; Melis, Trudda, 2018) and safeguard their long-term financial performance (Buallay et al, 2021). Furthermore, sustainable investments offer potential opportunities for increased returns over the long term. Pension funds acknowledge that sustainable companies often outperform their counterparts due to their adeptness in risk management, ability to leverage emerging trends, and access to responsible capital (Alda, 2019). Pension funds may encounter constraints in finding suitable sustainable investment opportunities, particularly in certain sectors or regions too. The limited availability of investable assets meeting their risk-return requirements poses a challenge to portfolio diversification (Boado-Penas et al, 2020; Melis, Trudda, 2018). One of the significant challenges faced by pension funds is the lack of standardized metrics and reporting frameworks for sustainable investments (Rempel, Gupta, 2020; Krpan et al, 2019). Therefore this paper aims to provide an overview of pension fund investment into sustainable assets, exploring the motivations, challenges, and potential benefits and provides a critical review of pension fund sustainability metrics and reporting systems in Lithuanian case.

1. The regulation of Pension fund systems in Lithuania

The regulation of pension fund systems in European Union member states is not governed by EU regulations. The establishment and structure of pension systems within each country are determined at the local level. However, certain aspects of these systems, particularly those relating to fund management and asset class investment, are subject to European regulations (Kopa et al, 2022). OECD countries set limits or even impose a total ban on investing in certain assets (OECD, 2022a). Such a regulatory and supervisory strategy is ambiguous: on the one hand, it ensures a minimum amount of investment in risk classes, but, on the other hand, it limits the maximum possible return on investment. At the end of 2021, many countries had imposed quantitative investment limits that pension providers were required to adhere to. These limits typically specify the maximum percentage of assets that pension providers can allocate to specific types of investments, including equities, real estate, bonds, retail investment funds, private investment funds, loans, and bank deposits (OECD, 2022a). Most of the legislative

changes regarding investment regulation led to a softening of the limits and allowed more discretion to pension providers. Pension funds are increasingly aware of the long-term risks posed by environmental issues, climate change, and social controversies, therefore sustainability in investments is becoming an integral part of every fund manager's decision-making process. Though sustainability is not mandatory when managing pension funds, the disclosure of the portfolio set-up is still regulated (Kopa et al, 2022). Part of the EU's sustainability regulation framework is Sustainable Financial Disclosure Regulation (European Commission, 2019) which ensures that every financial firm, including fund managers, is comprehensively disclosing how sustainable they really are. Pension funds commonly adopt ESG integration, whereby ESG factors are systematically incorporated into the investment analysis and decision-making process. This approach aims to enhance risk management and identify investment opportunities aligned with sustainability goals (Alda, 2019).

In Lithuania a key document describing pension fund management is the prospectus, which is approved by the governing body, is the Bank of Lithuania (Bank of Lithuania, 2018). It provides key information about the fund's management, including pricing, investment strategy, and asset reallocation principles. The fund's asset allocation is guided by two strategies: strategic asset allocation, reviewed annually and defining key markets and asset allocation principles, and tactical asset allocation, reviewed monthly and focusing on specific sectors. Investment strategy of a pension fund is based on strategic asset allocation, aiming to maintain an optimal ratio between risky and less risky asset classes throughout the accumulation period. Factors like regulatory requirements, average investor characteristics, and pension assets are considered. A pension accumulation company must comply with the established ratio of risky and less risky assets in the portfolio. Deviating by more than 10 percentage points from the established proportion is considered non-compliance (Bank of Lithuania, 2018). To manage investment risk, the company establishes indicators and criteria to monitor the fund's investments based on the chosen investment strategy (benchmark). Assets Categories include *Equities*, *Bills and bonds issued by public administration*, *Real Estate, Bonds issued by the private sector*, *Retail Investment Funds, Loans, Bank deposits* and *Private Investment funds* (OECD, 2022b). The pension fund's investments are rebalanced at the beginning of the year according to the specified benchmark in the strategy. Rebalancing may occur at the end of the previous year or the beginning of the year based on market forecasts. Other decisions considering market and economic forecasts are implemented continuously within the defined tolerances. The investment strategy of the pension fund, its implementation, and suitability undergo regular review and evaluation, at least once every three years (Bank of Lithuania, 2018).

The second pillar of the Lithuanian pension system comprises of five pension fund managers: "SEB investicijų valdymas" (SEB), "Aviva Lietuva" (AVIVA), "Luminor investicijų valdymas" (LMNR), "Swedbank investicijų valdymas" (SWED), and "INVL Asset Management" (INVL). Each pension fund manager follows an individual strategy for managing their life cycle funds, which considers the participant's age and proportion of equity investments. As fiduciaries, pension funds have a responsibility to act in the best interests of their beneficiaries. Recognizing the increasing expectations for responsible investment, all pension funds in Lithuania integrate environmental and social goals into their investment practices. However, comparing sustainable investments across different pension fund managers is challenging due to the lack of publicly available detailed information and variations in reporting practices. This study

aims to critically examine sustainability reporting and explore the feasibility of comparing sustainable investments among Lithuanian pension funds.

2. Analysis of Asset Categories and Sustainability Reports of Pension Funds in Lithuania: Key Results

The investment regulations for pension providers underwent significant revisions between 2002 and 2021. Here are the key changes that occurred during this period in Lithuania: 1) Early-conservative fund named as the Pension Asset Preservation Fund experienced an increase in the maximum exposure to equity investments from 0% to 20% in 2019. Additionally, the maximum exposure to bonds issued by the private sector was raised from 0% to 30% for the same fund in the same year; 2) Starting from the end of 2012, pension providers were permitted to allocate up to 30% of their investments into the "alternative asset class," previously referred to as "risk capital" until 2019 (OECD, 2022b). These revisions aimed to adjust portfolio allocations, expand investment opportunities, and accommodate evolving market dynamics, ensuring pension providers could optimize returns while maintaining prudent risk management practices.

Table 1 provides an overview of the portfolio limits for Lithuanian pension funds that adhere to whole life cycle investment strategies across different asset classes. The table specifies whether these limits pertain solely to direct investments or encompass all risks associated with pension funds and providers, including indirect investments through collective investment schemes.

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Tab. 1: Lithuanian Life-cycle pension accumulation funds' Asset Categories

Quantitative portfolio restrictions	Asset Categories
Portfolio Limits on the Investment of Pension Providers in Selected Asset Categories	*Equity; Bills issued by public administration and bonds issued by public administration and private sector; Retail Investment Funds; Bank deposits* -100% (Total exposure). *Real Estate; Loans* - 0% (Direct): Pension funds are prohibited from borrowing money or making direct investments in loans. *Private Investment funds* -20% (Direct) and other- as per the regulations of the II pillar pension funds, are allowed to allocate a maximum of 20% of their investments to non-UCITS (or similar) funds.
Investment limits in single issuer/issue by asset category	*Real Estate*; *Loans* - 0% (Direct); *Equity*; *Bonds issued by private sector*- 10% and other-Investments in securities or money market instruments issued by the same issuer are subject to a limit of more than 5% but no more than 10% of the net assets. However, the total value of such investments should not exceed 40% of the net assets. Additionally, investments in bonds issued by credit institutions subject to public supervision may not exceed 25% of net assets, provided that the bonds are backed by assets capable of covering bondholder claims. In cases where investments exceed 5% but not more than 25% in bonds from a single issuer, the total value of these investments cannot exceed 80% of net assets. *Retail Investment Funds; Bank deposits*- 20% and other deposits with a maximum term of 12 months, which can be withdrawn upon request, are allowed in credit institutions located in a Member State or another state that has a level of risk supervision at least as stringent as in the European Union. *Private Investment funds* - 5%. *Bills and bonds issued by public administration* - 35% and other investments in securities or money market instruments issued or guaranteed by the Republic of Lithuania, a Member State of the European Union, their local authorities, or other states or international bodies involving at least one EU Member State, should not exceed 35% of the net pension assets. However, the Supervisory Authority has the discretion to permit a higher allocation if participant interests are adequately protected, provided that the investment is spread across at least six issuances and no more than 30% of the net assets are invested in a single issuance.
Other Quantitative Investment Regulations on the Assets of Pension Providers	*Self-investment / Conflicts of interest* -The general rules for investments include the following: 1) Investments in transferable securities or money-market instruments of a single issuer can be more than 5% but no more than 10% of the net assets, as long as the total value of such investments does not exceed 40% of the net assets. However, this restriction does not apply to deposits. 2) The total investment amount in transferable securities, money-market instruments, or deposits issued by a single entity cannot exceed 20% of the net assets of the pension fund.3) The total investments in financial instruments and deposits of companies belonging to a group that prepares consolidated financial reports should not exceed 20% of the net assets of the pension fund. *Limit on foreign currency exposure*- 100%. *Limit on derivatives* - 0%. *Ownership concentration limits* - 10%. A management company, along with the pension funds it manages, cannot hold shares that collectively carry more than 1/10 of the total voting rights at the general shareholders meeting of an issuer. However, a pension fund is allowed to independently acquire more than: 1)10% of the total non-voting shares of a single issuing body using its own funds. 2)10% of the total debt securities of a single issuing body using its own funds. 3) 10% of the money market instruments issued by a single issuing body using its own funds.

Source: authors' own data from (OECD, 2022a; 2022b)

During the period from 2002 to 2021 significant changes were made to the investment provisions of pension providers, primarily related to diversification. Regulations introduced measures to promote diversification of investments, aiming to reduce concentration risk and enhance portfolio resilience. Investment restrictions were allowed to be relaxed, allowing pension providers to allocate more of their assets to

certain investment classes, such as shares or alternative assets. Also, the range of permissible investment instruments was broadened, enabling pension providers to invest in a wider array of financial products, including derivatives and structured products. Regulations increasingly focused on risk management practices, requiring pension providers to implement robust risk assessment frameworks and stress-testing methodologies. The integration of sustainability factors into investment decision-making gained prominence, with regulations encouraging pension providers to consider environmental, social, and governance (ESG) criteria in their investment strategies. Regulations placed greater emphasis on transparency and reporting obligations, requiring pension providers to provide detailed information on investment holdings, performance, fees, and risk profiles to ensure greater transparency for pension fund participants. These changes aimed to modernize and adapt pension investment regulations to evolving market conditions, promote prudent and sustainability investment practices, and align pension funds with emerging trends in the financial industry.

The sustainability ratings of five Lithuanian companies, which owned pension funds, are provided in Table 2.

Tab. 2: Pension fund manager ESG Risk Ratings 2023

SEB investicijų valdymas (SEB)	INVL Asset Management (INVL).	Aviva Lietuva(AVIVA)	Luminor investicijų valdymas (LMNR)	Swedbank investicijų valdymas (SWED)
Medium ESG Risk	no data	Low ESG Risk	Low ESG Risk	Medium ESG Risk
23,8	no data	11,6	10,9	21,7

Source: authors' own data from (Sustainalytics, 2023)

However, when it comes to providing detailed information on sustainable investments, only Swedbank (SWED) offers comprehensive sustainability ratings for its pension funds. The pension funds of other companies provide more general information, mentioning investments in areas such as green technologies, forest conservation, renewable energy, and so on. (see Table 3).

Tab. 2: Swedbank investicijų valdymas (SWED) sustainability index/ranking

	Scoring scale	2016	2017	2018	2019	2020	2021	2022
Bloomberg Gender and Equality Index	0–100 (max 100)	-	-	-	77	77	69	75
AllBright (ranking)	Swedbank's ranking among 329 companies in 2018	71	47	32	-	-	-	-
CDP (previously Carbon Disclosure Project)	B was the average score for the financial sector in 2022.	-	-	-	B	B	B	C
CDP (score)	Max score is A. Average for the finacial sector in 2018 is B-.	B	B	B				
Dow Jones Sustainability Index	0–100 (max 100). New calculation method in 2018. Score for 2017 is restated according to the new method. Swedbank is not included in the DJSI World Index, but is included in the DJSI Europe. Swedbank was included in the Dow Jones Sustainability World Index in 2020 and 2021 as well as in the Dow Jones Sustainability Europe Index in 2022.	77	81	79	76	81	84	76
EY SHE Index Sweden	e 0–100 (max 100)	-	-	-	-	-	82	82
Fair Finance Guide	0–100% (max 100%)	55	61	64	65	68	68	70
FTSE4Good ESG rating	0–5 (max 5). Swedbank has qualified for the FTSE4Good Index. Scoring scale A+ – D	4.3	4.1	4.4	4.6	4.5	4.3	4.0
ISS Corporate Governance	2016-2018: Risk level 1-10 (1 low risk, 10 high risk). Refers to risk level for Environment, Social, Governance criteria. 2019-2022: A+ – D- (max A+)	-	-	1	C (Prime)	C (Prime)	C (Prime)	C (Prime)
MSCI ESG rating	AAA – CCC (max AAA)	-	-	-	A	AA	AA	AA
S&P ESG rating	0–100 (max 100)	-	-	-	-	-	75	76
Sustainalytics	2016-2018: ESG Rating, Outperformer. 2019-2022: 0–10 negligible risk, 10–20 low risk, 20–30 medium risk, 30–40 high risk, 40+ severe risk.	-	-	80	27.5	27.6	24.8	21.7

Source: authors' own data from (Swedbank: Annual and sustainability report 2018; 2019; 2022)

SWED maintains a strong focus on monitoring and responding to demands and recommendations from various sustainability surveys and indexes. This commitment enables the bank to uphold a high standard and continually enhance its sustainability efforts. SWED engages in dialogues with diverse stakeholder groups to monitor and evaluate the outcomes of these initiatives. SWED achieved qualification for the

renowned Dow Jones Sustainability World Index 2020, a highly esteemed sustainability index. This recognition signifies SWED ongoing commitment to environmental, economic, and social concerns. The annual rankings by Dow Jones highlight the most sustainable companies globally, and SWED inclusion reflects its consistent efforts in these areas. Furthermore, SWED attained the highest ranking among major Swedish banks in the Fair Finance Guide's annual policy report, further demonstrating its dedication to responsible finance.

Conclusion

Pension funds play a crucial role in the global investment landscape, and their growing interest in sustainable assets reflects a broader recognition of the importance of sustainable development and responsible investment practices. By integrating ESG factors into their investment strategies, pension funds can mitigate risks, enhance long-term returns, and drive positive societal change. However, to fully harness the potential benefits of sustainable investing for pension funds and society, it is crucial to address challenges related to measurement, limited investment diversity, and expertise. Additionally, standardizing metrics and reporting systems for sustainable investing is necessary to ensure transparency and comparability across investments. By overcoming these challenges, pension funds can maximize the positive outcomes of sustainable investing for both their beneficiaries and society as a whole.

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Impact of Artificial Intelligence on Employment in the Slovak Digital Information Communication Technology Sector

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Abstract

In the following article we focus on one of the most up-to-date topics in the digital world as artificial intelligence affects employment in the digital information communication technology sector focused on the Slovak Republic. This revolutionary technology brings great changes and the impact on the working environment is inherent. In this article, we provide profound views of how artificial intelligence changes jobs and what opportunities and challenges come with it. The article points to significant data obtained from verified and relevant sources that are significant to clarify the ICT environment in Slovakia and at the same time the impact of artificial intelligence on various jobs as well as the whole industry. It is imperative to point out particular areas in which artificial intelligence is crucial and used the most. These areas are supported by artificial intelligence technology, whether as primary or secondary technology with regard to sight and support of the human factor.

Key Words: *AI, Slovak ICT, artificial intelligence, employment*

JEL Classification: M39, O11, O14

Introduction

Artificial intelligence (AI) is currently one of the ultimate technologies that permeates many information industries, including sectors of digital communication technologies worldwide and also in Slovakia. This technology allows computer systems to analyze and interpret large amounts of data and draw meaningful conclusions from them. With this capability, AI can automate tasks that previously required human interaction. Artificial intelligence has a wide range of applications in the digital information communication technology sector. One of the areas where AI is most visible is in content personalization and targeted marketing. Thanks to artificial intelligence algorithms, it is possible to collect and analyze data about users, their preferences and behavior on websites. Based on this data, it is then possible to create personalized content and targeted ads, increasing the effectiveness of marketing campaigns. (Brodny, J., & Tutak, M. 2022).

Data from the OECD show that approximately a third of the current jobs in Slovakia may be at risk soon. The generation that acquired school skills could work with them for up to 26 years, but now this time has been shortened to 4.5 years. 65 % of children who started to go to elementary schools before 2022 are expected to focus on professions that do not exist today and the current education system has not yet prepared them for it. The information and communication technology sector (ICT) is crucial for increasing the productivity and competitiveness of companies. Up to 54 % of value-added comes from this sector, making it the second most important sector from the private sector. The ICT sector is also the fastest-growing industry in Slovakia due to its minimal demand for raw materials, space, and energy. However, it requires highly qualified human resources. It is already facing a lack of labor and in the next five years, it will be necessary to bring about 3,000 new employees per year to the labor market (OECD, 2023), (MIRRI, 2023).

The current education system cannot produce graduates with the correct structure and low IT/STEM. This system is insufficient, outdated, and ineffective to the market needs and process of digitizing the economy and society. As part of the national project "Effective labor market in the Slovak Republic through sector-oriented innovation", which implements the Ministry of Labor and Social Affairs of the Slovak Republic with the support of the European Social Fund and the European Regional Development Fund under the Human Resources Operational Program, a human resources development strategy for ICT sector was developed by 2030. This strategy analyzes the above and presents prospects for the ICT sector growth with an emphasis on the development of human resources. Its analysis of the sector condition is based on several parameters. It contains an overview of the structure of Slovak ICT companies, the share of sales, labor productivity compared to the EU countries, investments in research and innovation, as well as the structure of employees. It also analyzes wages, demographic trends, and workforce distribution within the sector. The document records the expected innovative and technological changes that will affect new professions and professions. Pestle analysis takes into account technological, economic, ecological, political, demographic, and regional factors. He addresses questions such as the aging population, changing work and study habits, interest in education in specific areas, and flexibility of educational systems. The transition to the knowledge and digital economy will require the transformation of skills in STEM areas. The current education system would have to significantly increase the number of graduates ready for the ICT sector to keep up with this transformation. All this with a limited number of teachers who should provide teaching in these areas.

The strategy proposes systemic changes in the preparation of human resources focusing on quality improvement. This also applies to the opening of new educational roads outside traditional frames, the introduction of cloud-based scalable solutions, and the use of online and digital education. Supporting sector partnerships and increasing digital literacy levels will also be crucial. The transformation of endangered professions will require effective retraining. The strategy contains an action plan with more than two hundred activities that systematically address future development. The aim is to make Slovakia competitive even after 2030 (Trexima, 2023).

1. Methods of Research

In the subsequent manuscript, we employed the aforementioned methodologies to accomplish the specified tasks as well as:

- Acquisition of relevant sources and information from domestic and foreign publications,
- Collecting and analyzing data from databases statistist, OECD, and Europa,
- Statistical methods,
- Interpretation of results.

The following scientific procedures and methods were used to process the article:

Analysis - is the method of division of the whole into individual smaller components, characters, and parts and subsequent examination of their properties and links. In general, this is a method of analysis or decomposition of parts. It is therefore the opposite of the synthesis. The main task of the analysis is to get the most important data and information that makes up the essence of the issue.

Synthesis - represents a method of examination based on the context between factors and elements and the subsequent identification of individual links of characters and their relationships, opposites, and their reproduction. Synthesis reveals the causes, addiction, sequence, and tendency of stages of development. The synthesis uses a sequence from individual parts to the achievement of the whole.

Induction - is a method of examination by which we set general theses and conclusions based on a detailed examination of the issue. It is a progressive scheme from individual parts to general conclusions. Obtaining outputs or claims using induction are likelihood of correctness.

Deduction - as the opposite of induction uses the method of examination from the general parts to specific conclusions. It is a logical analysis of the issue, which uses thought practices based on general knowledge to specific findings.

Comparison method - is a beneficial element within the research methods used. Especially because of the examination of mutual relations between individual elements and their common characteristics. By comparing, we also recognize the differences that arise between the elements.

Method of Document Analysis - It will be used primarily to gain knowledge about the current state of the problem solved from available sources

Statistical methods help us recognize measured deviations, for each set of data, to measure the variability of values around the average. To compare the percentage of the ICT sector in Slovak GDP and investments in the VC in AI, we examined trends and found the potential of existing relations between the two data sets. One way to do this is to portray data on the line chart.

2. Results of the Research

In an increasingly interconnected world driven by technology, artificial intelligence (AI) has emerged as a powerful force reshaping various industries. One sector that has witnessed remarkable transformations is the digital information and communication technology landscape.

2.1 Content personalization and targeted marketing

One of the key applications of AI in the digital information and communication technology sector is content personalization and targeted marketing. With the help of AI, it is possible to collect and analyze a large amount of data about users, their preferences, behavior and previous interactions on websites and social media. This data gives us a deep understanding of our customers and allows us to create personalized content that brings added value to them. Thanks to the AI application, it is possible to automatically adapt the content of a website or e-mail campaign according to the preferences of a specific user. For example, if a visitor prefers a specific product category, artificial intelligence can show him relevant offers or recommend related products based on the analysis of his previous shopping behavior.

Targeted marketing is another major area where artificial intelligence brings benefits. With its help, it is possible to create targeted advertising campaigns and focus on specific groups of customers based on their demographics, preferences, or online behavior. This increases the effectiveness of advertising and helps achieve better results.Automation and optimization process Artificial intelligence also enables the automation and optimization of many processes in the digital information and communication technology sector. For example, automating the search and sorting of content on websites improves the user experience and helps visitors find relevant information faster and more efficiently.

Artificial intelligence is also very beneficial in the field of data analysis and processing of huge amounts of information. Using machine learning and deep learning, it is possible to identify patterns, predict trends and create forecasts based on existing data. This information can then serve as a valuable resource for business decision-making and planning (Namatherdhala B., et al., 2022).

2.2. Chatbots and virtual assistant

Chatbots and virtual assistants are another example of the application of an artificial intelligent environment in the digital information communication technology sector. These smart programs can automatically answer questions and solve user problems through chat interfaces. The use of chatbots and virtual assistants in the field of customer support and services significantly reduces costs and improves customer communication efficiency. Chatbots and virtual assistants are one of the most prominent applications of artificial intelligent environment in the sector of Slovak digital information communication technologies. These intelligent programs have become an integral part of many websites and services, not only in customer support, but also in various other sectors. Chatbots and virtual assistants provide fast and efficient customer support and services. Their ability to answer questions and solve problems in real-time means that customers do not have to wait for a live operator. This improvement in the speed and availability of support contributes to higher customer satisfaction and improves the overall impression of the company. Chatbots are also able to process a large number of requirements at once, which means that multiple users can serve at the same time. This reduces the waiting time and enables faster customer applications.

Another advantage of chatbots and virtual assistants is the automation of recurring tasks. These intelligent programs can automate processes such as sending confirmation emails, tracking orders, or providing simple information about products or services. In this way, the time and resources of employees are released who can devote themselves to more complex tasks and interactions with customers. Chatbots and virtual assistants are able to collect and analyze data on user preferences and behavior. This information is then used to provide personalized recommendations and information. For example, if a user searches for a specific product or service, the chatbot may recommend similar products or provide information about events and offers that might be interested in. This personalized zoom increases the likelihood that the customer will find what he is looking for and improves the overall user experience (Xiao, J., Boschma, R., 2022).

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2.3 Prediction and analysis of data

Artificial intelligence also plays an important role in the prediction and analysis of data in the digital information communication technology sector. Analytical tools with artificial intelligence can identify patterns and trends in data and provide valuable information for corporate decision-making. Thanks to these tools, it is possible to better understand the behavior of users, their preferences and predict future trends. In the Slovak Digital Information Communication Technology sector, prediction and data analysis play a very important role. The use of AI in this area allows businesses to gain valuable knowledge from their data and use them to decide and plan future steps. Artificial intelligence can analyze a huge amount of data and identify patterns and trends that would be difficult to recognize by the human eye. Using machine learning and deep learning algorithms, it can predict future customer behavior, market trends, and preferences. This information is of great importance for businesses because they allow them to make informed decisions and adapt to the changing market. Prediction and analysis of data help businesses optimize their internal processes and increase efficiency. Based on data analysis, weaknesses and deficiencies in processes can be identified and proposed to improve them. This reduces costs and increases productivity, leading to better results for the company (Baek, C. H., et al 2023).

2.4 Content personalization and targeted marketing

Artificial intelligence is also extremely useful in content personalization and targeted marketing. Based on the analysis of data on user behavior, it is possible to create personalized content and offers that are relevant to that individual. This increases user engagement and the likelihood of their conversion. Targeted marketing based on the prediction of the right target groups also reduces costs and increases the effectiveness of marketing campaigns.

2.5 Challenges and opportunities

With the arrival of AI in the Slovak digital information and communication technology sector, certain challenges and opportunities also come. One of the challenges is the need to adapt to new technologies and acquire the necessary expertise and skills. However, with this challenge comes many opportunities for AI and digital professionals. The growing demand for experts with knowledge in the field of artificial intelligence opens up new jobs and opportunities for career growth. Although the use of AI in the Slovak digital information and communication technologies sector brings many advantages, there are also some challenges that need to be dealt with. It is important to be aware of these challenges while identifying the opportunities it offers (Acemoglu D., et al., 2022).

2.6 Ethical and legal issues

As the use of AI grows, new ethical and legal issues arise. For example, what is the right way to collect and process personal data, how to ensure fair and transparent decision-making by algorithms, or how to minimize the negative consequences of automation on jobs? It is important to address these issues and create regulations and standards that ensure the fair and ethical use of an artificially intelligent environment.
The need for expertise Using AI requires expertise and skills. The creation and

implementation of intelligent systems require knowledge of machine learning algorithms, deep learning, and data analysis. It is important to invest in education and training so that we have enough qualified professionals who will be able to use artificial intelligence effectively (Ulnicane I., 2022).

2.7 Risk of losing jobs

Automation and the use of an artificially intelligent environment may result in job losses in some industries. For example, how chatbots and virtual assistants will replace employees in customer support. It is important to recognize this challenge and look for ways to help employees adapt to new technologies and acquire new skills that will be needed in the digital environment. Opportunities for innovation and growth
Despite the challenges, the use of AI also brings many opportunities for innovation and growth. Businesses that can effectively use artificial intelligence can gain a competitive advantage and move into leadership positions in their industry. Creating intelligent solutions and applications can bring new market opportunities and open the door to new ways of communicating and interacting with customers (Acemoglu D., et al., 2022).

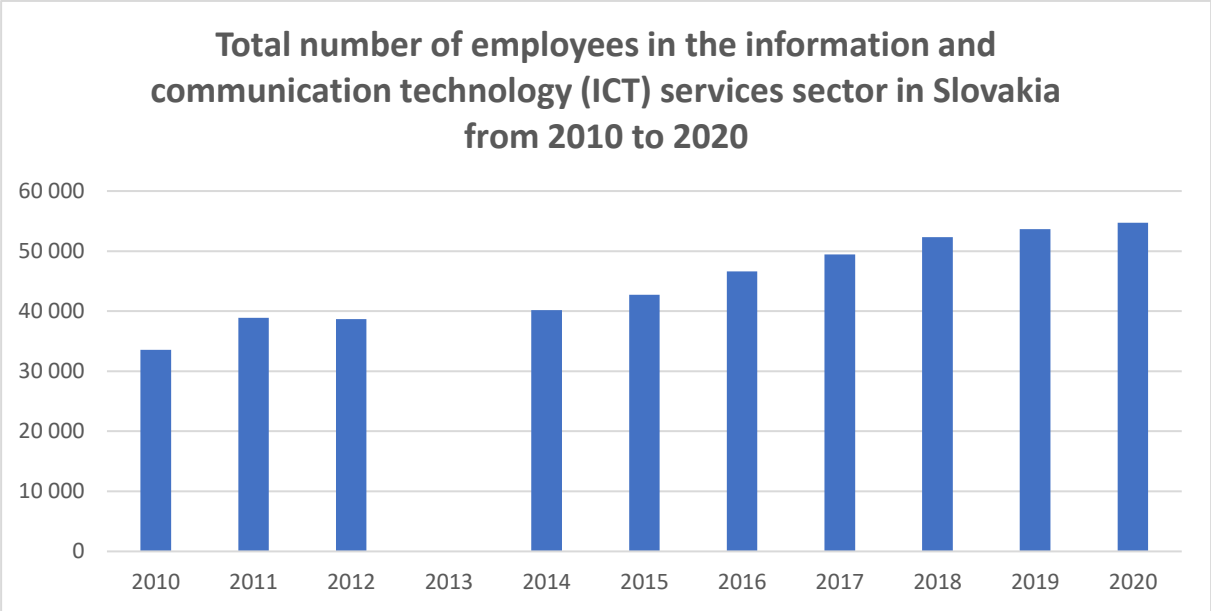
2.8 Increasing safety and security

With the growing amount of data and digital threats, information security and protection is a key factor for businesses in the digital information and communication technology sector. Artificial intelligence can significantly contribute to improving safety and security by being able to analyze and identify threats in real-time.
Intelligent cyber attack detection and prevention systems can analyze user behavior and prevent potential threats. It is also possible to use artificial intelligence in monitoring and detecting fraud and unwanted activities online.

The Services of Information and Communication Technologies (ICT) in Slovakia recorded constant growth in terms of the period from 2015 to 2020 as we can see in Graph no. 1. During this period, the number of employees working in the ICT service sector is constantly increasing. In 2015, this sector employed a total of 42,734 individuals who represented a pillar of technological progress and digital innovations. The following year, in 2016, the number of employees increased to 46 604, indicating a positive trend in the given industry in Slovakia. Until 2017, the workforce in the ICT service sector was further expanded to 49,434 employees, reflecting the growing demand for technological solutions and services. This growth continued in 2018 when the number of employees reached 52 331, evidence of the resistance and adaptability of this industry. The year 2019 recorded a slight increase in employment, while 53,676 individuals work in the ICT service sector. This growth can be attributed to the ongoing digital transformation in various sectors, which requires qualified experts to satisfy the developing technological environment. Finally, in 2020, the number of employees in the ICT service in Slovakia reached the highest point, with a total of 54,745 individuals contributing to the success of this industry. This trajectory upwards means the sector's ability to create jobs and support economic growth even in difficult times such as the Covid-19 pandemic (Statista.com, 2023).

Overall, the period from 2015 to 2020 meant a consistent increase in the total number of employees in the information and communication technology services sector in Slovakia. This growth points to the importance of the sector in the management of innovation, the promotion of digitization, and the provision of job opportunities for qualified experts in the country.

Fig. 1: Total number of employees in the information and communication technology (ICT) services sector in Slovakia from 2010 to 2020

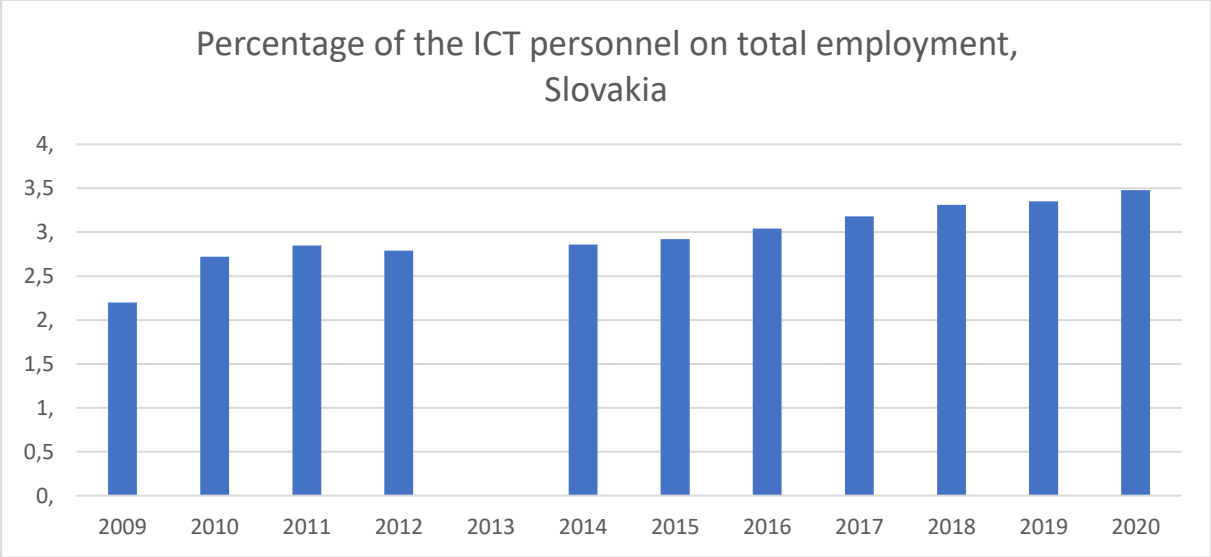


Source: authors' own calculations, data from statista.com, 2023

The percentage of ICT employees in the total job in Slovakia has seen a gradual increase over the years, reflecting the growing importance of the information and communication technology sector in the country's workforce. As we can see in chart no. 2, in 2009, ICT staff represented 2.2% of the total job in Slovakia, indicating the weaker presence of ICT technological experts in the overall workforce in Slovakia. In 2010 there was a slight increase, which represents 2.72%. The following years have shown a consistent upward trend as a percentage of staff in the ICT sector. In 2011 Slovakia reached 2.85% and in 2012 it was 2.79%. Although the data for 2013 is not available, the percentage continued to increase in 2014, reaching where Slovakia recorded 2.86% and in 2015 this trend increased to 2.92% of ICT staff from total employment in Slovakia. The year 2016 meant a significant milestone, while ICT staff represented 3.04% of the total job in Slovakia. This increase suggests increasing demand for technological experts and their key role in the management of digital transformation between sectors. This trend continued in the coming years, while the percentage of ICT employees reached 3.18% in 2017 and 3.31% in 2018. In 2019 it was at 3.35%, emphasizing the continuing integration of technology in the workforce. Finally, in 2020, the percentage of ICT employees achieved total employment of 3.48%, as evidenced by the permanent growth of this sector and its increasing impact on the overall labor market in Slovakia as well as the importance of the whole industry of information and communication technologies (Statista.com, 2023).

Overall, the percentage of ICT employees in total employment in Slovakia is constantly increasing from 2.2% in 2009 to 3.48% in 2020. This direction of rise reflects the increasing importance of digital skills and increasing reliability of the technology in different sectors and also to increased Demand for ICT experts in the workforce in Slovakia.

Fig. 2: Percentage of the ICT personnel on total employment, Slovakia

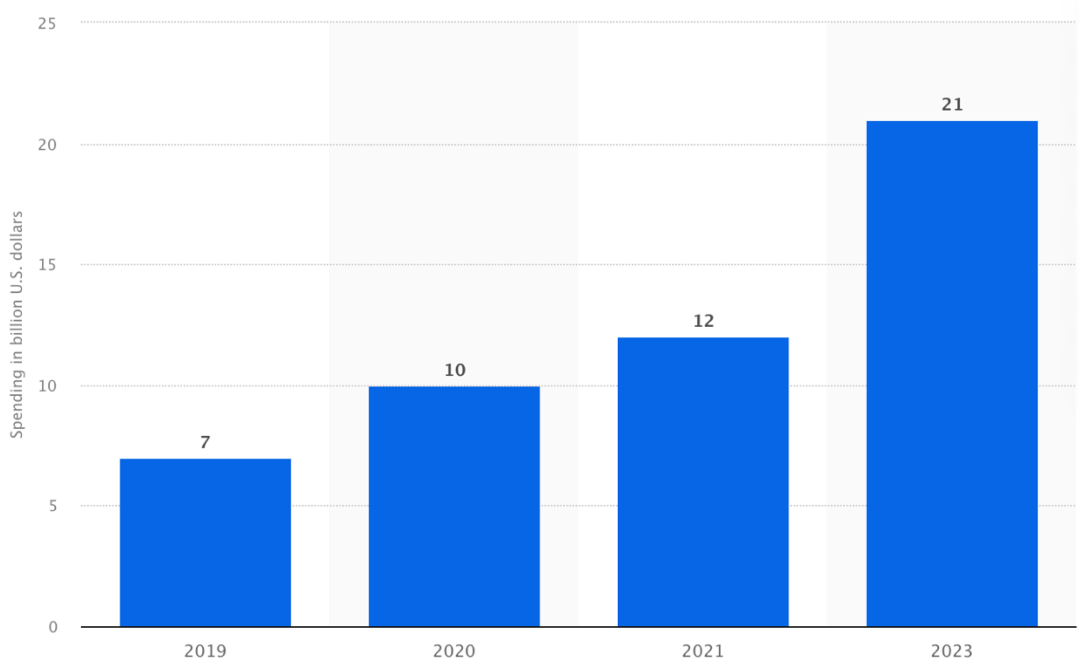


Source: authors' own calculations, data from statista.com, 2023

Spending on artificial intelligence in Europe continues to rise from 2019 to 2023, reflecting growing investment in artificial intelligence technologies and applications across the region. As we can see in Chart 3, in 2019, planned spending reached $7 billion, indicating a significant commitment to harness the potential of AI. The following year, in 2020, AI spending climbed to $10 billion, a significant increase in investment. This growth has continued in 2021, with spending forecast at $12 billion, indicating a growing focus on AI-driven innovation and digital transformation. By 2022, planned AI spending in Europe has climbed to an impressive $21 billion, marking a significant jump in AI investment. This substantial increase reflects the growing recognition of AI's potential to revolutionize industries and stimulate economic growth in EU countries (Statista.com, 2023).

These projections demonstrate a strong commitment to the advancement of AI technology and its widespread adoption across Europe. The region's growing investment in AI technologies and applications indicates a belief in the transformative power of artificial intelligence to shape the future of various sectors and drive innovation in the coming years.

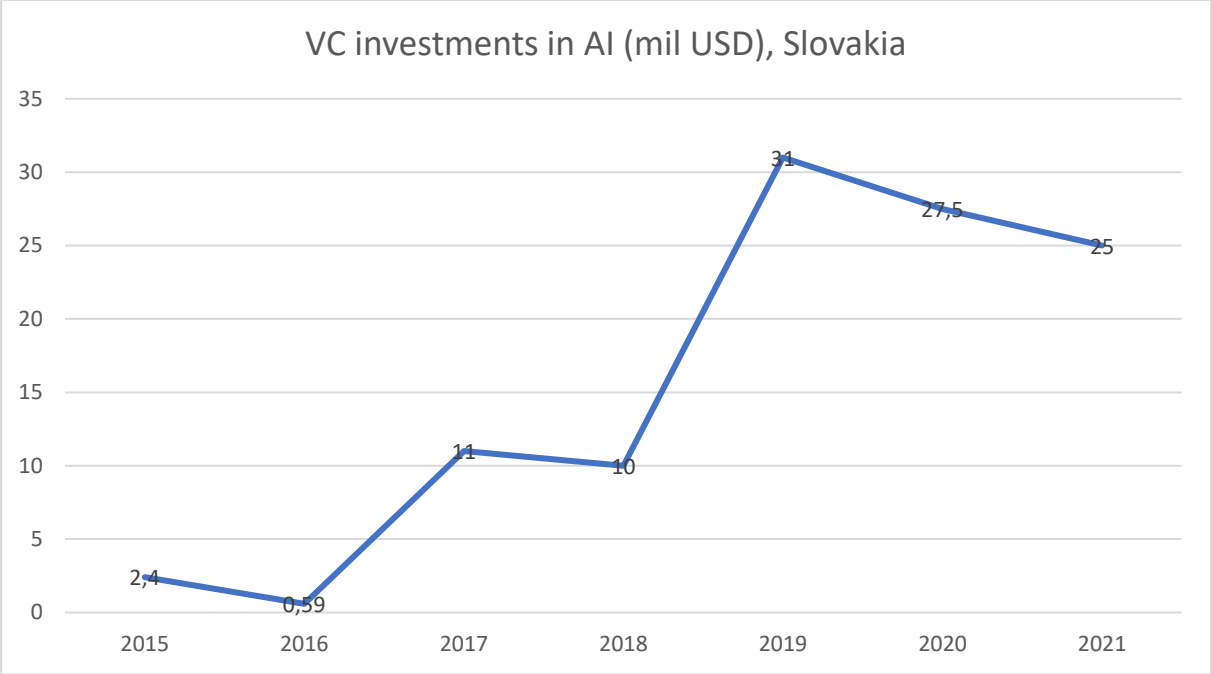
Fig. 3: Projected AI spending in billions USD, Europe by year



Source: Statista, 2023.

VC investments (Venture Capital) in AI in Slovakia have seen a fluctuating trend over the years. In 2015, they reached $ 2.4 million, suggesting only a slight interest in startups and projects AI. As we can see in Graph 4, in 2016 investments in AI fell significantly to $ 0.59 million, reflecting a temporary decline in funding and businesses in Slovakia. The following years have seen a significant increase in investment in AI. In 2017, investments rose to $ 11 million, indicating the renewed interest in the potential of technology and applications of AI in the territory of the Slovak Republic. This positive trend continued in 2018 with investments of $ 10 million. In 2019 there was a significant jump in investments in AI, which reached $ 31 million. This increase in finance demonstrated growing confidence in the AI sector and its potential for innovation and growth in Slovakia. In 2020, there was a slight decline, with 27.5 million USD projects allocated. Despite the decline, the level of investments remained relatively high, which reflects the continuing interest in supporting startups and initiatives for AI. In 2021, investments in AI in Slovakia reached $ 25 million, indicating a consistent fund of finance to the sector, although at a slightly lower level compared to the previous year. We can say that this period was influenced by the Covid-19 pandemic and all sectors were affected not only in Slovakia but around the world. Overall, investments in AI in Slovakia recorded ups and falls, but with a generally positive trend. These investments emphasize the recognition of the AI transformation potential and its growing importance in promoting innovation and economic growth in the country (OECD, 2023).

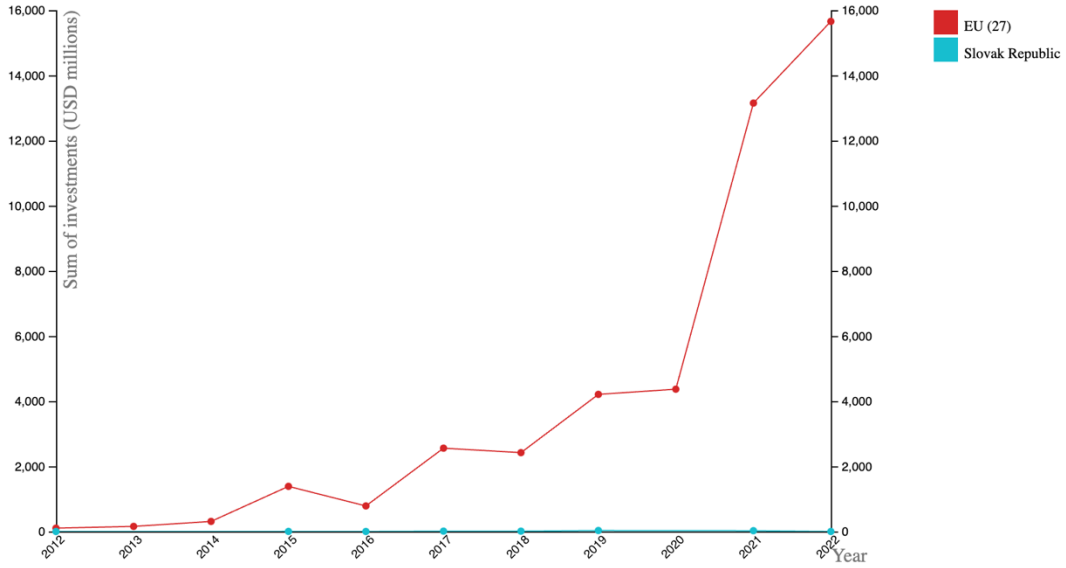
Fig. 4: VC investments in AI, Slovakia per year 2016-2022



Source: authors' own calculations, data from oecd.ai, 2023

In the following chart 5 we can see the level of investment in the European Union countries compared to the level of investment in the Slovak Republic.

Fig. 5: European Union VC investments in AI vs Slovak Republic VC investments in AI

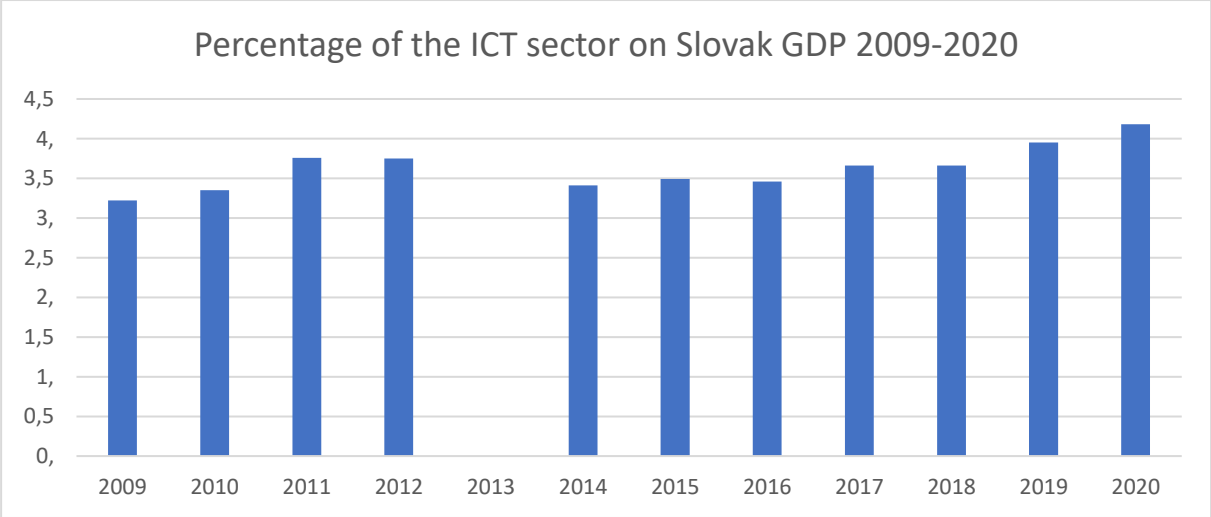


Source: oecd.ai, 2023

In the following analysis of data based on available data from Statista.com, Europa. eu, and OECD.Ai, we dealt period 2015-2020. We calculated the average percentage of the ICT sector per GDP, which reached 3.76 %. Furthermore, we found that the average investment of the VC in AI reached $ 13.35 million. In addition, we have also calculated standard deviations for this data, which provides us with information about the variability of values in these areas. The standard deviation of the current share of the ICT sector in the GDP SR

is approximately 0.2752, while the standard deviation of VC investments in AI is approximately $ 10.5233. These statistics provide us with basic data based on which we can further analyze and compare these sectors. We start with the calculation of the average percentage of the ICT sector in the Slovak GDP for 2015-2020. Subsequently, we will also calculate the average investments of the VC for AI for 2015-2020 (Statista.com, 2023).

Fig. 6: Percentage of the ICT sector on Slovak GDP 2009-2020



Source: authors' own calculations, data from statista.com, 2023

The average percentage of the ICT sector in Slovak GDP (2015-2020):
(3.49 + 3.46 + 3.66 + 3.66 + 3.95 + 4.18) / 6 = 3.76

Average venture capital investment in AI (2015-2021):
(2.4 + 0.59 + 11 + 10 + 31 + 27.5 + 25) / 7 = $13.35 million

We also need to calculate the standard deviation for each data set to measure the variability of the values around the mean.

Standard deviation of the percentage of the ICT sector in the GDP of the Slovak Republic (2015-2020):

The square of the differences from the average for each year:
(3.41 - 3.76) 2 = 0.1269
(3.49 - 3.76) 2 = 0.0729
(3.46 - 3.76)^2 = 0.0900
(3.66 - 3.76)^2 = 0.0100
(3.66 - 3.76)^2 = 0.0100
(3.95 - 3.76)^2 = 0.0361
(4.18 - 3.76)^2 = 0.1764

Average of the squares of the differences:
(0.1269 + 0.0729 + 0.0900 + 0.0100 + 0.0100 + 0.0361 + 0.1764) / 6 = 0.0756

The square root of the mean squared differences:
$\sqrt{0.0756} \approx 0.2752$

The standard deviation of the percentage share of the ICT sector in the GDP of the Slovak Republic (2015-2020) is approximately 0.2752.

Standard deviation of capital investment in AI (2015-2020):

The square of the differences from the average for each year:
(2.4 - 13.35)^2 = 104.8025
(0.59 - 13.35)^2 = 141.5809
(11 - 13.35)^2 = 5.5225
(10 - 13.35)^2 = 11.2225
(31 - 13.35)^2 = 312.4801
(27.5 - 13.35)^2 = 199.6025
(25 - 13.35)^2 = 135.9225

Average of the squares of the differences:
(104.8025 + 141.5809 + 5.5225 + 11.2225 + 312.4801 + 199.6025 + 135.9225) / 7 = 110.7741

The square root of the mean squared differences:
$\sqrt{110.7741} \approx 10.5233$

The standard deviation of VC investment in AI (2015-2020) is approximately $10.5233 million. These calculations give us the mean values and variability (standard deviation) of the two data sets corresponding to the VC investment in AI.

To compare the percentage share of the ICT sector in Slovak GDP and investments in VC in AI, we examined the trends and found out the potential of existing relationships between these two data sets. One way to do this is to plot the data on a line graph.

Line graph showing the percentage of employment in the ICT sector in relation to the GDP of the Slovak Republic and VC investment in AI for the years 2015-2020:

Year | Percentage of ICT sector in GDP | VC Investments in AI (MIL USD)

2015 | 3.49 | 2.4
2016 | 3.46 | 0.59
2017 | 3.66 | 11
2018 | 3.66 | 10
2019 | 3.95 | 31
2020 | 4.18 | 27.5

The percentage of the ICT sector in Slovak GDP has generally increased over the years from 2015 to 2020. Although there does not appear to be a strong linear relationship between the two data sets, we can make the following observations. The general upward trend in both sets of data indicates a positive increase in the contribution of the ICT sector to Slovak GDP and VC investments in AI over the years. There are periods when VC investment in AI increased, while the percentage of the ICT sector in Slovakia's GDP remained relatively stable or showed a smaller increase. This could indicate that VC investment in AI is influenced by other factors beyond the overall contribution of the ICT sector to GDP. It is important to note that this analysis is based on the limited data provided, and further analysis and statistical tests may be necessary to establish more complex relationships or correlations between the two data sets.

Conclusion

The impact of artificial intelligence on employment in the Slovak digital information and communication technology sector is inherent and brings with it many opportunities and challenges. AI applications in this sector are really broad and include content personalization and target marketing, process automation and optimization, chatbots and virtual assistants, as well as data prediction, processing, and analysis. Content personalization and targeted marketing allow you to create personalized content and targeted ads based on the analysis of user preferences and behavior. In this way, the effectiveness of marketing campaigns is increased and the user experience is improved. Automation and optimization processes in the sector of digital information communication technologies are being accelerated and made more efficient thanks to artificial intelligence. Automating content discovery and analytics enables faster and more efficient information delivery and supports better business decision-making. This also includes chatbots and virtual assistants for quick support and services through effective communication. These intelligent programs automate repetitive tasks and provide personalized recommendations and information. Prediction and analysis make it possible to better understand customer behavior and predict future trends. This information is a valuable resource for business decision-making and planning future steps. Overall, artificial intelligence in the Slovak digital information and communication technology sector brings many advantages. With its help, it is possible to improve the efficiency, personalization, and automation of various processes. However, there are also certain challenges associated with this, such as the need for constant updating and training of workers or changes in job positions due to the impact of technology or artificial intelligence. However, it is important to pay attention to ensuring ethical and legal principles, as well as the safety of using technology such as artificial intelligence. The coming years will be crucial not only for Slovakia, and the European Union but also for the whole world, the establishment of borders and also measures that regulate technologies such as artificial intelligence in a positive direction.

Acknowledgment

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Reverse Knowledge Transfer: Examples of Three Business Centers in Slovakia

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Abstract
For international organizations, business centers are a way to simplify particular tasks. While some of the centers work on many projects for the parent corporation, others are highly specialized in only one. A business center's establishment in the host nation signifies an infusion of direct foreign investment for that nation, bringing with it information, expertise, technology and, know-how. The aim of the article is to identify the reverse transfer of knowledge from business centers in the Slovakia to their parent company. In this article, we investigate three chosen business centers located in Slovakia – a country belonging to the region of Central and Eastern Europe. We use the approach of a case study based on various cases. Then, using the method of comparison, we evaluate and compare the similarities and differences of these centers. Our research has led us to the conclusion that a reverse knowledge transfer can be seen in the examples of business centers in Slovakia that we have chosen; however, this knowledge does not flow back to the parent company in two cases but instead is transferred to other centers of the given company in other countries. In one instance, we fail to notice this information transfer. This is due to the chosen center being a special kind of center for a certain multinational corporation. In one instance, we found a definite reverse transfer of knowledge in the areas of sustainability and resilience from the center to the parent firm.

Key Words
transfer of knowledge, case study, central Europe

JEL Classification: L80, L84, D80

Introduction

Many global multinational companies have included shared service centers and business centers in their corporate strategies. These centers can be characterized as organizational units that combine company resources – human capital, organizational structure, and information technology systems – to fulfill support tasks and provide services to internal customers (Gospel and Sako, 2010). Wang (2014) defines such a center as one that delivers one or more types of common services to diverse operational units more cost-effectively and efficiently.This is a type of sub-function centralization in which the tasks of several entities are merged or consolidated. Positive economies of scale, in particular, are envisaged as a result of a beneficial split (Schuppan, 2019). The competencies carried out by the centers increased along with the number of Shared service centers in the CEE area. Based on of the aforementioned, it is vital to distinguish between Business Centers and shared service centers. Business centers are centers that carry out more complicated and labor-intensive tasks (Rusiňák, 2023).

Having branches overseas offers the parent company several benefits, one of which is the knowledge transfer in reverse. The majority of the research has been on knowledge transfers from parent businesses to subsidiaries (Dunning, 2001; Rugman, 2006) rather than knowledge transfers from subsidiaries to parent companies. There is currently a scarcity of literature on reverse knowledge transmission (Kogut and de Mello, 2017). Authors Ferencikova and Hrdlickova, (2017) focused on the reverse transfer of knowledge to branches and subsidiaries in other countries.

Some of the world's challenges include social inequality, unethical business management, carbon emissions, deforestation, and climate change. As a result, more and more businesses have begun to recognize not only the bad impact of their actions on the planet, but also the following negative impact of these changes on themselves, and they are attempting to limit it as much as possible or find acceptable possibilities (KPMG, 2023). This tendency has an impact on the operations of all businesses that seek to remain competitive. This is not the case with multinational firms and their regional offices.

The article's major contribution is to define the presence of reverse knowledge transfer between corporate hubs in Central and Eastern Europe, as well as whether this knowledge transfer helps sustainability and resilience. Based on the aforementioned, we established the research question and specified the article's primary aim. The aim of the article is to identify the reverse transfer of knowledge from business centers in Slovakia to their parent company.

Research Question 1: Do the business centers in Slovakia produce new information or know-how then is shared with the parent company?
Research Question 2: Does reverse knowledge transfer increase resilience and sustainability?

1. Methods of Research

The article's processing involved the use of several scientific research techniques. In the first section of the essay, we identified and investigated the problems with shared service centers and reverse knowledge transfer, as well as characterized the literature gap, based on the collection, processing, and analysis of accessible sources of domestic and international literature. The case study approach is a crucial technique that serves as the foundation for processing the empirical portion of the article. Based on several cases, the case study methodology is used. Yin (2014) defines a case study as an empirical method that investigates a contemporary phenomenon in its actual context, especially when the boundaries between the phenomenon and the setting are not distinct and obvious. A case study as a research method includes several research approaches, each having a unique way of gathering and analyzing data. From the aforementioned, it can be concluded that the case study is more than just a method of data collection or a design element. It is an advanced research technique. We utilized the case study method with three examples to help to understand this content.

According to Kogut and de Mello (2017), most studies in which experts investigate reverse knowledge transfer use quantitative methods (particularly surveys); therefore, case studies and other more qualitative methods could be used in future research to better understand this complex and contemporary phenomenon. Sake of digesting this post, we used the case study technique using trhee example. The case study method for

investigating reverse knowledge transfer was also implemented by Ferencikova and Hrdlickova (2017).

Based on interviews with the directors of the specified facilities, we gathered data for the processing of case studies. The business centers that were chosen for this project were chosen from among those that serve the Slovakian market and engage in similar primary activities as the centers in Slovakia. The major activity of the centers – always financial centers – was a key factor in the selection process. In the three instances provided, it was also able to include a larger variety of formation years. In addition, the centers' staff counts, locations within Slovakia, and parent business headquarters all varied to some extent. We applied semi-structured interviews which took place between November 2022 and April 2023. To protect the centers' personal information, the respondents requested that their names be withheld, and this was done. The interviews lasted around 90 minutes and were performed in three different ways: face-to-face or online. The interviews were conducted, and then a thorough transcription and analysis of the material obtained – preparation of protocols from the interviews– took place. The methods allowed for the processing of lone case studies.

After that, we added further data to the information gleaned from interviews to analyze complicated case studies on the specified centers that relate to the problem we are looking into. These firms' official websites or the official websites of the organizations in charge of creating an advantageous business climate in the subject nation are where we found the information. The comparison approach was then used to examine a few different features of the problem under consideration in business centers. In the discussion, we debate our assertions and use publications that have been published in the Scopus or Web of Science. We use the synthesis approach to summarize the key results at the conclusion of the article.

2. Results of the Research

A total of 65 Shared Service Centers or Business Centers are allocated in Slovakia on September 2022 (BSCF, 2022). To process this article, in the following text, we present case studies of three selected centers. Together with other centers in the country, they participate significantly in the creation of the GDP of Slovakia, are a significant contributor to the state budget, and are one of the most important employers. In the following text, we examine the reverse transfer of knowledge from these centers to their parent companies. We provide a summary of key details regarding the business centers under examination in Table 1.

Tab. 1: Basic information about selected business centers

	BC 1	**BC 2**	**BC 3**
Establishment	2007	2017	2013
Localization	Bratislava	Bratislava	Košice
Localization of parent firm	United States	Germany	Switzerland
Main Activity	Financial services	Financial services	Financial services
Number of Employees	800	330	300

Source: processed by the authors according to official websites of examined centers

From Table 1, it can be concluded that in all cases of the centers that are the subject of this article's investigation, the main object of their activity is financial services. Diversity can

be observed in the case of the years when the centers started their activities in Slovakia as well as in the countries where their parent companies are located. One of the centers has a different location on the Slovakian market and one of the examined centers has a higher number of employees compared to the other two.

Business Center 1 (BC 1)

The parent company views the functioning of the center in Bratislava as primarily serving a strategic purpose. The Bratislava center is special and plays a special function. It encompasses both local and international activities. Slovakia is seen by corporate headquarters as being of utmost importance. Within this firm, several activities performed in Bratislava are not performed anyplace else in the globe. Within the context of a multinational corporation, specific financial actions or activities in the area of information and communication technology are carried out in the indicated nation. Then, these actions are made available on a worldwide level (Anonymous informant #1, 2022).

The BC1 of the parent company in Bratislava serves as an example of the knowledge transfer in sustainability and the engagement of centers in diversity, equality, and inclusion. Representatives of the Bratislava business center regularly present not only their results in this area but also the specific steps, procedures, and know-how of the parent company and other branches around the world, even though in this particular case it is not one of the main key activities or tasks of the Bratislava business center (Anonymous informant #1, 2022). However, given that it is a foreign company's branch, there is a requirement for producing a reverse knowledge transfer. The representative of BC1, which we looked at, said that there was interest in turning the Bratislava location into a center of excellence. This focuses the management of the center's attention even more on certain tasks, as these tasks won't be performed elsewhere for the specific multinational corporation. The aforementioned information leads to the conclusion that, in our instance of the shared services center, even in its initial form, we did not record a sizable knowledge transfer to the parent company in the case of the center's core operations. In their opinion, the creation of a center of excellence will result in a higher degree of specialization of the given center and the reverse transfer of knowledge to the parent company will be even less than before (Anonymous informant #1, 2022).

Business Center 2 (BC 2)

The multinational corporation of BC 2 has constructed its business center in Bratislava to serve the Slovakia market since 2017. The parent company's decision to establish a center in Bratislava was motivated by the need to streamline operations so that they could be centralized there. The parent company views its business center as serving several purposes. Offering financial services is one of their main specialties, but they also deal with taxes, buying, controlling, automation, and robotization. The gradual emergence of a center of excellence for specific processes has been brought about by the growth of skills and the rising added value offered by people. In general, it can be stated that the goal of this business center is to simplify processes and become a business partner for other countries (Anonymous informant #2, 2023).

Processes in this area are constantly being improved and simplified since the BC2 business center in Slovakia is highly specialized in offering accounting services. They are now working very hard at the Bratislava facility to automate and robotize the accounting tasks they carry out. They were able to automate certain common accounting tasks in this

way. Their expertise was so cutting-edge that these procedures were then introduced and put into use in other centers, where those centers provide the same or equivalent services to other nations. The BC2 center in Bratislava first automated several operations, and these activities were later automated either globally or individually, for example, in the Shanghai business center, which offers financial services to Asia (Anonymous informant #2, 2023).

Although the BC2 business center in Bratislava has succeeded in creating procedures to make the activity more productive, research and development as a whole are not covered by this center. Chemical research and development centers are those that are situated outside of Slovakia. The aforementioned center of excellence, which is dedicated to dealing with processes, improving their efficiency, and automating them to the greatest extent feasible, is now being built in Slovakia (Anonymous informant #2, 2023).

Business Center 3 (BC 3)

The directors of the third investigated firm were inspired to establish a BC3 business center in the nation by the presence of manufacturing facilities on Slovakia's market and the original proposal to establish a modest regional center there. In the instance of BC3, since its founding in 2013, a dramatic increase in activity may be seen between 2016 and 2019. The center stabilized after this year. Conclusion: From the parent company's perspective, this center is a tool for accomplishing financial objectives by lowering costs for global partner firms. They take over processes in their activities that they can take over within their competencies and do them centrally with lower costs. The services provided by BC3 are so specialized that BC3 in Košice has become a center of excellence. BC3 is currently a center of excellence for robotics and automation of financial processes (Anonymous informant #3, 2023).

There is a worldwide team of roughly 50 professionals in the Košice Center. It is not a squad made up entirely of citizens from Slovakia, though. There are workers there from Colombia, India, and other nations. The team's overall objective is to automate financial procedures. The group works along with other centers of multinational corporations abroad while operating inside the Košice Center of excellence (Anonymous informant #3, 2023). As part of this, the SPA continues process initiative was created, the essence of which is process improvement. In Slovakia, they also have the so-called master black – an expert in improving processes in the field of finance. It is devoted to streamlining the creation of reports, accounting of invoices, visualization of data, and consolidation of activities. They also have a team that travels to the parent company. They present their findings there and train workers regarding processes and methodology. Through the methodology, they create skills in these workers to carry out new processes. In the Košice center, they don't undertake traditional research and development. They are primarily interested in information and communication technology, which helps the efficiency of the center's operations (Anonymous informant #3, 2023).

3. Discussion

There are certain parallels and variations between the aforementioned business centers that operate in the market of Slovakia, both in terms of their fundamental characteristics, which are enumerated in Table 1, and in the situation of reverse knowledge transfer.

Table 2 provides a summary of the fundamental characteristics relating to the reverse transfer of knowledge from the institutes we looked at.

Tab. 2 Summary of the characteristics relating to the reverse transfer of knowledge from the selected business centers

Business Center	**Reverse knowledge transfer**
BC1	- Diversity, equality, inclusion ; - This is not the main activity of the center ; - Results and know-how are presented to the parent company and branches around the world;
BC2	- Automation of accounting processes; - Main activity of the center; - Results and know-how are implemented globally or in selected branches that perform services for other regions;
BC3	- Automation of financial processes; - The main activity of the center; - Results and know-how are presented in the parent company, the Slovak team trains employees in the parent company regarding the methodology they implement.

Source: processed by authors

In all three cases, a reverse transfer of knowledge can be observed from the business center that the given multinational corporation has in Slovakia. However, it is not possible to unequivocally confirm the reverse transfer of knowledge as defined by the authors Kogut and de Mello (2017). Authors define reverse knowledge transfer as the opposite flow (flow from the subsidiary to the parent company). In the context of transnational corporations, subsidiaries have emerged as vital creators of knowledge and competencies. To remain competitive in a global business environment, transnational corporations must effectively collect and implement the knowledge of their geographically dispersed network of subsidiaries (Sinai and Heo, 2022). The subsidiaries have different roles in the corporations: some are supposed to commercialize products and services, others conduct research and development, and some manufacture products. The subsidiaries can either utilize the existing corporate knowledge and potentially adapt it if needed or generate new knowledge and create new skills (Mudambi et al., 2013). Based on our research, in the case of business centers, knowledge transfer can be observed not only to the parent company but also to branches that the multinational corporation has in other countries.

Special consideration should be given to BC1 in this aspect. Based on the case study that has been provided, it can be said that even in a tiny European nation, there is a center that engages in activities that promote sustainability and resilience. In this instance, not only does the researched center give it extra attention, but it also shares its knowledge with other centers within the firm and the parent company. The concentration of the centers on initiatives in the realms of sustainability and resilience cannot be seen in the other two situations. However, by simplifying and automating some tasks that are then moved to the parent business or sister firms, they help to lower the need for labor inside the companies, which in turn reduces emissions from office space, foreign national transportation, and other sources.

The steady creation of centers of excellence from traditional shared service or business centers makes a significant contribution to the possibilities of knowledge transfer to other divisions. In all three of the aforementioned situations, business centers develop into centers of excellence that use trained personnel to generate higher added value and make every effort to automate conventional, straightforward tasks as much as they can. They have a rare chance to develop expertise or simplify procedures at the centers of excellence in a way that will be appealing to multinational corporations or other centers within the business. However, it is important to note in this context that the three business centers that we looked at may have been unique instances on the market, and the results drawn from our analysis might not apply to other centers in Slovakia. This is the limitation of our research. There may be additional centers where there is no reverse transfer of information, or knowledge is transferred in areas other than financial centers that we did not uncover in the cases we looked at. The analysis of other businesses that operate in Slovakia and the determination of the reverse knowledge transfer between them and their parent company can be included in the future expansion of our research, which can then be compared to earlier findings.

Conclusion

In addition to the often-discussed advantages of increasing efficiency and ensuring higher competitiveness of multinational corporations, business centers also represent an advantage for their parent company that results from the possible reverse knowledge transfer. Based on the examination of the available literature, we identified a literature gap in the reverse transfer of knowledge from business centers to parent companies. Using three examples of business centers operating in Slovakia, we investigated whether such a transfer exists and what its specifics are.

It may be inferred from the three unique instances of business centers functioning in Slovakia that there is no common model for the transfer of knowledge backward between business centers and their parent company. The ability to transmit knowledge backward relies on the particular center and the overall organizational structure of the business (multinational corporations, branches, centers, etc.). In the situations we looked at, we saw a reverse knowledge transfer happening between the center and other centers the firm has abroad as well as between the center and the parent company. In the two instances of the observed centers, the information transmission is connected to the primary function of the specified centers – financial services. One of the analyzed situations even allowed for the definition of knowledge transfer in the areas of sustainability, resilience, diversity, equality, and inclusion. In this context, it is necessary to draw attention to the fact that all three of the business centers that were the focus of our investigation grew out of modest shared services hubs to become centers of excellence that employ highly skilled workers and generate higher added value, which also helps Slovakia's economy expand.

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Modeling the Excess Return of ČEZ a.s. Share

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Abstract

To evaluate the excess return of ČEZ a.s. shares, we propose a multifactor asset pricing model derived from the Asset pricing theory. In addition to market risk, factors that may affect the performance of ČEZ a.s. shares are added. These are price of electricity, price of natural gas, price of CO2 emission allowances and the industrial production index. To take into account a possible persistence of the excess return and external shocks, autoregressive and moving average terms are also included into the model. Thus, from an econometric point of view, it is an ARMAX model. We verify the validity of the model on monthly and quarterly data from 9-2007 to 4-2023. The results of our analysis show that the proposed model can explain exceedingly well the variability of excess return of ČEZ a.s. stock in both monthly and quarterly time frequencies.

Key Words
excess return, ČEZ a. s. stock, asset pricing theory, CAPM model, ARMAX model

JEL Classification: C21, R13

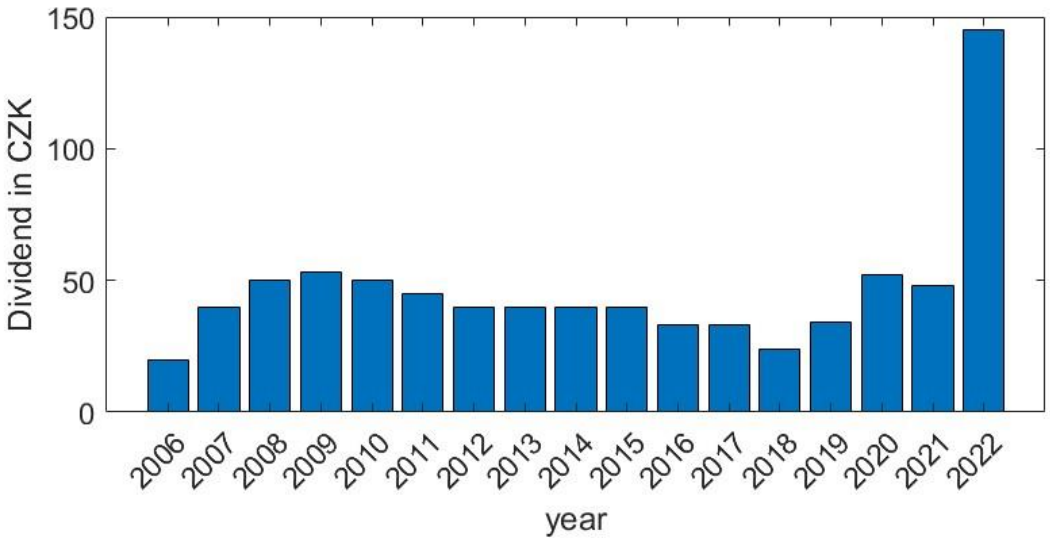
Introduction

ČEZ a. s. is a typical utility firm in the Czech Republic. It is an energy giant that owns the ČEZ Group whose main business activities are the production, trade and distribution of electric and thermal energy, trade and sale of natural gas as well as coal mining. Its main shareholder is the Czech government who holds a share of almost 70% of its shares. Given the liquidity of the Prague Stock Exchange, ČEZ a.s. shares are the most traded security there. The average number of its trades exceeds 1000 a day and the average daily trading volume is over CZK325mil over the last 12 months. ČEZ a.s. has also been paying regular dividends to its shareholders regularly since 2006 up to now, see Figure 1. Though the interest of individual investors in investing into stocks may not be as widespread as in more developed economies since the tradition is not as deeply rooted here, the shares of ČEZ a.s. are attractive for both domestic and foreign institutional investors from the point of view of both dividend income and capital gains.

Utilities stocks tend to offer investors stable and consistent dividends. Their price is often less volatile than the overall equity markets. Hence, the performance of the stock of these companies is a main focus of researchers and practitioners and many studies on the performance of utilities stocks and the factors which can affect their returns around the globe, for example Oberndorfer (2009), McDonald (2010), Da (2017), Ji (2019), Reboredo and Ugolini (2018), Zhang (2020), and Pham et al (2023). There are numerous analyses in the form of qualification theses at universities across the country on the identification of factors that can influence the price of ČEZ a.s. stock and their returns, for example Kajurová and Dvořáková (2016). As ČEZ a.s. shares are a prominent component of the Prague Stock Exchange, banks and brokers also regularly provide investors with analyses and forecasts of its future development. As a regional stock, it has not attracted much attention either from practitioners or from theorists. There is a clear lack of more qualified research on what can influence the price of ČEZ a.s. stocks or their returns. In

order to fill this gap in the literature, we propose a model to measure the impact of factors which can reasonably influence the excess returns of ČEZ a.s. share within the framework of the well-known CAPM model. We extend the basic version of this model with other factors that may affect both the supply and demand of electricity produced by ČEZ a.s.. We will test our model with data available from 9-2007 to 4-2023 for monthly and quarterly data. Based on the results obtained, we will draw some conclusions about the excess return on ČEZ a.s. share.

Fig. 1: The evolution of dividends paid by ČEZ a.s. in 2006–2022



Source: authors' calculations in Matlab, company (CEZ)

1. Methodology

The basic theoretical framework for modeling the excess return of ČEZ a.s. stock is the capital asset pricing model where the expected rate of return of an individual security $E(r_i)$ is a function of systematic risk reflecting the volatility of its return. This model is called the Security Market Line (SML) and it can be formalized as

$$E(r_i) = r_f + \beta_i[E(r_m) - r_f], \tag{1}$$

where $E(r_m)$ is the expected return of the market portfolio, r_f is the risk-free rate and β_i is a measure of the systematic risk of this security, see Barucci and Fontana (2017). Inserting the intercept in equation (1) gives a modification of SML which, also known as the single index model

$$E(r_i) - r_f = \alpha_i + \beta_i[E(r_m) - r_f] + e_i, \tag{2}$$

where α_i is the excess return that is specific to the security, and e_i is the non-systematic risk. The excess return of ČEZ a.s. stock may be influenced by other factors specific to the electricity market. These can be the market price of electricity, its demand and cost of its production. If these factors are added to model (2), we obtain the multifactor version of the asset pricing theory.

$$\mathrm{E}(r_i) - r_f = \alpha_i + \beta_i[E(r_m) - r_f] + \sum_{j=1}^{p} \gamma_j X_j + e_i, \tag{3}$$

where X_j is the j-th factor from the total number of factors *p.* Let's set $R_i = E(r_i) - r_f$ as the excess return of stock i and $RM = E(r_m) - r_f$ and if we assume that the excess return has a certain persistence and that the effect of external shocks can be carried over to the next period, the model gets the following specification by adding these two terms:

$$R_i = \alpha_i + R_i(-1) + \beta_i RM + \sum_{j=1}^{p} \gamma_j X_j + e_i + \mu e_i(-1). \quad (4)$$

Model (4) is an ARMAX model, where the exogenous variables are the excess market return and other factors that influencing the excess return of ČEZ a.s. shares.

2. Data

We verify the validity of model (4) using data available from the Bloomberg database. We use monthly and quarterly data. The reason is that both monthly and quarterly time horizons are important for investment decision-makers and this allows us to analyze how different factors can affect the excess return with respect to the different length of the time span. The data cover the period from 9-2007 to 4-2023. The excess return of ČEZ a.s. stock *R* is computed as the year-to-year change in its price minus the risk-free interest rate for the corresponding period. In this research, the overnight indexed swap rate is used as the risk-free rate. It is a fixed/float interest rate swap where the floating leg is computed using a published overnight index rate. The index rate is typically the rate for overnight unsecured lending between banks. The " risk-free" nature of these contracts is due to their short maturity (1 month or 3 months) and the fact that they are derived from the interbank market, where counterparty risk is low, and thanks to central bank supervision. They are also actively traded and therefore liquid contracts. The excess return on the stock market return *RM* is calculated in the same way from the Prague Stock Exchange index PX. Other factors included in the model are the future price of electricity (ELEC), the price of natural gas (GAS), the price of CO2 emission allowances (CO2) and the index of industrial production (IPV). The data on industrial production are primarily provided by the Czech Statistical Office, they are called the monthly and quarterly basic index of industrial production, respectively. The inclusion of these variables can be observed in works of Adi (2022), Ji et al. (2019), Mo et al. (2012). As electricity, natural gas and emission permits are priced in euro, we also use the series of EUR/CZK spot exchange rate[1] to convert these series into corresponding series in CZK. Then we compute the corresponding series of year-to-year changes. All the year-to-year changes of variables are computed as follows

$$\Delta Z_t = \frac{Z_t - Z_{t-1}}{Z_{t-1}} . 100, \quad (5)$$

where Z_t is the value of a variable at the current period, Z_{t-1} is the value of a variable at the same period of the previous year. The descriptive statistics of the time series used in the econometric analysis are presented in Tables 1 and 2. The development of the price of ČEZ a.s. shares and its returns can be observed in Figures 1 and 2. All computational work was done with Matlab.

[1] A spot exchange rate is the current price an investor can exchange one currency for another, for delivery on the earliest possible value date.

Tab. 1: Descriptive statistics of monthly data

Characteristic	R	RM	ELEC	GAS	CO2	IPV
Mean	-2.071	-1.841	8.825	9.904	34.154	1.298
Median	-2.098	0.506	-4.270	6.941	10.789	2.822
Minimum	-59.415	-80.181	-99.726	-113.189	-85.954	-42.478
Maximum	59.836	51.439	175.416	195.364	710.513	43.860
25 percentile	-16.055	-12.102	-18.845	-29.181	-23.788	-1.516
75 percentile	13.851	9.321	22.923	31.615	43.497	5.879
Std deviation	24.766	22.904	48.505	63.770	126.951	9.330
Skewness	0.120	-1.003	1.390	0.932	3.783	-0.837
Kurtosis	2.954	5.373	5.269	4.070	18.091	8.914
Num of Obs.	175	175	175	175	175	175

Source: authors' calculations in Matlab

Fig. 2: The evolution of monthly CEZ stock price and its returns

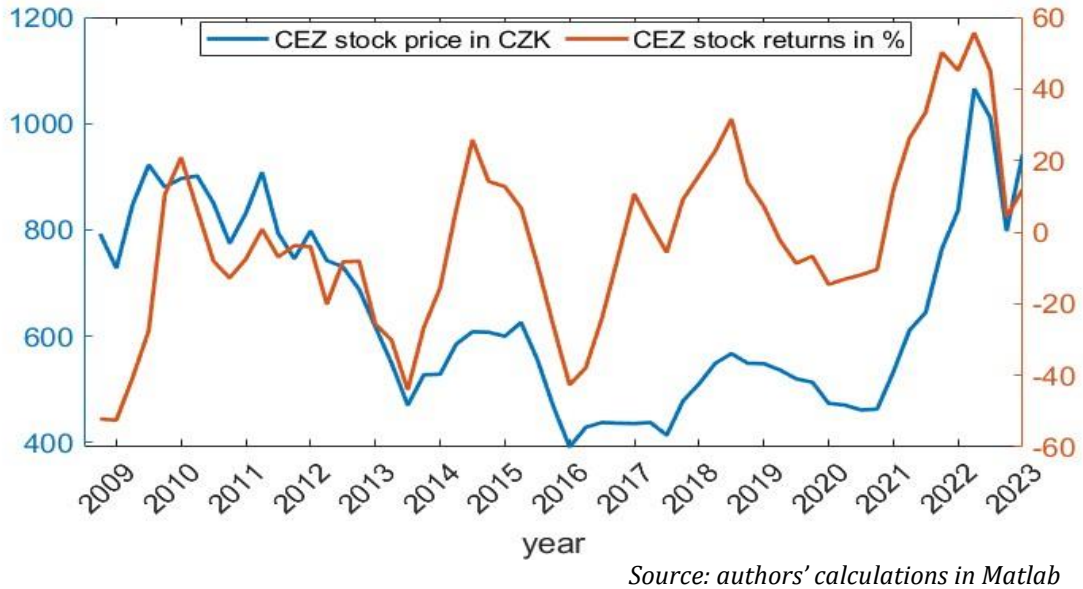
Source: authors' calculations in Matlab

Tab. 2: Descriptive statistics of quarterly data

Characteristic	R	RM	ELEC	GAS	CO2	IPV
Mean	-2.279	-1.886	8.485	9.700	30.612	1.704
Median	-5.016	0.396	-4.498	6.760	8.638	2.714
Minimum	-53.147	-74.353	-66.728	-102.384	-79.869	-15.449
Maximum	54.196	44.909	162.739	181.124	640.871	16.500
25 percentile	-15.032	-11.091	-17.716	-30.405	-24.225	-1.332
75 percentile	11.672	7.081	21.360	26.343	37.922	7.015
Std deviation	24.359	22.323	47.669	62.927	118.545	6.917
Skewness	0.108	-1.119	1.502	0.975	3.960	-0.678
Kurtosis	2.890	5.737	5.352	4.019	19.941	3.077
Num of Obs.	58	58	58	58	58	58

Source: authors' calculations in Matlab

Fig. 3: The evolution of quarterly CEZ stock price and its returns



Source: authors' calculations in Matlab

3. Results of the Research

Prior to the econometric analysis, a unit root test was carried out to ensure the stationarity of the time series used in the following estimation. The standard augmented Dickey-Fuller test was applied. The testing results of this test for both monthly and quarterly frequencies are presented in Table 3. The results in Table 3 show that all time series generated for the empirical verification of our model are stationary and they can be used as input data for the ARMAX model.

The estimation of coefficients of our ARMAX model was performed in Matlab and it strictly follows a standard methodological procedure, see Wooldridge (2001). First, the model for monthly data was estimated. In addition to the intended variables, two dummy variables D01 and D02 were also included into the model specification. They are intended to capture the sharp decline due to the financial crisis in 9-2008 and its recovery a year later. However, in the case of the Czech Republic, this fall occurred one month later, i.e. in 10-2008, as did the recovery. The estimation results are shown in Table 4. Except the intercept and the coefficients for GAS and CO2, all other estimated coefficients are statistically significant at the level $\alpha = 0.95$ including the dummy variables indicating that their inclusion is fully justified. Furthermore, the value of the coefficient of determination R2 = 0.9345 and the Durbin-Watson statistic DW = 2.04 show that the model has high predictive power and there is no autocorrelation in the residuals.

Tab. 3: Results of unit root test of time series

Series	Monthly Data		Quarterly Data	
	Test stat	p-value	Test stat	p-value
R	-3.087	0.0022	-2.774	0.0064
RM	-4.231	0.0000	-6.965	0.0000
ELEC	-3.415	0.0007	-4.553	0.0000
GAS	-4.215	0.0000	-4.830	0.0000
CO2	-4.957	0.0000	-5.481	0.0000
IPV	-5.829	0.0000	-3.485	0.0008

Source: authors' calculations in Matlab

Tab. 4: Estimation results with monthly data

Variable	coefficient	SE	t-stat	pval
C	-0.254	0.548	-0.464	0.643
R(-1)	0.783	0.037	21.437	0.000
RM	0.173	0.035	4.955	0.000
ELEC	0.078	0.032	2.460	0.015
GAS	-0.030	0.021	-1.397	0.164
CO2	0.002	0.005	0.491	0.624
IPV	-0.129	0.064	-2.014	0.046
D01	-34.325	6.988	-4.912	0.000
D02	18.879	6.713	2.812	0.006
MA	0.358	0.080	4.497	0.000

Source: authors' calculations in Matlab

We proceeded in a similar way for the quarterly data. The only exception is the inclusion of five dummy variables into the specification: D01 for Q4-2008 for the 2008 crisis, D02 for Q3-2013, D03 for Q4-2017, D04 for Q2-2022 and D05 for Q1-2023. The estimation results for quarterly data are shown in Table 5. In this case, all estimated coefficients except the one for CO2 are statistically significant at level $\alpha = 0.95$ and higher. the value of the coefficient of determination R2 = 0.9185 and the Durbin-Watson statistic DW = 1.982 indicate similar conclusions as in the case of monthly data.

4. Discussion

The results of the econometric analysis in Tables 4 and 5 show that although the estimated α is negative in both cases, it is insignificant in the shorter horizon but is significant in the longer one. This does not mean that the investing in ČEZ a.s. share is associated with a negative excess return. Rather, it can be explained by the dividend that ČEZ a.s. regularly pays to its shareholders. As for β, it is positive and significant, but much lower than one, which means that ČEZ a.s. stocks do not share so much systemic risk with the stock market. It also confirms the less volatile nature of utilities stocks. The estimated value of β consistent with the values of beta of various utilities firms across the world in McDonald et al (2010). The coefficients of the AR and MA terms are positive, indicating that there is a significant persistence in the excess return of ČEZ a.s. stock and that the effect of external shocks can be extended to the next period. The value of the AR term in the quarterly data model is lower than the one in the shorter time span version indicating that it dies out faster in the longer time span. The opposite is true for the MA term. The impact of the electricity price on the excess return of ČEZ a.s. stock is positive in both cases, but it is higher with quarterly data. This may be due to the fact that it takes time for the price factor to be reflected in the company's performance. This result is consistent with the finding of Lin and Chen (2019). The same is true for the cost factor represented by the price of natural gas. While in the short term, the effect of this factor may not be visible in the financial performance of the company, in the longer term it negatively affects the performance of the excess return of ČEZ a.s. shares. This inference is in agreement with the results of Pham et al (2023) and Ordu and Soytas (2016) about the time varying connection between the natural gas price and returns of utilities stocks. Regarding the role of the price of CO2 emission allowances, the estimated coefficient of this factor is very small and statistically insignificant indicating, which indicates that this factor has no impact on the excess return of ČEZ a.s. stock. The comparison of our result with those of other studies is rather challenging as the effect of CO2 emission allowances on

performance of energy producing firms is ambiguous. While Mo et al (2012) claim that it is time-varying, i.e. it was insignificant at the beginning and becomes more effective as the CO2 emission related measures grow in severity over time, Koch and Bassen (2013) have found that for majority of power producers CO2 price movements are not a relevant risk factor. Tian et al (2016) have also come to a similar conclusion while according to Ji et al (2019) the effect of CO2 price on the performance of the electricity producing firms depends on their specific power generation mix and carbon intensity. As far as the demand for electricity is concerned, it is represented by the industrial production as we assume the higher it is, the more electricity the industrial production (the economy as well) will consumes, the result is interesting. In the shorter time horizon, the demand has a negative impact on the performance of the excess return of ČEZ a.s. stock. In the longer term, however, its impact becomes positive. In both cases, the effect is statistically significant. The explanation may be that wholesale customers may have long-term contracts with ČEZ a.s. for the supply of electricity. This result is in contrast with the finding of Da et al (2017) who argue that rising demand for electricity may lead to a decline of returns of stocks in the future.

Tab. 5: Estimation results with quarterly data

Variable	coefficient	SE	t-stat	pval
C	-4.066	1.252	-3.248	0.002
R(-1)	0.241	0.074	3.274	0.002
RM	0.239	0.071	3.349	0.002
ELEC	0.365	0.073	5.033	0.000
GAS	-0.145	0.048	-3.045	0.004
CO2	-0.006	0.012	-0.519	0.606
IPV	0.399	0.183	2.186	0.034
D01	-23.183	10.496	-2.209	0.032
D02	-20.461	8.226	-2.487	0.017
D03	36.807	8.753	4.205	0.000
D04	23.085	8.458	2.729	0.009
D05	21.797	8.315	2.621	0.012
MA	0.835	0.142	5.864	0.000

Source: authors' calculations in Matlab

Conclusion

We proposed a model based on asset pricing theory for the excess return of ČEZ a.s. share. In addition to the market risk factor, we included in the model other factors that may affect profits, costs of production and demand for electricity – the main product of ČEZ a.s. - into the model. The model then was verified with appropriate monthly and quarterly data for the time period from 9-2007 to 4-2023. The results of the verification show that the model has extremely high predictive power and produces interpretable outputs which are in line with common economic wisdom. Therefore, it can provide some important insights into how various factors can influence the excess return of ČEZ a.s. stock. We assume that the results are encouraging so this approach can be extended to examine excess returns of other stocks from various markets in the region as well as in the further abroad.

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The Impact of Import and Export on the Domestic Trade of Fruit in the SR

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Abstract: The aim of the paper is to find out the impact of import and export of fruits on the domestic market through the trends of import and export of selected fruits in the Slovak Republic. The period under study is 2010-2022. The data are from the DataCube database (SUSR), Situational and Outlook Commodity Reports for Fruit and Vegetable Commodities (VUEPP) and Eurostat. Descriptive analysis and regression analysis are used in the paper. During the period under review, the consumption of southern fruits exceeded that of temperate fruits. The amount of fruit imported was higher than the amount exported. Twice as much southern fruit was imported into Slovakia as temperate fruit in the period under review. Bananas, apples, mandarins and oranges accounted for the largest share of fruit imports. Imports of all fruits are on an increasing trend. As far as fruit exports are concerned, exports of temperate and southern fruits from Slovakia were almost balanced during the period under review. Apples and bananas accounted for the largest share of fruit exports. Exports of all fruits, except plums and sloes, are on an increasing trend.

Key words: *import of fruit, export of fruit, consumption*

JEL Classification: D02, D12

Introduction

Global trends and movements in the world present major challenges and also important opportunities for individual economies. Globalization as an economic phenomenon has greatly influenced the growth of international trade, (Dubravska - Sira, 2015). Higher and more stable relative trade advantages are found in bulk primary raw agricultural commodities and less in ready-to-consume foods, resulting in competitiveness gaps in food processing and international food marketing, (Bojnec, Forto, 2009). There has been shown to be a link between the organization of the food supply chain and the type of target markets, with supermarket-oriented exporters more likely to buy through vertically integrated channels, (Hou at al., 2015). Stagnation in the growth trajectory of exports has triggered significant changes in the structure and strategy of the private fruit exporter sector. It is argued that increased vulnerability is not simply a function of small-scale inefficiencies per se. Rather, an important explanatory factor for the increasing failure rate among fruit packers is the nature of economic power relations, which tilt heavily in favour of the exporting companies, (Murray, 1997).

Micronutrient deficiencies, undernutrition and overnutrition coexist in many countries undergoing nutritional transition. Addressing these challenges simultaneously would require transformational changes in a country's food system. The overall composition of diets is poor, with lower availability of fruits and vegetables and higher supply of sugar and oils compared to regional and global averages. Domestic production is low for most food groups, and so heavy reliance on imports from other countries bridges the energy supply gap, (Zakari at al., 2023). If a country is unable to secure sufficient quantities of

quality food from the domestic market for various reasons, it is necessary to import food from abroad, (Škamlová, 2022).

The boom in foreign trade in fruit and vegetables also brings with it negatives. When harvesting fruit for export, it is important to capture the appropriate stage of ripeness. The fruit transported should have sufficient firmness for transport and sufficient ripening potential to satisfy consumers. Some fruits never ripen or may overripen and be too soft and subject to rot, (Zerbini, 2009). The fruit also needs to be treated. For tropical fruits exported from Thailand to international markets, a two-stage vapour heat treatment (VHT) is used to disinfest oriental fruit fly (Scrimartpirom et al., 2023). Current imports of fruits and vegetables (FV) generate large amounts of greenhouse gas (GHG) emissions, some of which could be avoided. Local food production has been recognized as an environmentally feasible alternative production option and could help reduce GHG emissions (Michalsky-Hooda, 2015). As a result of climate change, fruit production is expected to decline and consumer surplus is expected to decrease. (Kan et al., 2023). The South African fruit industry is concerned about increasing losses, both financial and loss of actual production, related to temperature breaks in the export cold chain (Fedeli at al., 2022). People also returned to greater use of local food production during the COVID-19 pandemic. During this period, reduced exports and imports and lack of activity due to the disruption of the international tourism economy severely impacted food security in many Pacific Islands. People often returned to natural resources to provide for themselves, their families or to generate income. Travel vending would be an alternative food delivery system for the people of Bora-Bora during a global crisis that could prove sustainable in the aftermath of this pandemic (Minier at al., 2023).
Food consumption is influenced by prices and consumer income. Poor people are the most affected by the high prices of goods. (Cudjoe, et al., 2010). The increase in food prices and its effects were also transferred to local food prices, and especially to local consumers. There is a greater transmission of food shocks from world food prices to local food prices in low-income countries compared to high-income countries (Bekkers, et al., 2017). The high price growth in 2022 was mainly due to the increase in the price of goods belonging to the two main expenditure groups of households in Slovakia – food and non-alcoholic beverages as well as housing and energy, which together make up 47% of expenditure. Food prices increased by 19.3%. The biggest impact on household expenses was the overall increase in the prices of meat (18%), milk, cheese and eggs (20%), bread and cereals (21%), oils and fats (42%), fruit (10%), vegetables (20 %). On average for 2022, the CPI increased for households of employees by 12.6%, for low-income households by 13.1% and for households of pensioners by 13.9% (ŠÚSR, 2023).

1. Methods of Research

The aim of the paper is to find out the impact of import and export of fruits on the domestic market through the trends of import and export of selected fruits in the Slovak Republic. The data for the analysis are drawn from the Statistical Office of the Slovak Republic, the DataCube database, the Research Institute of Agricultural and Food Economics, the Situation and Outlook Commodity Reports for fruit and vegetable commodities and Eurostat for the period 2010-2022.

In this paper, descriptive analysis is used to describe the actual state of foreign trade in fruit. Regression analysis is used to quantify the impact of imports and exports on domestic fruit consumption and the effect of prices on import and export.

Linear model of consumption for fruit

$$Q = a + b_1.I + b_2.E; \qquad I = b_1.P_I \ ; \qquad E = b_1.P_E \tag{1}$$

Exponential model of consumption for fruit

$$Q = a.b_1^I.b_1^E; \qquad I = {b_1}^{P_I} \ ; \qquad E = {b_1}^{P_E} \tag{2}$$

Power model of consumption for fruit:

$$Q = a.I^{b_1}.E^{b_2}; \qquad I = {P_I}^{b_1} \ ; \quad E = {P_E}^{b_1} \tag{3}$$

Where Q is fruit consumption in the Slovak Republic, I is import of fruit to the Slovak Republic in thous. t; E is export of fruit from SR in thousand t; P_I price of import; P_E price of export; a is intercept, b_1, b_2 are regression parameters

Regression analysis is used to estimate the trend of export and import of selected fruits.

$$I_i = a + b.t; \qquad E_i = a + b.t \tag{4}$$

$$I_i = a.b^t; \qquad E_i = a.b^t \tag{5}$$

$$I_i = a.t^b; \qquad E_i = a.t^b \tag{6}$$

Where I_i is import of the *i*-th fruit; E_i is export of the *i*-th fruit; a is intercept, b is regression parameter, t is time

2. Results of the Research

Impact of imports and exports on domestic consumption

The European Union imports fruit mainly from Egypt, Israel, Jordan, Lebanon and Morocco. The Slovak Republic imports fruit from the European Union, in particular bananas, citrus fruits, apples, pears and quinces, grapes, melons, cherries, peaches and plums, strawberries, raspberries and blackberries. As regards the other V4 countries, Slovakia mainly imports bananas from the Czech Republic and Poland and imports apples, pears and quinces from all V4 countries.

The European Union exports fruit mainly to Moldova, Georgia, Azerbaijan, Belarus (mainly berries), Egypt (75% of imports) and Jordan. The Slovak Republic exports from the European Union mainly bananas, citrus fruits, apples, pears and quinces, grapes, melons, cherries, peaches and plums, strawberries, raspberries, blackberries. As regards the other V4 countries, the Slovak Republic exports mainly grapes to the Czech Republic and Hungary. It exports citrus fruits mainly to Hungary and strawberries, raspberries and blackberries to all V4 countries.

Between 2010 and 2022, the average annual fruit export from Slovakia was 57380 tonnes, Table 1. The average import of fruit was 259474.21 tonnes. The distribution was left-handed, flatter than normal. The total fruit consumption was 222803.39 tonnes. Slovak consumers in the period under review preferred apples in particular. The average annual per capita consumption of apples was 13,58 kilograms during the period. Oranges were also very popular, with the average Slovak consumer consuming 9.42 kilograms per year. This was followed by bananas, the average consumption of which was 8.88 kilograms per capita per year during the period under review. Among domestic fruits, apart from apples, grapes (3.76 kilograms per capita per year) and peaches and nectarines were particularly preferred, with an average annual consumption of 2.48 kilograms per capita per year. Among southern fruits, mandarins (4.37 kilograms per capita per year) and lemons (2.24 kilograms per capita per year) were the most prefer.

Tab. 1: Descriptive analysis of fruit market

	Mean	Median	St. Dev.	Kurt.	Skew.	Range	Min.	Max.
Export (t)	57380,72	56396,50	10510,79	3,67	-1,21	49224	26534	75758
Import (t)	259474,21	255359,50	23795,23	-0,73	-0,07	80345	219554	299899
Consumption (t)	222803,39	222654,50	14766,97	-0,97	0,00	47270	197973	245243

Source: authors` calculations

The impact of fruit imports and exports on domestic fruit consumption was investigated using linear, exponential and power series models. By regression analysis, we found that if fruit export increases by 1 t, domestic fruit consumption does not change statistically significantly, Table 2. If import of fruit from abroad increases by 1 t, domestic fruit consumption increases by 869 kg with 99% confidence. The estimated model shows that imports have a more significant impact on consumption than exports.
Furthermore, we investigated the effect of the price on the export and import of fruit. Tab.3 provides an overview of the results of the regression analysis. The power model was the most suitable for describing the effect of the price of fruit imports on fruit imports. The estimated coefficient shows the price elasticity of fruit imports, whose coefficient is 1.828. With 99% confidence, when the price of imported fruit increases by 1%, imports will increase by 1.828%. Imports are price elastic.
The power model also appeared to be the most suitable for describing the effect of the fruit export price on fruit export. The coefficient of price elasticity of export is 1.528. If the price of exported fruit increases by 1%, the export of fruit will increase by 1.528%. Export is price elastic.

Tab. 2: The results of regression analysis (impact of import and export on consumption of fruit)

	R square	Sign. F	Model	Coeff. (export)	Coeff. (import)
Consumption of fruit	0.997	0,001	linear	-0,054	0.869**

$^{*}\alpha = 0{,}05; ^{**}\alpha = 0{,}01$ Source: authors` calculations

Tab. 3: The results of regression analysis (impact of price of import on import of fruit and impact of price of export on export of fruit)

	R square	Sign. F	Model	Coeff. (P)
Import of fruit	0.998	0,001	power	1,828**
Export of fruit	0.998	0,001	power	1,528**

$^{*}\alpha = 0{,}05; ^{**}\alpha = 0{,}01$ Source: authors` calculations

Import of fruit

Imports of southern zone fruit account for a larger share of total imports of Slovak fruit than imports of temperate zone fruit. In the period under review, the highest average import was bananas, Table 4. An average of 66,265.76 tonnes per year was imported into the Slovak Republic. The minimum value of banana imports was reached in 2010 and the maximum value in 2019. The distribution is right-sided, flatter than normal. Apples were another important import commodity of fruits during the period under review. On average, 42294.24 tonnes of them were imported annually. The lowest import was in 2018, the highest in 2007. The import quantities of apples showed the highest standard deviation during the period under review. Therefore, it was not possible to estimate a regression model for the trend of apple imports. The distribution was left-sided, flatter than normal. Imports of mandarins and oranges, lemons, grapes and peaches with nectarines were also significant. During the period under review, an average of 25509.65 tonnes per year of tangerines and 25408.88 tonnes per year of oranges were imported.

The minimum quantity of tangerines was imported in 2017, the maximum quantity in 2007. Imports of tangerines have been erratic over the period under review, fluctuating frequently, the standard deviation has been quite high. The distribution was right-handed, more pointed than normal. The minimum quantity of oranges was imported in 2012 and the maximum in 2013. The evolution of orange imports is characterized by two more pronounced fluctuations, namely in 2006 and in 2013. The standard deviation is lower than for the fruit types mentioned so far. The distribution is left-handed, more pointed than normal. The average import of grapes in the period under review was 15146.12 t. The standard deviation is low, the distribution is left-handed, flatter than normal. The least grapes were imported in 2006, the most in 2012. The trend is slightly increasing, with three significant short-term increases in grape imports in 2005, 2008 and 2012. As regards lemons, the average annual quantity imported was 13709.47 tonnes. The distribution is left-handed, more pointed than normal. The minimum quantity of lemons was imported in 2005, the maximum in 2020.

Tab. 4: Descriptive analysis of fruit import

	Range	Min.	Max.	Mean	St. Dev.	Skew.	Kurt.
Bananas	50289	40189	90478	66265,76	16464,67	-0,04	-1,26
Oranges	12530	19965	32495	25408,88	3484,96	0,48	0,18
Tangerines	25425	12375	37800	25509,65	5745,44	-0,33	1,33
Lemons	11422	10208	21630	13709,47	3474,37	1,07	0,29
Grapefruits	3597	4583	8180	5782,24	817,43	1,33	4,09
Raisins	10724	11358	22082	15146,12	2402,85	1,38	3,82
Apples	28471	29837	58308	42294,24	7913,59	0,46	-0,49
Pears	4914	2269	7183	4628,00	1110,59	0,16	1,24
Peach, nectarines	5852	7600	13452	10960,18	1692,08	-0,84	0,05
Apricots	2064	495	2559	1366,18	626,51	0,29	-0,79
Plums, prunes	2263	914	3177	1647,06	679,22	0,98	0,07
Cherries	939	23	962	361,53	243,02	0,70	0,97
Strawberries	7103	433	7536	2670,59	1640,81	1,50	4,10
Raspberries, mulberries	999	0	999	309,29	313,40	0,96	-0,19
Gooseberries currants	728	0	728	200,59	214,61	1,00	0,66
Cranberries	2069	0	2069	408,18	578,63	1,89	3,44

Source: authors` calculations

The trend of banana imports into the Slovak Republic was slightly fluctuating in the period under review. Therefore, the variation of the trend is described by a linear model only at 51%, Table 5. According to the estimated model, the average increase in banana imports each year was 2319.7 tonnes with 99% confidence. The exponential model of apricot import trend offers an equally low explanation of the variation. It explained 55.6% of the variation in the time series. According to the estimated coefficients, apricot imports increase on average by 0.1% with each year. The linear model of the trend in imports of plums and sloes explained 63.8% of the variation in the time series. With 99% confidence, imports of plums and sloes increase by 92.7 tonnes with each additional year. 65.5% of the variation in the time series was explained by the linear model of the trend in imports of cranberries and blueberries. With each additional year, imports of these fruits increased by an average of 92.7 tonnes. A linear model of the trend in raspberry and mulberry imports explained 77.4% of the variation in the time series. With each additional year, imports increased by 54.6 tonnes. The most pronounced upward trend is seen in the import of lemons. The linear model explained 84% of the variation in the time series. According to the estimated model, on average, lemon imports increased by 630.7 tonnes each year with 99% confidence.

Tab. 5: The results of regression analysis (trends of fruit import)

	R square	Sign. F	Model	Coeff. (intercept)	Coeff. (time)
Bananas	0,506	0,001	Linear	45388,1**	2319,7**
Lemons	0,840	0,000	Linear	8033,6**	630,7**
Apricots	0,556	0,001	Exponential	6,4**	0,1**
Raspberries, mulberries	0,774	0,000	Linear	-182,1*	54,6**
Cranberries, blueberries	0,655	0,000	Linear	-426,5*	92,7**
Plums, prunes	0,638	0,000	Linear	679,9**	107,5**

* $\alpha = 0{,}05$; ** $\alpha = 0{,}01$ Source: authors` calculations

Export of fruit

The highest average annual quantity of fruit exported in the Slovak Republic in the period under review was for apples. The lowest quantity of apples was exported in 2004 and the highest in 2013, Table 6. The distribution is left-handed, flatter than normal. Apple exports are cyclical, with significant fluctuations; the trend function cannot be described statistically reliably.

Banana exports were also significant in the period under review. On average, 16098 tonnes were exported annually. The lowest quantity of bananas was exported in 2004, the highest in 2014. Exports of tangerines and oranges are also high. Over the period under review, an average of 3,320.94 tonnes of tangerines and 3,110.41 tonnes of oranges were exported annually. The lowest quantity of tangerines was exported from the Slovak Republic in 2020, oranges in 2004, the highest quantity of mandarins in 2011 and oranges in 2006. The distribution of tangerine exports in the period under review was right-handed, flatter than normal. The distribution of oranges was left-handed, more pointed than the normal distribution.

Trade in southern zone fruit is widespread in Slovakia. Exports of bananas, tangerines, oranges, lemons and grapefruit are significant. During the period under review, the trend in exports of southern fruit was very similar to that of imports, less domestic consumption. The exception is banana exports, which rose sharply in 2014 even though imports did not grow as dynamically.

Among temperate fruits, apart from apples, peaches were mainly exported with nectarines, pears and plums with sloes. These fruits also have high imports. Peaches and nectarines were exported at an average annual rate of 1,382.59 tonnes during the period under review. The lowest was in 2004, the highest in 2005. Pear exports averaged 700,88 tonnes per year. The lowest export was in 2016, the highest in 2012. The distribution is left-handed, more pointed than normal. Plums and sloes were exported from Slovakia at an average annual rate of 444.24 tonnes. The lowest was in 2020, the highest in 2024. The distribution is left-handed, more pointed than normal.

Tab. 6: Descriptive analysis of fruit export

	Range	Min.	Max.	Mean	St. Dev.	Skew.	Kurt.
Bananas	36262,00	3396,00	39658,00	16098,00	9798,49	0,80	0,25
Oranges	12469,00	443,00	12912,00	3110,41	3222,07	2,30	5,31
Tangerines	5471,00	644,00	6115,00	3320,94	1608,72	-0,50	-0,63
Lemons	3323,00	226,00	3549,00	1434,59	806,08	1,05	1,78
Grapefruits	756,00	89,00	845,00	378,82	242,01	0,67	-0,85
Grape Seeds	2519,00	357,00	2876,00	1561,24	634,04	0,11	-0,03
Apples	19535,00	8659,00	28194,00	18039,18	5464,44	0,09	-0,57
Pears	1613,00	110,00	1723,00	700,88	382,75	0,88	2,03
Peaches, nectarines	3079,00	312,00	3391,00	1382,59	809,34	1,32	1,94
Apricots	203,00	10,00	213,00	99,00	62,85	0,44	-1,04
Plums, prunes	1955,00	69,00	2024,00	444,24	469,97	2,65	8,24
Cherries	540,00	17,00	557,00	331,23	167,91	-0,47	-0,81
Strawberries	296,00	3,00	299,00	130,65	90,30	0,74	-0,45
Raspberries, mulberries	91,00	0,00	91,00	17,44	22,23	2,60	8,43
Gooseberries currants	7,00	0,00	7,00	0,81	1,72	3,47	12,98
Cranberries	417,00	0,00	417,00	62,63	144,12	2,76	7,69

Source: authors` calculations

The trend in exports of individual fruits is more difficult to describe using regression models. The estimated models shown in Table 7 described only 44-51% of the changes in the time series of fruit exports. For trend estimation, power models were more appropriate for smoothing the trend in banana, apricot, and strawberry exports. For plums and prunes it was an exponential model. According to the estimated model, plum exports were the only export that had a declining trend during the period under study (declining at an average annual rate of 0.121%).
The most significant model was the power model for flattening the trend in banana exports. According to the estimated model, with 99% confidence, banana exports increased on average by 0.59% with each successive period.

Tab. 7: The results of regression analysis (trends of fruit export)

	R square	Sign. F	Model	Coeff. (a)	Coeff. (time)
Bananas	0,510	0,001	Power	8,328**	0,593**
Apricots	0,444	0,003	Power	2,988**	0,687**
Plums, prunes	0,488	0,002	Exponential	6,810**	-0,121**
Strawberries	0,500	0,002	Power	2,605**	0,973**

* $\alpha = 0{,}05$; ** $\alpha = 0{,}01$ Source: authors` calculations

3. Discussion

Slovakia is one of the countries that lags behind the EU average in food self-sufficiency (Škamlová, 2022). Diversification of related products has a positive effect on a firm's export performance and a negative moderating effect on the relationship between interregional diversification and export performance (Losilla et al., 2019).
Chinese exports of apples and pears to the EU have increased significantly, although EU apple and pear production is protected by the EU's entry price system (EPS), which aims to protect EU producers from international competition by limiting imports below the minimum import price. The high relevance of the EAA for apples originating in China was of a temporary nature, while the relevance of the EAA for pears originating in China is of a more general nature. In addition, the significance of the EPS varies seasonally. Pear production in China is more competitive than apple production against the EU (Goetz, Grethe, 2010).

In Chile, steps are being proposed to correct structural imbalances in the market. These could accelerate productive gains, increase the potential success of small growers attempting to 'convert' to fruit production, and improve rural equity. If applied to the small fruit sector as a whole, such steps could help sustain Chile's fruit export sector - an objective that can be seen as crucial to Chile's economic well-being, (Murray, 1997).
Hong Kong is a major importer of fresh fruit and vegetables. An analysis of price-quantity relationships over a 3-year period from 1985 to 1987 for four very different crops (lemons, onions, lettuce and avocados) supplied by three countries (USA, China and Australia) showed that the semilog form $P = \alpha + \beta \ln Q$, where P = price, Q = quantity and α and β are constants, provided a good description of the relationship. Further analysis showed that competition between these countries had no significant effect on the price-quantity relationship (Mayer at al., 1991).
Indicators of economic development, particularly GDP, were positively related to the supply of cereals and animal foods over time, but no such relationship was observed with the supply of fruits and vegetables. Food system policies to improve nutrition and health outcomes in The Gambia need to focus on improving the diversity of food supply - especially fruits and vegetables - and maximizing national domestic production to reduce dependence on food imports, (Zakari at al., 2023).

Conclusion

By quantifying the impact of importing fruit from abroad on the domestic market, we learned that if imports increase by 1t, domestic consumption of fruit increases by 869 kg with 99% confidence. Both imports and exports are price elastic. Some of the imported fruit is further traded and exported abroad. Bananas are the most important component of fruit imports, followed by apples, mandarins and oranges. Since southern fruits are more popular with Slovak consumers than temperate fruits, imports of southern fruits are crucial to meet the needs of consumers in the fruit market. According to the estimated import trend functions for bananas, lemons, apricots, raspberries and mulberries, cranberries and blueberries, and plums and sloes, we can assume that imports of these fruits into Slovakia will continue to increase in the future.
As regards exports, the largest share is accounted for by apples, bananas and oranges. According to the estimated trend functions, exports of bananas, strawberries and apricots will increase in the future. On the basis of the previous trend of plum and sloe exports, we can assume that their exports will decrease by 0.12% per year on average.

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Assessment of Non-financial Reports in the Context of Circular Economy: The Case of Czech Large Companies

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Abstract

The attention to environmental protection, sustainability, CSR, circular economy, and other related concepts became increasingly important to economies and their businesses nowadays, especially at the EU level. The upcoming Corporate Sustainability Reporting Directive (CSRD, Directive 2022/2464) which requires many businesses to report on sustainability, is a good example. In the Czech Republic, many large companies are already publishing their non-financial reports voluntarily or obligatorily. The presented research focuses on the Circular Economy (CE) concept and aims to asses, whether CE-related topics can be found in these types of reports. Thus, 50 large companies were selected and the level of their CE-related information in non-financial reports was assessed. Additionally, the overall assessment of the existence of these reports was made. Each company was given the evaluation score according to the amount of CE-related information published in its non-financial report or on the website. The results show that reports can bring necessary CE-related information, especially Sustainability reports or Corporate Social Responsibility reports. However, the quality of the non-financial reports depends on the fact whether organizations obligatorily publish them due to Directive 2014/95/EU or expect the obligation due to Directive (EU) 2022/2464. Those organizations that do not have to follow these directives do not publish almost any CE-related information.

Key Words

circular economy, CSRD, non-financial reporting

JEL Classification: M21, Q51

Introduction

Since forming the concept in the late 1980s, the Circular economy (CE) has developed and gained much attention today, mainly because it complements other related topics such as Corporate Social Responsibility (CSR), Sustainability, or Environmental management. Those topics are very important for economies nowadays, especially since the adoption of the European Green Deal, which aim is to become climate neutral continent (European Commission, 2023).

To help to achieve this, the EU approved Directive (EU) 2022/2464 related to corporate sustainability reporting (called CSRD), which states that specific businesses ("undertakings") must report non-financial information regarding sustainability. So far, this reporting was obligatory for large firms with more than 500 employees who were admitted to trading on a regulated market or credit and insurance institutions (European Parliament and the Council, 2014).

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The new Directive (European Parliament and the Council, 2022) states that non-financial reporting will be obligatory for all large enterprises (defined as those that exceed two of the three following criteria: more than 250 employees, balanced sheet total of more than EUR 20 mil., net turnover more than EUR 40 mil.) and small and medium-sized enterprises that are admitted to trading on a regulated market (European Parliament and the Council, 2023).

Approval of these directives can be perceived as an essential step that points out the necessity of incorporating environmental issues (amongst others) into business thinking. By addressing these issues, businesses can benefit in many ways, especially in the case of CE which can even help businesses to gain better financial performance (proved by e.g. Atstāja and Spāde, 2020; Farooque et al., 2022; Hategan et al., 2021; Li et al., 2022).

CE represents mainly an environmental view because it is "a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible" (European Parliament, 2023). There are many definitions of CE which are mostly related to the 3R concept of „reduce, reuse and recycle" (Kirchherr et al., 2017), but sometimes even the 9R concept (see Potting et al., 2017). Also, some authors (e.g. Dong et al., 2022; Ellen MacArthur Foundation, 2013; Sarfraz et al., 2022) consider the issues regarding the reduction of emissions and the use of renewable energy also part of the CE concept.

In the Czech Republic, the CE is not unknown, for example, at the national level, the strategic framework "Cirkulární Česko 2040" ("Circular Czechia 2040") was made by the Ministry of the Environment of the Czech Republic. But also many businesses started to adopt the practices related to the CE concept voluntarily, sometimes without realizing it (AMSP ČR, 2022). Additionally, many large firms are used to making reports on their sustainability or CSR and the "environmental" pillar is closely related to the CE concept. Thus it seemed interesting to explore these non-financial reports. The aim of the presented research is on the sample of 50 selected large companies to asses, whether the CE-related topics can be found in the non-financial report. An additional aim is the overall assessment of the existence of these reports.

1. Methods of Research

As there is no general and universally accepted definition of CE, it is not easy to research this subject. However, in this research, the circularity will be mainly assessed by using the same methodology as the Flash Eurobarometer 441 called "European SMEs and the Circular Economy". In this survey made in 2016, a set of questions regarding specific activities made by small and medium-sized enterprises was used to assess the level of CE implementation. These activities were: Minimise water usage and maximize its re-usage; Use of renewable energy; Minimise energy consumption; Minimise waste; and Redesign products and services to minimize the use of materials or use recycled materials (European Commission, 2016). The suitability of these indicators to assess the level of CE implementation was also confirmed by the studies of Antonioli et al. (2022), Dong et al. (2022), Farooque et al. (2022), Gupta et al. (2021), or Sarfraz et al. (2022), who used at least some of them. Additionally, activities regarding the minimalization of emissions are often used to assess the level of CE implementation in businesses (for example in the studies made by Dong et al., 2022; Farooque et al., 2022; Sarfraz et al.; 2022), thus the assessment of this activity was also added to this research. Therefore, the following

indicators were defined: Water consumption, Renewable energy, Energy Consumption, Minimised Waste, and Emissions.

The subjects of the research were non-financial reports of the top 50 large legal entities in the Czech Republic, measured by the number of employees. The list of legal entities was downloaded from the Orbis database (Bureau van Dijk, 2023). Although, the search criteria excluded organizations such as Public authorities/States/Governments, a few non-businesses entities appeared in the list (for example hospitals, and universities). However, these institutions were analyzed further (as additional research), because when employing such a big number of employees, the impact on the environment is also important, thus their level of circularity should not be neglected. The reports were searched on the websites of organizations. The procedure of the information assessment was based on the research made by Hategan et al. (2021), who assessed non-financial reports of large companies in Romania. The evaluation method is described in Tab. 1.

Tab. 1: evaluation method the non-financial reporting.

Amount of information	Score
no information on the web	1
no information in the report	2
few information in the report (e.g. one sentence)	3
partial information in the report (e. g. one paragraph)	4
complete information in the report (e. g. several paragraphs, figures, tables, etc.)	5

Source: authors' elaboration, based on(Hategan et al., 2021)

The information regarding previously defined indicators (topics) was searched for in reports of selected organizations and assessed. Also, the type of report and the year of publication were recorded.

2. Results of the Research

In the assessment, reports for the 50 biggest organizations according to the number of employees were included. Most of the reports were for the year 2021 (30), then 2022 (10) and 2020 (2), in 8 cases no report was found. For better clarity of results, the organizations were divided into 3 categories. Universities, the State's organizational components, and Hospitals were designated as Category 0 ("non-profit"). Financial and insurance institutions were designated as Category 2. And other organizations (thus profitable companies that were not included in Category 2) were designated as Category 1. The number of organizations according to their category and the number of their employees is visible in Tab. 2.

Tab. 2: Categories of organization and their employees

Number of employees	Number of organizations			
	Category			Total
	0	1	2	
>= 10000	2/40%	2/40%	1/20%	5/100%
5000–9999	4/50%	1/12%	3/38%	8/100%
3500–4999	8/67%	3/25%	1/8%	12/100%
2064–3499	7/28%	14/56%	4/16%	25/100%
total	21/42%	20/40%	9/18%	50/100%

Source: author's elaboration

Table 2. shows that these "non-profit" organizations create the biggest category (21 organizations) and also represent the biggest employer. On the other hand, financial and insurance organizations are the least represented.

As to the type of report, the Annual report dominated (28 cases), then the Sustainability report was found in 12 cases, and the CSR report in 2 cases. In 8 cases no report was found. About categories, no reports (5 times) or Annual reports with almost no CE-related information (16 times) were found in category 0. In category 1, a Sustainability report with partial or complete CE-related information was found 8 times, Annual reports with limited CE-related information were found 8 times (also 1 CSR report) and 3 times no report was found. In category 2, 4 Sustainability reports (with comprehensive CE-related information), 4 Annual reports and 1 CSR report were found. Generally, Annual reports provide none or limited CE-related information in comparison to Sustainability or CSR reports in which information is more comprehensive. However, if attention is paid only to those, that have or will have the obligation to publish non-financial information (Categories 1 and 2), the results are positive and show the readiness of businesses to report on their sustainability efforts. Out of 29 organizations in these two categories, only 3 do not publish any report at all, 5 have no CE-related (thus also sustainability-related) information in their Annual reports (out of 12 Annual reports) and 14 organizations publish their full Sustainability or CSR reports. Thus 21 organizations out of 29 report on their sustainability to some extent.

Regarding the level of CE-related information found in these reports, the Tab. 3 and Fig. 1 show the important results. The value of each indicator is calculated as the average of the given scores (for this indicator) for all organizations in the category. It is visible that businesses in category 2 (which should be those, that already report on their non-financial data) provide the most CE-related information, especially in terms of activities related to Minimised waste, Emissions, as well as Energy Consumption and Minimised materials. Category 1, has worse results, however, the values for Minimised waste, Emissions and Minimised materials show that also these organizations do not resign on reporting this information (only 6 organizations have no CE-related information in their reports, and the rest have at least a minimum). Category 0 has the lowest results, as expected, only 4 organizations have at least limited information about some category, and the rest have none.

Tab. 3: Assessment of CE-related information in reports

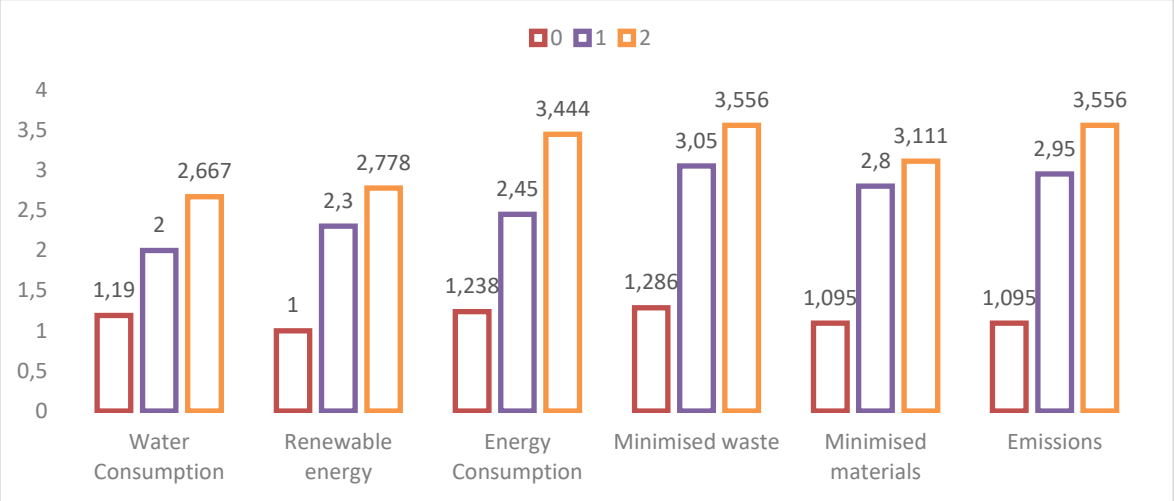
	Category			Total
	0	1	2	
Water Consumption	1.190	2.000	2.667	1.780
Renewable energy	1.000	2.300	2.778	1.840
Energy Consumption	1.238	2.450	3.444	2.120
Minimised waste	1.286	3.050	3.556	2.400
Minimised materials	1.095	2.800	3.111	2.140
Emissions	1.095	2.950	3.556	2.280
Total	1.151	2.592	3.185	2.093

Source: author's elaboration

Regarding categories, according to the average calculated for all organizations, the most often reported is Minimised waste, followed by Emissions, Minimised materials, and Energy consumption. The least reported is Water consumption.

As to the maximum and minimum average values of individual companies, the maximum value vas 4,83 (3 companies, category 1) and the minimum is 1 (23 companies, 16 from category 0, 6 from category 1, and 1 from category 2).

Fig. 1: Assessment of CE-related information in reports



Source: author's own elaboration

3. Discussion

The most important finding of this research is that Sustainability (or CSR) reports can provide almost all CE-related information. In these types of reports, the most often score given for each category was 5 (40 times out of 78). The worse result was in the case of Annual Reports, in which usually only a limited amount of information was found. However as the results of the assessment show, most of those organizations that obligatory report on their non-financial information, do that by publishing the Sustainability report. Thus in the future, the Sustainability report can be easily used to assess the level of circularity.

As to categories, the least reported activity was about minimising water consumption and the use of renewable energy, on the other hand, the most often reported was about emissions and waste minimalisation.

Additionally, the overall assessment of the existence of reports with CE-related information was made. Generally, those organizations that obligatory publish non-financial reports (category 2, e. g. financial or insurance institutions) publish good quality Sustainability or CSR reports with comprehensive CE-related information. Only one organization in this Category published an Annual report with no CE-related (or Sustainability-related) information. Additionally, Sustainability or CSR reports can be found even in Category 1 in 9 cases, which confirms the relative readiness of these companies for future obligations. The fact, that in Category 0 are no Sustainability reports was not surprising. However, this should be seen as a problem, because even these organizations have a great impact on the environment (in fact, they represent the biggest group amongst these 50 organizations and the biggest employer) and nothing pushes them to act more responsibly.

This research cannot be easily compared to similar research by made Hategan et al. (2021), because they assessed a much bigger sample (cca 700) of companies in Romania and only those organisations that obligatory publish non-financial reports. Also, the results of the assessment are not shown in their paper, because it was only a part of their research (they analysed the relationship between this assessment and financial performance).

Conclusion

The analysis of non-financial reports of 50 selected Czech large companies (according to the number of employees) brought interesting results. Attention was paid to CE-related information in these reports as well as the overall assessment of their existence. The results show, that these reports can bring necessary CE-related information. However, the quality of these reports decreases when the information does not have to be published obligatory due to Directive 2014/95/EU and Directive (EU) 2022/2464.

To conclude, the largest companies in the Czech Republic (categories 1 and 2) were found successful in this type of reporting, with two exceptions: topics regarding minimising water consumption and the use of renewable energy. These topics should be more elaborated in the reports. On the other hand, the information regarding emissions and waste is usually published in quite good quality.

The question is if other organizations with fewer employees will be also ready when the obligation established by Directive (EU) 2022/2464 starts to apply. The limited number of analysed organizations can be seen as the biggest limitation of this research. Thus, future research will be processed on a bigger sample containing large organizations and also those SMEs that will obligatorily publish non-financial reports in the future. Additionally, the relationship between the CE level and financial performance will be studied.

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Addressing Income Inequality in Vietnam's Northern Midlands and Mountains: A Focus on Fiscal Policy Factors

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Abstract

The Northern Midlands and Mountains constitute one of Vietnam's six economic regions, yet it faces the lowest average income among the top 3 regions, with an average of only 1.613.000VND/month in 2014. Moreover, this region experiences the highest level of income inequality, as indicated by a Gini index of 0.42 in 2020. The study highlights that increased income inequality can lead to a decline in the region's economic growth, significantly impacting the province's GDP. The research emphasizes income redistribution as one of the essential functions of fiscal policy, alongside its roles in supporting macroeconomic stability and promoting overall growth. This research analyses and identifies the interplay between fiscal policy factors and income disparity to tackle the Northern Midlands and Mountains income inequality. The study utilizes panel data compromising 7,980 observations. Notably, the findings underscore the potential of increased investment and enhanced household education as critical factors for improving income inequality and fostering economic growth in the region. By considering these factors, Vietnamese economic strategists can devise effective measures to mitigate inequality and foster sustainable regional development.

Key Words

Income inequality, fiscal policy, economic growth, Vietnam, the Northern midlands and mountains

JEL Classification: C21, R13

Introduction

Addressing economic inequality requires coordinating many policy tools, including fiscal policy. Income redistribution is also one of the three essential functions of fiscal policy, besides supporting macroeconomic stability and promoting growth.

Economic inequality is the difference in income or wealth between different social groups. More equitable income distribution is the desired goal of policymakers. Low inequality is an essential precondition for achieving greater equality in access to socio-economic and political resources. With economic growth, inequality can have positive and negative effects on growth, but studies show that the adverse effects are predominant (Bastagli et al., 2012). Inequality can positively affect growth by providing incentives for innovation and entrepreneurship, increasing savings and investment in the economy if the rich have a higher saving-to-income ratio, could allow a small number of individuals in developing countries to accumulate the minimum amount needed to start a business and receive a good education (Ostry et al., 2014).

On the other hand, inequality can also harm growth because it limits the ability to accumulate human capital; create political and economic instability, leading to a decline in investment; hinder the consensus needed in society to adjust the economy to sustain growth in the event of shocks. Studies (Zungu et al., 2021) also show that the relationship between inequality and growth can be non-linear. In particular, the increase in inequality from a low level creates an impetus to promote growth but, to a certain extent, creates incentives for profiteering and leads to lower growth. Empirical results (Schmidt and Juijin, 2021; Iradian,2005: Castells and Royuela, 2014) show that inequality hinders economic growth, at least in the medium term.

To deal with inequality in countries, relying on an overall system of many policies, including fiscal policy, is necessary. Fiscal policy can affect an individual's current and future income and access to health, education, and other social security services, affecting different inequality aspects. Tools for direct fiscal policy to redistribute current income include taxes and progressive transfer payments. In addition, spending to promote growth towards infrastructure development, health care, and education also helps achieve equity goals. Such expenditures are the tools of the fiscal policy to perform the redistribution function indirectly.

First, tax and progressive transfer payments immediately impact individuals' disposable income today. The government levies progressive taxes on the rich higher than the poor and implements transferable spending programs for social security activities that benefit the poor more than the rich. It will have income redistributive effects from rich to poor, thereby reducing income inequality. At the same time, such redistributive tax and spending policies also affect market returns (earnings before taxes and transfers) through effects on future earnings generation. Bénabou (2000) emphasizes the impact of redistributive policy on the accumulation of human capital. In particular, progressive fiscal policies and measures to loosen credit constraints allow people with low incomes to invest more in human development, helping increase their relative income in the future. According to IMF (2014), spending on education is the expenditure that most obviously impacts future income ability. A higher level of education often results in more equality in income distribution (Cevik and Correa-Coro, 2015).

On the other hand, social justice can also be supported by realizing the remaining two fiscal policy objectives, macroeconomic stability and growth efficiency, thereby affecting the economic opportunities available to the public. People experience poverty and the distribution of market income (Goni, Lopéz, and Servén, 2008). Macroeconomic stability is one of the determinants of inequality (Ferreira, Leite and Litchfield, 2007). In the budget structure of countries, taxes, and budget expenditures can regulate income, such as personal income taxes, unemployment benefits, and social benefits, adjust automatically to the business cycle, and limit output volatility in the economy. In addition, realizing the stabilization objective of fiscal policy can also contribute to ensuring social equity by preventing macro-financial crises in which people experiencing poverty are the most vulnerable.

Fiscal policy seeks growth efficiency by providing public goods, addressing market failures, and promoting overall economic growth. While there can be tension between efficiency and equity (Bastagli et al., 2012), recent studies suggest that the outcome depends on the specific policy instruments employed. Fiscal policies prioritizing infrastructure development, investment in human capital (e.g., Health care, education,

social insurance), and inclusion with improved access to resources have contributed positively to efficiency and equity (Muinelo-Gallo and Roca-Sagales. 2011).

The Northern Midlands and Mountains are one of the six economic regions of Vietnam. This region has many potentials and advantages for rapid and sustainable development. However, the development orientation of the area still needs to overcome many obstacles, leading to uneven development. Along with the Central Highlands and the Northern Midlands and Mountains, these are the two most unequal regions. The research titled "How does Income Inequality Affect Economic Growth in Vietnam from 2010 to 2020: A case study in the Northern Midlands ad Mountain Region" (2023) of the author has shown that if inequality increases, the region's economic growth will tend to decrease, and this impact is very significant on the GDP of the provinces in the sample.

Therefore, the author decided to do this research to find a solution to solve the problem of income inequality in the region with the research question **"How can fiscal policy impact income inequality in the Northern midlands and mountain regions in Vietnam and what strategies can be employed to address income inequality and promote economic growth?"**

1. Methods of Research

The Northern Midlands and Mountains are the most extensive territories in Vietnam (100,965 km^2), accounting for about 28.6% of the country's total area. This region includes 14 provinces. The Northern Midlands and Mountains have many potentials and advantages for rapid and sustainable development. However, the development orientation of the area still needs to overcome many obstacles, leading to uneven development. The possibilities and strengths have not been entirely and effectively exploited.

Drawing from previous research by Ho et al. (2023), the study identifies the key variables that my influence income inequality and economic growth. The subsequent focus will be on examining these variables in greater detail, particularly their impact on economic growth and inequality.

The paper is carried out based on the theoretical and empirical synthesis; the author has built the variables and models used in the study as follows:

$$G_{INC_{it}} = \beta_1 LNINVEST_{it} + \beta_2 \mathrm{LNHEALTHEXP}_{it} + \beta_3 LNTAX_{it} + \beta_4 LNPENSION_{it} + \beta_5 LNSOCIAL_{it} + \beta_6 EDU_{it} + \mu$$

In Vietnam, the General Statistics Office has published data on the GINI coefficient (G_INC) of provinces and cities calculated from the VHLSS datasets from 2010-2020. Since the GINI coefficients by income are not uniform, the author uses raw data from the survey of Vietnamese family living standards results to ensure compatibility when comparing the effects of inequality by income to calculate the GINI coefficient according to the income of 14 provinces in the Northern midlands and mountains in the period 2010-2020.

In the above period, the author uses six sets of VHLSS data to process the research model data. The income GINI coefficient (G_inc) is calculated directly at the website:

http://www.wessa.net/co.wasp using the Lorenz curve GINI method based on each household's income and expenditure data in each province. Since the VHLSS data are not representative of the provincial level, the absolute value of the impact of the independent variables extracted from this dataset (including household investment (INVEST); household income tax (TAX); household health expenditure (HEALTHEXP); household pension (PENSION); State social security (SOCIAL), and education of the head of household (EDU)) on discontent the income equality in the regression function may not be accurate, which is the main limitation of the study. Therefore, the article only focuses on understanding the direction of impact between social security variables and demographic characteristics in the relationship with income inequality but needs to analyse the impact of these variables in the model. Variables include INVEST; TAX; HEALTHEXP; PENSION; SOCIAL, performed on base ten logarithms to help control high values in the research sample.

Variables, including income, production and business investment, health expenditure, income tax, pension, social security, and education level, are described and extracted explicitly from the VHLSS period data set - 2010 to 2020.

2. Results of the Research

Table (1) show that most of the mean values of the variables are consistent with the actual situation and developments in Vietnam in 6 datasets of the household living standard survey (VHLSS) from 2010 to 2020.

Tab. 1: Descriptive statistics of the variables in the model

Variable	Obs	Mean	Std. Dev.	Min	Max
G_INC	7,980	0.6121	0.2262	0.3984	0.8876
LNINVEST	7,980	6.9191	4.5175	0	12.9967
LNHEALTHEXP	7,980	6.3097	2.4801	0	12.6280
EDU	7,980	6.2165	4.3363	0	12
LNTAX	7,980	3.6915	3.1662	0	11.5129
LNPENSION	7,980	0.7598	2.6841	0	12.1914
LNSOCIAL	7,980	2.6731	3.5450	0	13.1223

Source: authors' calculations in Stata 16

The variable representing income inequality in Vietnam in the Northern Midlands and Mountains (G_INC) has an average of 0.61, indicating that the inequality in expenditure in this region is higher than with an alarming level of 0.4 from the General Statistics Office. The variables represent, respectively, the natural logarithm of household investment (LNINVEST); household health expenditure (LNHEALTHEXP); household income tax (LNTAX); household pension (LNPENSION), and State social security (LNSOCIAL) averaged 6.91; 6.3; 3.69; 0.75 and 2.67. Finally, the variable that represents the education of the head of household (EDU) has an average of 6.2, which means that the average has completed lower secondary school.

The relationship between the independent variables in the model is shown through the correlation coefficient in the correlation matrix below.

Tab. 2: The correlation matrix between the independent variables

	G_INC	LNINVEST	LNHEALTHEXP	LNTAX	LNPENSION	LNSOCIAL	EDU
G_INC	1.0000						
LNINVEST	-0.5550*	1.0000					
LNHEALTHEXP	0.2111*	-0.1112*	1.0000				
LNTAX	0.3867*	-0.2299*	0.1632*	1.0000			
LNPENSION	0.0773*	-0.1307*	0.1094*	0.0958*	1.0000		
LNSOCIAL	-0.5226*	0.2669*	-0.0865*	-0.1490*	-0.0163	1.0000	
EDU	-0.2042*	-0.0168	0.1392*	0.0524*	0.1538*	0.1002*	1.0000

Source: authors' calculations in Stata 16
Significance of the symbol: *p<0.1 (significant level of 10%), **p<0.05 (significant level of 5%), ***p<0.01 (significant level of 1%).*

Table (2) shows that the coefficient of linear correlation between independent variables and specific dependent variables is statistically significant, including the correlation between investment (LNINVEST) and social security (LNSOCIAL) and education (EDU) with income inequality (G_INC). The positive correlation reached statistical significance between health expenditure (LNHEALTHEXP), income tax (LNTAX), and Pensions (LNPENSION) with income inequality (G_INC).

For independent variables, the most significant correlation is the positive correlation between investment (LNINVEST) and social security (LNSOCIAL) with 0.26; then there is a negative correlation between investment (LNINVEST) and income tax (LNTAX) with -0.22; followed by a positive correlation between health expenditure (HEALTHEXP) and income tax (LNTAX) with 0.16. Most of the remaining independent variables have little correlation, and the correlation coefficient is not too large, showing little possibility of multicollinearity occurring in the model.

Table regression results

After carrying out the regression according to the regression models, the author conducts along with the test to select the most suitable model between the two fixed effect model (FEM) and ordinary least square (OLS) models. As a result, the FEM model is suitable for performing the regression after using the Hausman Test with the OLS model. Both FEM and OLS models are presented in the table below as follows:

Tab. 3: FEM and OLS model regression results

G_INC	(1) FEM		(2) OLS	
LNINVEST	-0.0197***	(-49.79)	-0.0198***	(-50.02)
LNHEALTHEXP	0.0121***	(17.37)	0.0115***	
LNTAX	0.0167***	(30.32)	0.0166***	(30.05)
LNPENSION	0.0014**	(2.22)	0.0013**	(2.08)
LNSOCIAL	-0.0220***	(-44.35)	-0.0224***	(-45.01)
EDU	-0.0108***	(-27.29)	-0.0108***	(-27.31)
VHLSS	-0.0000***	(-8.13)		
_cons	0.7426***	(120.74)	0.7414***	(120.09)
Hausman Test	Prob > chi2 = 0.0000 => The suitable model is FEM			
F-Value	0.0000		0.0000	
R2	0.5663		0.5663	
N	7980		7980	

Source: authors' calculations in Stata 16
Significance of the symbol: *p<0.1 (significant level of 10%), **p<0.05 (significant level of 5%), ***p<0.01 (significant level of 1%). The number in brackets () is the t value in the regression model.*

FEM model:

$$G_INC_{it} = \beta_0 + \beta_1 \text{LNINVEST}_{it} + \beta_2 \text{LNHEALTHEXP}_{it} + \beta_3 \text{LNTAX}_{it} + \beta_4 \text{LNPENSION}_{it} + \beta_5 \text{LNSOCIAL}_{it} + \beta_6 \text{EDU}_{it} + VHLSS_t$$

Table (3) shows the regression results of FEM and OLS, according to which the model selected as FEM has the following results: The variable LNINVEST harms income inequality (G_INC), reaching statistical significance at 1%; same for social security (LNSOCIAL), education (EDU) and VHLSS variables; the remaining variables include health expenditure (HEALTHEXP); income tax (TAX) and pension (LNPENSION) have a statistically significant positive impact at 1% and 5% on income inequality (G_INC).

The results from the regression table are similar to the expectations. However, these results may still suffer from various econometric phenomena and defects such as multicollinearity, variable variance, and influence from outliers. Therefore, the study will test the strength of the model and ensure the consistency and validity of the results, and the regression results will be based on testing the model's reliability.

Check model robustness

Tab. 4: Verification of multicollinearity using VIF

Variables	VIF
LNINVEST	1.14
LNSOCIAL	1.11
LNTAX	1.09
LNHEALTHEXP	1.07
EDU	1.06
LNPENSION	1.05
VHLSS	1.02
Average of VIF	1.08

Source: authors' calculations in Stata 16

Table (4) shows that the VIF coefficients of all variables are less than 5. Besides, the mean coefficient of VIF is less than five is 1.08. Since VIF has a value from 1 to 5, the model has multicollinearity but is not too severe (Wooldridge, 2002).

Tab. 5: Variance test

Breusch–Pagan/Cook–Weisberg Test
H0: The model is not affected by variance
H1: The model is changed by variance
Prob > chi2 = 0.0889

Source: authors' calculations in Stata 16

The results from Table (5) show that p-value = 0.08 < 0.1 (significant level of 10%), so hypothesis H0 is rejected and hypothesis H1 accepted. Therefore, the study's FEM model is concluded with variable variance defects.

Because the FEM model is suffering from variable variance defects, the FEM model will be regressed with the Robust Standard technique (substantial standard) to overcome the defects and give better research results.

Tab. 6: Regression of FEM model with Robust

G_INC	(1) FEM	
LNINVEST	-0.0197***	(-46.70)
LNHEALTHEXP	0.0121***	(16.99)
LNTAX	0.0167***	(28.59)
LNPENSION	0.0014**	(2.04)
LNSOCIAL	-0.0220***	(-38.70)
EDU	-0.0108***	(-25.40)
VHLSS	-0.0000***	(-8.12)
_cons	0.7426***	(123.55)
F-Value	-	
R2	0.5663	
N	7980	

Source: authors' calculations in Stata 16

Note: *The above results were estimated using a Fixed Effects model (FEM) with vital standard errors (Robust Standard Errors). Significance of the symbol*: *p<0.1 (significant level of 10%), **p<0.05 (significant level of 5%), ***p<0.01 (significant level of 1%). The number in brackets () is the t value in the regression model.*

Table (6) shows that after overcoming the variable variance defects, the variables still give similar results compared to the old model regarding sign and impact significance. To control outliers, the author uses the winsorisation technique suggested by Lim, Hooy, Chang, and Brooks (2016) to remove outliers in the FEM model in the previous table. The author will remove outliers in the 1st and 99th percentiles in the table below.

Tab. 7: Regression results control for outliers for the FEM model

G_INC	Model FEM (1%-99%)	
LNINVEST	-0.0196***	(-46.60)
LNHEALTHEXP	0.0121***	(16.94)
LNTAX	0.0167***	(28.65)
LNPENSION	0.0014*	(1.96)
LNSOCIAL	-0.0222***	(-39.12)
EDU	-0.0108***	(-25.40)
VHLSS	-0.0000***	(-8.17)
_cons	0.7426***	(123.52)
R2	0.5671	
N	7980	

Source: authors' calculations in Stata 16

Significance of the symbol: *p<0.1 (significant level of 10%), **p<0.05 (significant level of 5%), ***p<0.01 (significant level of 1%). The number in brackets () is the t value in the regression model.*

The results from Table (7) show that the adjusted R2 coefficient of the FEM model is 0.5671, showing that the independent variables in the model all explain more than 56.71% of the change in the dependent variable. This result is about 0.08% higher than previous FEM models. Most of the impact directions with the variables are consistent with the expectations of the original research and coincide with the previous models.

The formal FEM regression model is as follows:

$$G_INC = 0.74 - 0.019 * LNINVEST + 0.012 * LNHEALTHEXP + 0.016 * LNTAX + 0.001 * LNPENSION - 0.022 * LNSOCIAL - 0.01 * EDU - 0.00 * VHLSS$$

The results of the effects of variables show that other factors remain constant when income; An increase in social security by 1% will reduce household income inequality by 1.9% and 2.2%, respectively. Similarly, when education increases by one year, income

inequality will decrease by 1%, other things being equal. On the contrary, other factors remain constant when health expenditure (LNHEALTHEXP); income tax (LNTAX); pension (LNPENSION) increase by 1%, and income inequality also increases by 1.2%, respectively; 1.6% and 0.1%.

3. Discussion

In the results of this study, the authors provide clear evidence that, first, a place that health expenditure, pensions and income taxes will all increase inequality in household income (Muinelo-Gallo, L., & Roca-Sagalés, O., 2014; Cuong, D. V., 2019), while social security reduces inequality in household income. Working to correct for defects and remove outliers allows for a more precise determination of the effects of fiscal policy on income distribution.

The results from the proxy variables for fiscal policy demonstrate that the middle and poor classes are affected by fiscal policy. At the same time, the rich will be the beneficiaries. This outcome is generated through health spending (which exacerbates inequality from the middle and poor classes) and social security spending in pensions (increasing pension systems will reduce lower-class participation). For household investment, the results show that it is an investment that will reduce inequality as well as improve the income ratio of the poor and middle classes while reducing the participation of the rich. Similar findings were reached by Muinelo-Gallo, L., & Roca-Sagalés, O. (2014). With a relatively high investment rate at 1.9% and social security at 2.2%, it will create a stimulating effect to reduce the pressure from fiscal policies such as taxes, pensions, and spending because the percentage impact is relatively low. Finally, increasing the education level of households will help reduce income inequality in the future because the opportunities that education offers are tremendous compared to households with a low level of education. This result also supports the findings on education level and income inequality in Vietnam with some authors such as Truc (2016), Private & Association (2017), and Phuong & Nguyet (2021).

Implementing fiscal policies by the Vietnam Government focusing on increasing public investment and focusing on more equitable income distribution is contributing to limiting the impact of income inequality on the economic growth of the Northern Midlands and Mountains. In the future, the Vietnamese government may focus more on changing not only the tax structure and pension control but also household health spending behaviour while improving the control of tax evasion, encouraging households' investment with preferential loan packages, or increasing the implementation of social security and study promotion activities in remote areas, especially when the sample of the study is in the Northern Midlands and Mountains.

Conclusion

This study examines the relationship between fiscal policy elements and income inequality in the Northern Midlands and Mountains region of Vietnam, aiming to address income inequality in the area. The research finding indicates that specific fiscal policy measures, such as spending on health, income taxes, and pensions, contribute to increased household income inequality. Conversely, social security measures have a positive impact by reducing inequality in household income.

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The study reveals that fiscal policy affects different economic classes in the region differently. The middle and poor classes are more negatively impacted, while the rich tend to benefit. Health spending exacerbates inequality for the middle and poor while increasing pension systems reduces lower-class participation.

On a positive note, household investment emerges as an effective approach to reduce inequality and improve the income ratio of the poor and middle classes while decreasing the participation of the rich. Additionally, enhancing household education is identified as a key strategy to reduce income inequality in the future, given the significant opportunities education provides compared to households with lower education attainment.

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EU Taxonomy in the Context of Environmental, Social and Governance (ESG) Ratings

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Abstract
The effects of climate change will have a significant economic impact on the global economy in the future. In some cases, these will be gradual changes, while others will be more dramatic. These occur at a higher frequency of extreme weather events. The impacts caused by the effects of climate change, which are already taking place on a large scale and are visible, are costing billions of dollars. The 2030 Agenda for Sustainable Development, adopted at the 2015 New York Summit, includes 17 global sustainable development goals (SDGs). The aim is to universally manage the development of contemporary society on a global and local level. The European Green Deal is the European Commission's plan for the ecological and societal transformation of the European Union's economy for a sustainable future. The main objective of the European Green Deal is to make Europe a climate-neutral continent by 2050. An ecological transformation of companies' business models in the EU will be inevitable and a prerequisite for the path towards a sustainability model. In order to meet the above objectives, the European Commission has developed an evaluation base (EU taxonomy) that will allow transparent decision-making towards sustainability. Companies will have to disclose their economic activities in a transparent and comparable way, which will contribute to a rapid and green transformation of the economy.

Key Words
ESG, EU, environmental, entrepreneurship, bibliometric analysis

JEL Classification: M14, A13, H59

Introduction

Voluntary disclosure of non-financial information on environmental, social and governance (ESG) aspects is a rapidly developing and increasingly important topic that has attracted a lot of attention from both academic researchers and capital market participants in recent years (Tsang, & Frost, & Cao, 2023). The current call for European company accountability takes the form of three key concepts known as ESG: 'Environment' includes the environmental impact of business, 'social' impact on society and 'governance'.

Since 2018, around 11,000 companies in the European Union must report non-financial indicators such as the environmental impact of doing business, respect for human rights, environmental protection, anti-corruption behaviour, equal treatment of employees regardless of gender, inclusive approach and so on. This obligation was imposed on them by the Non-Financial Reporting Directive (NFRD). The aim is to make this information available to all stakeholders and to motivate companies to do business responsibly.

Key elements of the new and improved Non-Financial Reporting Directive, also known as the Corporate Sustainability Reporting Directive (CSRD), a requirement for more detailed reporting requirements and compliance with mandatory sustainability reporting standards set by the EU. One of the main goals of the CSRD is to increase the transparency of companies and their value chains, but also to put non-financial reporting on a par with financial reporting so that it becomes the same priority for company management. In the first wave, in 2025 (reporting for the financial year 2024), the regulation will apply to companies that are already obliged to report according to the NFRD, i.e. all listed companies, and at the same time large companies with more than 500 employees, which are lower tens of companies in the Czech Republic (Šafranková, & Šikýř, 2019). One year later (in 2026 – reporting for the financial year 2025), the Directive will be extended to all large companies that meet at least two of the following criteria: a) More than 250 employees; b) A turnover of at least EUR 40 million; c) Total assets of at least EUR 20 million. In subsequent waves, the notification obligation will also apply to listed SMEs and companies outside the EU.

While companies have been disclosing their approach to sustainability for some time, CSRD will require a new level of disclosure and hundreds of indicators, policies and targets in areas such as: 1) Managing climate change risks; 2) Circular economy and pollution; 3) Protection of biodiversity; 4) Reducing energy and water consumption; 5) Fair treatment of workers both within the company and throughout its value chain; 6) Prevention of corruption; 7) Supplier relationship management; 8) Payment discipline; 9) Lobbying activities etc.

The aim of the article is to identify the areas of scientific research within which the EU taxonomy is addressed, based on the analysis of bibliometric data characterizing scientific publications indexed in Web by Science databases and the specification of scientific discourse. Based on this objective, the following research question is defined:

(1) What topics (problems) did the scientific discussion in the field of current and future EU legislation – NFRD and CSRD standards deal with?

1. Methods of Research

To achieve the goal of the article, bibliometric analysis was used as an effective method to find trends in specific research areas and identify relevant publications for further qualitative research, where the publications and trends are worked with in greater detail (Jacimovic et al, 2021) Examining written scientific studies produced in any field of science on a regular basis is of great importance both to determine the level of development in the field and to determine which issues the authors predominantly focus on (Matsimbe et al., 2022)

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The method of bibliometric analysis was used in the study to find out what topics (keywords) are associated with the current and future EU taxonomy in professional articles. Čadil (2015) finds bibliometric analysis valuable in its use "*for evaluating the volume of outputs of scientific activities. Its use is based on the fact that the articles are the main communication channel through which the created knowledge is disseminated to other researchers and potential users from the application sphere*." Hicks and Melkers (2012) point out that professional articles help to spread knowledge and topics to be addressed for future research in two basic directions: (1) inform what has already been achieved in scientific activities, (2) point out possible directions of further research. Overall, they help to reduce the discourse between scientific research and practice. Data was obtained from the Web of science database and subsequently processed with the help of VOSwiever, version 1. 6. 18, a software tool for creating maps based on network data and for visualization and exploration of these maps. The selection of the database according to phase one was chosen based on its availability and thematic breadth within all scientific disciplines (Web of Science). Keyword selection took place in phase 2. The bibliometric analysis included a sample of professional publications (without conference papers, books and legislation were included in the analysis. that contained the phrase across the entire range of documents ("CSRD" or "NFRD"), then articles were searched for separately on the topic of "CSRD" and "NFRD". Bibliographic database files can be provided as input, the Web of Science database and files (both standards – "CSRD" and "NFRD" – were used as keywords). A total of 1,352 scientific articles were found, keywords from these articles were exported by the RIS reference manager. VOSviewer was developed in the Java programming language. Since Java is platform independent, VOSviewer can run on most hardware and operating platforms. The density display option was used. In this view, items are labelled in a similar way to the label display technique. Each point in the map has a colour that depends on the density of items at that point. That is, the colour of a point in the map depends on the number of items around the point and the importance of adjacent items. Density is especially useful for getting an overview of the general structure of the map and for drawing attention to the most important areas on the map. (Van Eck and Waltman, 2007) This method made it possible to find out what keywords and with what intensity (density) are addressed in professional articles in the WOS database in connection with the EU taxonomy in the field of ESG.

2. Results of the Research and Discussion

As shown in Tab. 1, a total of 1381 articles were published in the Webo of Science (WOS) database on both NFRD and CSRD legislative standards. In the last five years, 842 articles were published, which represents 61 % of the total number of articles published on the topic.

DOI: 10.15240/tul/009/lef-2023-30

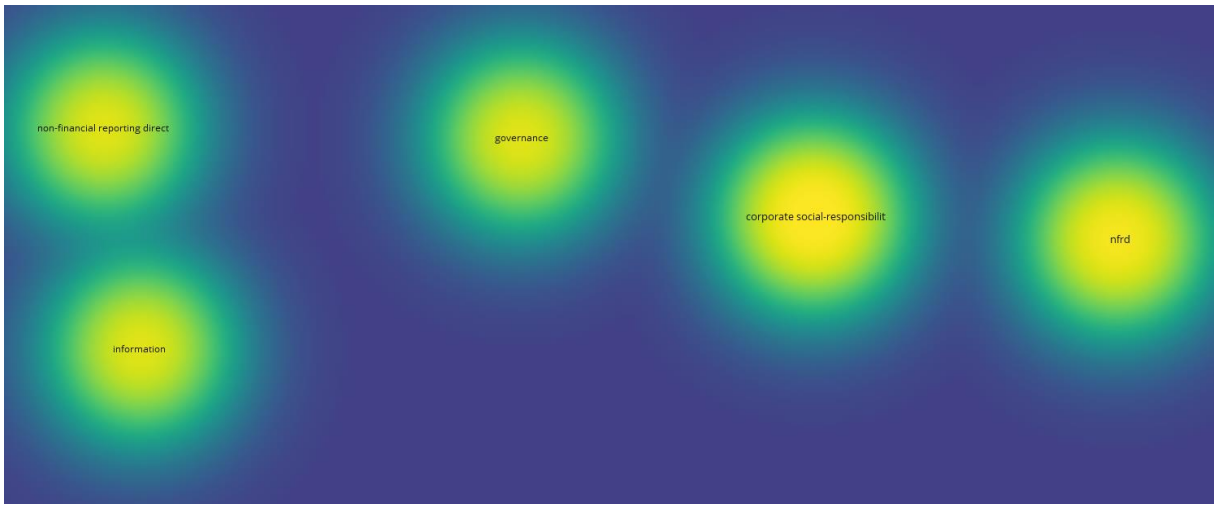
Tab. 1: Bibliographic records for selected keywords in Web of Science

WOS search terms	Number of articles in WOS	Number of articles in WOS 20 18-2023
"CSRD" or "Corporate Sustainability Reporting Directive" or "NFRD" or "Non-Financial Reporting Directive"	1.381	842
"NFRD" or "Non-Financial Reporting Directive"	53	44
"CSRD" or "Corporate Sustainability Reporting Directive"	1.335	833

Source: processed by the authors by WOS (2023/05/21)

The WOS database subsequently searched for articles dealing only with NFRD issues, totalling 53 articles, of which 44 articles (representing 83 %) have been published in the last five years. Subsequently, a bibliometric analysis was carried out, based on which the most common keywords related to the topic were extracted. VOSviewer software was used during the analysis. The generated set contained words that were found at least five times in the total of 53 analysed articles. Subsequently, the VOSwiever program was used in the form of a density map. Each point in the item density visualization has a colour that indicates the density of items at that point. By default, colours range from blue to green to yellow. The greater the number of items around a point and the higher the weights of adjacent items, the closer the colour of the point is too yellow. Yellow words have the highest occurrence (these keywords: governance, corporate social-responsibility, information).

Fig. 1: Visualization of density – "NFRD"



Source: processed by the authors by VOSwiever

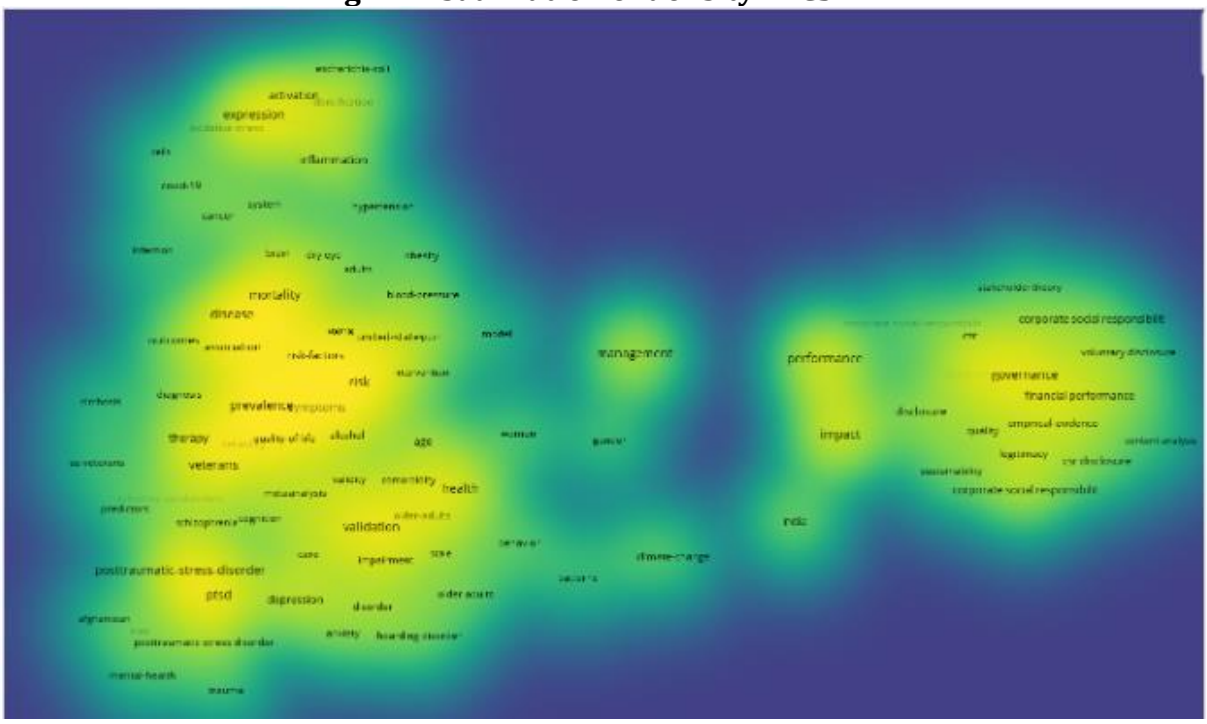
The same procedure was also applied when searching for articles in the WOS database on CSRD legislation, a total of 1335 articles, of which 833 articles (which make up 62 %) have been published in the last five years. Subsequently, a bibliometric analysis was carried out, on the basis of which the most common keywords related to the topic were extracted. VOSviewer software was used during the analysis. The generated set contained words that were found at least five times in the total of 53 analysed articles. Subsequently, the VOSwiever program was used in the form of a density map. Each point in the item density visualization has a colour that indicates the density of items at that point. By default, colours range from blue to green to yellow. The greater the number of items around a point and the higher the weights of adjacent items, the closer the colour of the point is too yellow (these are the keywords listed in Tab. 2).

Tab. 2: Density of words "CSRD"

Number of occurrences among keywords of professional articles from the WOS database	Keywords
41-50	Prevalence, performance,
31-40	Performance, governance, management, health,
21-30	Risk, depression, determinants, veterans, corporate social responsibility, validation, disease, risk-factors, mortality ,
11-20	Impact, csr disclosure, association, sustainability, hoarding disorder, gender, corporate governance

Source: processed by the authors by VOSwiever

Fig. 2: Visualization of density – "CSRD"



Source: processed by the authors by VOSwiever

The European Commission has broadened the scope to include around 49,000 companies matching 2 out of the 3 characteristics below: a) 250 employees and/or b) 40 million turnover and/or c) EUR 20 million of total assets of listed companies.

These characteristics cover more than 75 % of the total turnover of EU companies. These companies will have to comply with CSRD by 2024 (fiscal year 2023). It is worth noting that small and medium-sized listed companies that do not meet the above criteria receive an extra three years to comply. Regarding the reporting requirements under the CSRD, the requirements submitted by the NFRD will be amended. In addition to NFRD, the following topics are introduced:

1. Double Materiality Concept – reporting on both the company's impact on society and the environment, as well as the sustainability risks it faces (e.g., due to climate change and resource scarcity)
2. Formulation of long-term environmental, social affairs and governance (ESG) objectives and policies
3. Due diligence on its operation and supply chain

4. Disclosure of information concerning intangible assets (social, human and intellectual capital)
5. Reporting in accordance with the Sustainable Finance Disclosure Regulation (SFDR) and the EU Taxonomy Regulation
6. Integrated reporting and mandatory external assurance

Fig. 3: Global reporting rates of E, S and G risks

Source: processed by the authors by (KPMG, 2022), base 5,800 N100 and 250 G250

Over the past 5 years, the share of G250 companies reporting environmental issues as a risk to business has increased from 48 percent in 2017 to 64 percent in 2022, and the share of N100 companies from 28 percent to 46 percent. The social element of ESG is now becoming the focus of companies. However, the shift to solving social problems has yet to translate into a comprehensive set of disclosures (KPMG, 2022).

Currently, almost half of the G250 (49 percent) recognize social elements as a risk to their business. A smaller share of N100 companies (43 percent) deal with social risks. The elements cover areas such as community involvement, safety, and work issues, which are key risk areas for most companies. Companies also prefer to use narrative descriptions to describe social impacts instead of providing quantified data (KPMG, 2022),

Cörnell (2021) states that two main factors – investor preference and risk – influence the expected returns of companies with high ESG ratings (environmental, social and governance). While investor preferences for companies with high ESG ratings may reduce the cost of capital, the other side of the coin is lower expected returns for investors. In the study, Ammar Zahid et al. (2022) examines the relationship between environmental, social and governance (ESG) assessments and dividend policies, taking into account the mitigating role of audit quality. Based on data on Western European listed companies (leaders in the ESG revolution) for the period 2010-2019, panel regression analyses show a significant positive relationship between ESG and dividend payments. Thus, companies with strong ESG practices demonstrate their stakeholder and shareholder orientation, thereby maintaining dividend payments.

The key topics addressed in expert articles from the Web of science database in relation to the issue of EU taxonomy – CSRD and NFRD include mainly the topics of prevalence, performance, governance, corporate social responsibility, risk-factors, CSR disclosure,

sustainability, gender, corporate governance. Development and growth are drivers of economic growth, their relationship to sustainable development and sustainability is controversial. One of the important trends is the concept of corporate social responsibility. As part of this activity, companies are interested in what is happening in their surroundings, social and environmental issues, sponsor various programs on a local and wider scale. They often help to protect nature and biodiversity even in their own industrial area.

Conclusion

CSRD (Corporate Sustainability Reporting Directive) and NFRD (Non-Financial Reporting Directive) standards are European directives that apply to the sustainability reporting of companies. These Directives aim to improve the transparency and comparability of information relating to environmental, social and corporate governance. Although these standards are similar and have common elements, there are several fundamental differences between them. One of the main differences is the extent of application of the two directives. The CSRD standard focuses primarily on large companies with more than 500 employees, which are required to disclose sustainability information in their annual report. On the other hand, the NFRD standard was aimed at public companies and banks and had the obligation to provide information on the social and environmental impact of their activities, while other entities could provide this information voluntarily. Another difference is the content and details of the information to be disclosed. The CSRD standard sets out specific requirements for the disclosure of environmental, social and corporate governance information, including detailed indicators and quantitative data. On the contrary, the NFRD standard is more general and provides more scope for companies' own interpretation, which may lead to different approaches and the comparability of this information may be limited.

The key topics addressed in expert articles from the Web of science database in relation to the issue of EU taxonomy – CSRD and NFRD include mainly the topics of prevalence, performance, governance, corporate social responsibility, risk-factors, CSR disclosure, sustainability, gender, corporate governance. Development and growth are drivers of economic growth, their relationship to sustainable development and sustainability is controversial. One of the important trends is the concept of corporate social responsibility. As part of this activity, companies are interested in what is happening in their surroundings, social and environmental issues, sponsor various programs on a local and wider scale.

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Circular Economy Implementation from the Perspective of Benefits and Barriers

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Abstract

The circular economy is an economic model focused on reducing waste generation and promoting resource reuse. It has gained popularity as a sustainable solution to the linear economy's negative impact on the planet and socio-economic conditions. Implementing the circular economy involves replacing the concept of "end of life" with reduction, reuse, recycling, and restoring materials at various levels, from micro to macro. To explore the benefits and barriers of implementing the circular economy in the business environment, a literature review was conducted using the Web of Science Core Collection database. Among the 1,510 initial search results, 17 relevant articles were selected for analysis with application of snowball method. These articles represent contributions from various countries, with a majority from outside Europe. The analysis of the selected articles revealed six basic groups of benefits and barriers associated with the circular economy. Benefits include improved public relations, cost savings, competitive advantage, economic growth, environmental restoration, and job creation. However, barriers such as organizational culture, lack of information, financial constraints, inadequate legislation, low awareness, and limited customer interest pose challenges for implementation. While the circular economy offers numerous benefits, its successful implementation starts at the micro level, requiring businesses to overcome internal barriers. Companies must innovate their business models, consider future directions, and navigate financial challenges. Despite obstacles, the circular economy presents an opportunity for cost savings, improved company image, and positive environmental and societal impact. By embracing this model, businesses can contribute to a sustainable and prosperous future.

Key Words

circular economy, implementation, barriers, benefits, green deal

JEL Classification: M21, O13

Introduction

The circular economy is a new form of economic model that tries to minimize the generation of waste and promote the reuse of resources. The conceptual foundations of this concept date back to the 70s of the 20th century, when they were mentioned in the publication "The Economics of the Coming Spaceship Earth." Since then, the circular economy has been building and becoming more and more popular over the years. The linear economy that consists of obtaining, consuming and disposing of material is no longer sustainable and has led to the deterioration of the planet and socio-economic conditions. The circular economy is seen as a solution to this problem and can deliver significant sustainability benefits, including net savings and reduced emissions. This new concept is a building block of the so-called Green Deal for Europe and can deliver a prosperous, modern, competitive and climate-neutral economy (European Commission, 2015; Kirchherr et al., 2018).

Kirchherr, Reike and Hekkert (2017, p. 224) in their publication examined 114 definitions of the circular economy and defined it as "an economic system that is based on business models that replace the concept of 'end of life' with reduction, reuse, recycling and by restoring materials in production/distribution and consumption processes at the micro level (products, companies, consumers), at the meso level (eco-industrial parks) and at the macro level (city, region, nation and beyond) with the aim of achieving sustainable development that means improving quality environment, economic prosperity and social justice for the benefit of current and future generations."

The concept of circular economy was created to replace the one-way flow of raw materials through products to waste. In a circular economy, products and materials are kept as long as possible to minimize the volume of resources and waste. They are kept until the end of their useful life, in the meantime they are repeatedly used and recycled (Moldan, 2020). Overall, CE can be seen as a complex of improvements that minimizes the use of resources and energy, the production of waste and the closure of production processes (Geissdoerger et al, 2017). Unlike the linear economy, it works on the 3R principle, i.e. reduce – reuse – recycle, later on the 5R principle, i.e. reduce – reuse – recycle – repair – rethink. Overall, the principles of the circular economy are divided in the literature from the 3R framework to the 9R framework (Su et al., 2013; Kumar et al., 2019).

The aim of the paper is to find theoretically defined benefits and barriers related to the implementation of the circular economy in the business environment.

1. Methods of Research

The paper was created using the analysis of scientific articles available in the Web of Science Core Collection database for the period 2018 to 2022. Articles were selected using search terms and with a focus on the implementation of the circular economy. Based on the stated goals of this work, the criteria were set as follows (See Tab. 1):

Tab. 1: Criteria for literature review

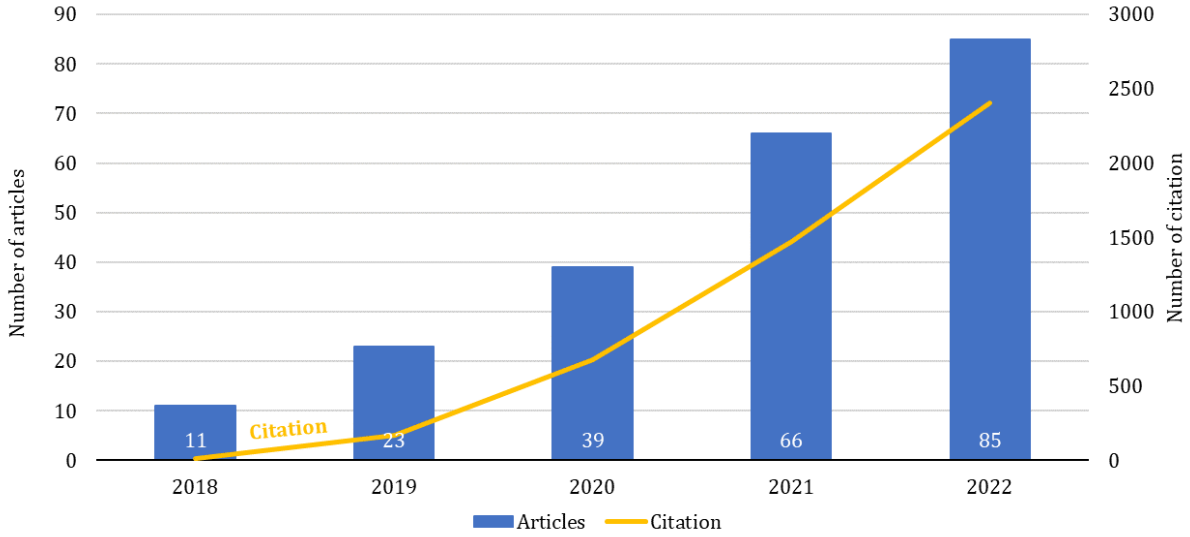
Area	Criterion
Database	Web of Science Core Collection
Period	2018-2022
Search field	Topic
Searched words	„circular economy“ „implementation“ AND „barriers“ „challenges“ „strategy“
Language	English
Geographical restrictions	none
Document type	article
Category	Management, Business, Economics, Engineering Manufacturing, Operations Research Management Science, Business Finance, Development Studies
Eliminated criteria	books, conferences and other types of documents, other languages other than English

Source: authors' research (2023)

In the Web of Science Core Collection database, based on the combination of the search words "circular economy" AND "implementation", 1,510 results were found. Such a high

number of results indicates that only this search condition was not narrowed down enough, therefore all exclusion criteria (see Tab. 1) were applied, thanks which the search conditions were sufficiently limited and the sample of found studies was drastically reduced. Based on the all defined criteria and after applying it, 224 articles were found.

Fig. 1: Development of a sample of 224 articles and citations



Source: authors' research (2023)

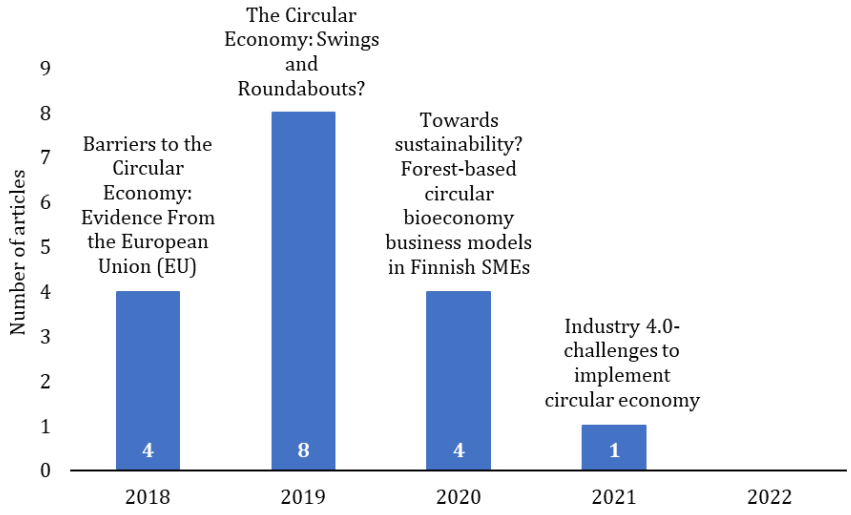
When looking at the nationality of the authors of the selected sample of articles, it can be seen that England has the largest percentage representation with 14%. However, as far as the overall representation of the European region is concerned, the articles here are in the minority. Contributions from almost 57% of the representation come from countries outside the European area.

The issue of the circular economy creates an area that is very actual. This is an area that is developing a lot over the years and not only in terms of the number of published articles and citations. For this reason and due to the need to further narrow the sample of found articles, the 25 most cited articles in the period 2018-2022 were selected to further analysis. The articles were analysed id terms of:

a) availability,
b) name,
c) thematic focus,
d) duplication.

Through these steps, it was achieved that the final sample of articles sufficient for the needs of this contribution. For the purposes of this paper, a final sample of 17 articles found through the criteria and limiting conditions of the literature search was explored.

Fig. 2: Analyzed articles and most cited publications displayed in years



Source: authors' research (2023)

A look at the publication source of the selected articles shows that they have been published in a total of 12 different journals worldwide. The analysis of the journals shows that almost 24% of the articles from sample 17 were published in the journal Business strategy and the environment. All the journals are ranked in the Q1 quartile by SJR, which speaks of the quality of the selected publications.

A method called Snowballing was used in the creation of the literary research. This procedure includes the use of the literature listed in the reference list of sources to create a search. This approach expands the systematic view of a given research area (Wohlin, 2014).

2. Results of the Research

The implementation of circular economy principles is still in its beginnings. Many companies and political circles support CE principles, but without real impact in terms of implementation itself (Lacy & Rutqvist, 2016). For the successful implementation of the circular economy in society, it is necessary to start at the micro level, i.e. at the corporate level (Su et al., 2013; Kumar et al., 2019). Successful implementation, however, according to Prieto-Sandoval et al. (2018) depends on many internal and external factors in the form of not only benefits but also barriers. According to Kirchherr et al. (2018) is the implementation of CE in the business environment affected mainly on internal barriers that companies need to overcome.

The benefits and barriers of the circular economy are possible according to Kumar et al. (2019) and Kirchherr (2018) divide into six basic groups (see Tab. 2).

Tab. 2: Summary of the benefits and barriers to the implementation of the CE

Area	Benefits	Barriers
Organizational	– improvement of public relations and company image – social responsibility	– organizational culture of the company, management resistance – lack of information – unwillingness to take risks
Economical	– gaining a competitive advantage – sustainable economic growth – entering new markets or gaining a larger market share – cost reduction thanks to a sustainable production method – prevention of future resource shortages – creation of new jobs	– unavailability of business partners for the processing of produced waste – high initial costs – lack of financial resources – financial instability/instability – large and uncertain return on investment
Social	– reduction of the amount of produced waste and emissions – environmental restoration	– low awareness and awareness of CE – low understanding of the benefits of CE
Technological	– increase in efficiency and productivity – new technologies of machinery and equipment	– ingrained principles of linear economics – lack of experts on CE issues, lack of knowledge of the area
Legislative	– tax reduction – CE development support – compliance with future legislation	– unclear, insufficient legislation – unequal conditions set by government institutions – low level of support
Commercial	– long-term customer satisfaction – readiness for a potential change in customer needs	– low interest from end customers – absence of customer pressures – competition with the established linear model

Source: authors' processing according to Kumar et al. (2019), Ormazabal (2016), Agyemang (2019), Demirel & Danisman (2019), Stahel (2016), Su et al. (2013), Kok et al. (2013), Geissdoerfer et al. (2017), Ghisellini et al. (2016), Kirchherr et al. (2017)

3. Discussion

The research was focused on benefits and barriers of implementing the circular economy in the business environment. The research represents a literary entry into this issue, which highlights examples of benefits and barriers that are mentioned in published articles of literature found through a systematic literary search from the Web of Science database.

Given the importance of the circular economy, it is clear that the benefits of these principles cannot be denied. The most motivating benefit for companies is cost savings together with building the company's image (Prieto-Sandoval et al., 2018).

García-Quevedo et al. (2020) highlights environmental improvement, cost reduction, economic growth, development and innovative processes among the potential benefits of CE. In contrast, MacArthur (2013) states among the benefits that the circular economy helps companies in their relationship with their end customers. Using the principles of the circular economy, companies and customers are aligned, and companies can better understand the needs and expectations of final subjects and focus their business activities. At the same time, CE represents a high potential in the area of unemployment, as

the implementation of CE will create new job opportunities. The impact on awareness of public health and the state of the environment cannot be neglected either.

Profitability, securing or increasing market share, these are the benefits that Agyemang (2019) evaluated as those that interested the respondents of his research the most. He found that more than the impact of CE on the environment, managers are also interested in other economic indicators in the form of reducing costs, increasing the performance and competitiveness of enterprises. In the case of small and medium-sized enterprises, it was also confirmed that innovative procedures in the area of the circular economy have a significant effect on revenue growth (Demirel & Danisman, 2019).

Although the circular economy represents an area with many advantages in terms of resource utilization and sustainability, it also represents many obstacles that companies must overcome to implement it. Adapting to CE principles forces business entities to make major innovations in existing business models and forces them to think about the future direction of business (Antikainen & Valkokari, 2016). Tukker & Tischner (2006) highlight the fact that for some types of companies, the transition to CE may mean that they move from a model of manufacturing final products to providing services in the form of repair or renovation of products, thereby contributing to the extension of the life of products and reducing the produced waste.

A change in culture or business strategy is often not supported at all by top management. In this case, it is almost impossible to enforce CE in the company and make its implementation (Agyemang, 2019). Social barriers are associated with low awareness and awareness of CE and understanding of the benefits it offers. Based on this, it is possible to see low motivation and confidence in joining new economic models. Global awareness by governments, businesses or other stakeholders is important in this regard (Geissdoerfer et al., 2017)

According to García-Quevedo et al. (2020) there is a direct link between the size of the company, its time in business and the perception of financial obstacles to the implementation of CE. In the case of newly established companies, it is clear that these companies have a harder time obtaining new sources of financing for adapting CE principles than companies with a long tradition. At the same time, it is obvious that the perception of individual types of barriers differs between individual economic orientations of companies. Companies focusing on innovative techniques for processing goods or materials perceive all types of areas as very important, on the other hand, companies that apply CE principles to reduce the amount of waste, optimize consumption, and use renewable energy mainly mention regulatory barriers, such as those that hold them back when implementing the principles CE.

According to a research study by Kircher et al. (2018) showed that interest in CE has not reached its maximum potential, and especially for very conservative companies, it is not a topical issue at all these days. Agyemanga (2019) shows that the lack of information and experts on the issue is a bottleneck in the implementation of the circular economy. Due to Agyemanga (2019), this barrier can be classified as the third most significant one mentioned by the respondents of his research. Which is also confirmed by Kumar et al. (2019).

Conclusion

The main focus of submitted contribution was to examine possible benefits and barriers connected with the implementation of the circular economy in the business environment. The article was prepared on the basis of a literature research in the Web of science database, where 224 articles were found through defined criteria, from which the 17 most cited were selected. These articles were assessed in terms of availability, title, thematic focus and duplicates, whether they are relevant for the creation of this contribution. The so-called snowballing method was also applied to obtain answers to the purpose of the article in the form of defined benefits and barriers related to the implementation of the circular economy in the business environment.

The adoption of circular economy principles is still in its early stages. However, it's evident that for the effective establishment of circular economy practices, the journey must start at the micro level, specifically within enterprises. The accomplishment of successful implementation hinges on a multitude of internal and external factors, encompassing both advantages and obstacles. The benefits of the circular economy can be divided into six groups: organizational, economic, social, technological, legislative and commercial. Each group brings its specific benefits, such as improving public relations and company image, gaining a competitive advantage, sustainable economic growth, reducing waste and emissions, increasing efficiency and productivity, tax breaks, long-term customer satisfaction and readiness for changes in customer needs etc. The benefits of circular economy principles are indisputable and have a significant impact on the environment, the economy and society.

However, the implementation of the circular economy also brings many obstacles. Businesses have to face challenges such as organizational culture, management resistance, lack of information, unwillingness to take risks, unavailability of business partners for waste processing, high initial costs, lack of funds, uncertain return on investment, insufficient legislation, low awareness of the circular economy and insufficient support by government institutions. It is important for businesses to innovate in their business models and think about the future direction of their business. Although the implementation of the circular economy faces many obstacles, there is a strong motivation for businesses, represented by cost savings and building the image of the company.

The limitation of this contribution is primarily in the limited sample of articles from which the contribution was made. With a larger sample of researched articles, other facts could be found that would contribute to the view of the benefits and obstacles of implementing the principles of the circular economy in the business environment.

The research is based on a small sample of selected articles. Despite this fact the research is designed to be first literature introduction for future research in which it will be mentioned.

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Determinants of Development of Municipal Economic Activity Zones in Poland

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Abstract
The research aims to identify the factors that can significantly affect the creation and development of economic activity zones set up in recent years in many Polish communes as an alternative to special investment zones centrally created by the state. The research was conducted in 2020–2022 in an interpretational mode with the application of a qualitative approach, i.e., with the use of quality detailed research (CATI and CAWI structured interviews). The research sample included 15 representatives of local self-governments who run such zones and 45 entrepreneurs investing in these zones. Apart from that, there were 5 individual in-depth interviews with representatives of self-governments. The study identified social and economic challenges that led to the development of municipal economic activity zones and related factors. The key objectives and circumstances concerning the establishment of the zones have been identified.

Keywords
investment, enterprises, local self-government, commune, municipal economic zone

JEL Classification: M16, L88, L53

Introduction

The local self-government manages the commune, which is supposed to ensure local development based on local resources and potential (B.Kożuch & A. Kożuch, 2013). It is also important to identify the needs and goals of local stakeholders in this process to enable balanced activities for the sake of improvement of the quality of residents' lives with activities in the field of economic growth and those enabling sustainability of environmental values of the area (Slattery & Zidar, 2020; Mutiarani & Siswantoro, 2020). Self-government management involves all activities related to spatial, social, and economic frameworks (Sbragia, 2019). The economic condition and development potential of a given region depend, among other factors, upon the efficiency of local self-government, its level of entrepreneurship in all the mentioned areas, and its managerial skills and competencies (Richert-Kaźmierska, 2010). These refer mainly to skills such as effectively organising work for the self-government units, creating and implementing the local development policy, stimulating economic growth (Makieła, 2008) and providing a favourable environment for private investments and creating workplaces. It is considered crucial for the effectiveness of self-governments' activities to think and act strategically (Kożuch, 2004), allow innovations as well as internal and local entrepreneurship (Kożuch, 2013) and advanced information technology.

In order to attract investors to specific locations, it is important to create competitive conditions for business development in these places. Local self-governments have an

important role to play here as they influence the development of infrastructure supporting business (e.g., the media, transport links), networking of internal and external actors of economic processes, creating an entrepreneur-friendly image of the commune, support and assistance for investors, innovative approach to the idea of spatial development processes (Stokan, Deslatte & Hatch, 2021) as well as attracting external investors through efficient marketing and promotional activities. As far as communication with potential investors is concerned, a special emphasis is put on developing technical infrastructure, proper development of spatial planning or offering companies attractive tax relief to their businesses (King, 2022). Building the right relations with businesses requires local self-governments to have a positive attitude towards investors and entrepreneurs while maintaining efficient communication with other stakeholder groups and ensuring social participation in making decisions related to important issues for the entire local community. It is facilitated by the wise and thoughtful policy of local self-governments aimed at realising a certain vision of the commune's development. It often requires financial tools, which in practice boils down to the commune incurring expenditures for the sake of social-economic development, such as preparing underdeveloped areas for investments which will, in the long run, increase their attractiveness to potential investors. However, such policies demand understanding and support from various local stakeholders, e.g., residents who have to consciously resign from immediate consumption of public funds (e.g., the development of infrastructure related to leisure activities, organisation of cultural events in the commune) and support self-governmental decisions to invest these funds into improving conditions for business development. It, therefore, means deferred but significantly higher and more prospective development benefits for the commune, such as future revenue streams from land sales or taxes paid by businesses (Dewi, Azam & Yusoff, 2019).

An example of activities aimed at supporting local entrepreneurship is the establishment of municipal economic activity zones. These are designated areas specially prepared for investments that meet potential investors' requirements and needs. The model of functioning of such zones has to be strictly tailored to identified needs of specific businesses, which manifests in the skilful management of investors' relations, preparing offers aimed at concrete branches of business, supporting investors in their activities related to the development of business infrastructure and more. The location of such zones often proves to be a conducive factor in attracting businesses. Many companies take up various types of initiatives to optimise their operations just by considering the change of location (Szczepańska-Woszczyna, & Kurowska-Pysz, 2016). Considering business determinants of running a business activity in a specific area, such as the area's image and potential, transportation access, workforce supply, proximity to sales markets, availability of business-related services, and problems, entrepreneurial communes create attractive conditions for business development and try to attract investors who would fuel the local social-economic growth and contribute to the improvement of living standard in the local communities (Vasstrøm & Normann, 2019).

1. Literature Review

Municipal economic activity zones are specially designated and tailored areas for investments that cater for the needs of potential investors. Local self-governments predominantly create them as an important tool for supporting the transformation of the economic frameworks of communes (Wiedermann & Godzik, 2022). Thanks to investments in the development of such zones, local self-governments accomplish a vision

of increasing the pace of economic growth according to their needs and using various entrepreneurship tools (Zoilboev, 2022). The objectives set for these zones revolve around supporting local entrepreneurship, acquiring key local investors, diversifying the economic frameworks, providing suitable areas for business activities, and fostering inter-sectoral cooperation. The real purpose of these zones is to initiate tangible strategic changes and thus shape business-related services and facilities which would support innovative transformations of the local economic frameworks (Arbolino, Lantz & Napolitano, 2023).

According to the classical theory of business location, a company invests in a place where it generates profits excessing general costs of investment to the greatest extent (Lösch, 1939). According to A. Weber's approach, the choice of locality largely depends on minimising transport costs (Skala & Rydvalova, 2021). However, the concepts of A. Lösch and K. Weber do not account for dynamic modern economic processes based mainly on advanced technologies and the global flow of information. Activities for the development of investment areas are also supported by the economic base theory, according to which each area can be identified with its core economic activity alongside additional activities focused on meeting the needs of an internal sales market and cooperating with neighbouring companies. Based on this theory, we can assume that the sense of creating economic activity zones serves the purpose of strengthening the economic base, allowing for the establishment of competitive enterprises that have positive implications not only for their specific location but also for the areas affected by exogenous factors (Zioło & Kilar, 2022). Economic activity zones may also be perceived as an area for cooperation between companies from core and complementary sectors. According to the concept of growth poles, development begins in very few industries and locations and then gradually spreads onto other parts of the territory, including regional centres and peripheries (Mikos, 2019). Non-economic factors, such as technical and social infrastructure, as well as socio-cultural elements, also play an important role. Enhancing growth processes and mitigating economic regress require providing the economy with fresh development stimuli. Such impulses can be provided by zones which attract external investors and revitalise local entrepreneurship. These zones may also break the negative cycle of diminishing competitive strength in the local economic frameworks. The major conclusions resulting from the concept of local development regarding the creation and functioning of economic activity zones are related to perceiving these areas as space for innovation and cooperation (Frick & Rodríguez-Pose, 2023). On the one hand, these zones should focus on creating external benefits which would visibly exceed the available ones in other parts of the commune and competing territorial units. On the other hand, they should be seen as permanently transforming and strengthening frameworks of cooperation, both within industries and between sectors (including not only business and public sector but also research, development and education). The zones cannot be merely limited to "islands" of development but should rather radiate with positive effects of development that benefit the entire commune and its economic frameworks. The potential of a particular zone is indicated not only by the number of subjects located there but also by the number and quality of the newly created workplaces and the intensity of relations between these subjects within the zone and in its vicinity (Grant, 2020). These relations may take the form of regular cooperation within production processes (a value-added chain) or projects, especially those oriented on working out some innovative values. If perceived in this way, the economic zones become a pole for local development and constitute a foundation for future economic frameworks of the commune. The existence of an economic zone is also an opportunity to implement the rules of sustainable development, especially in terms of spatial planning and mitigation of nuisance effects of

the economy on the environment and local community (Frick, Rodríguez-Pose & Wong, 2019).

Many determinants affect the proper functioning of economic activity zones, dependent on self-government. The major ones are financial, infrastructural, legal, administrative, spatial planning, information-marketing, and institutional factors (Wojtyra, 2020). The potential of a given zone to attract potential investors is indicated by such factors as (Borowiecki & Makieła, 2019):

- Infrastructural preparation (the area designated for the zone should be equipped with basic utilities, have access to public roads and be well integrated into local, regional, and national transportation networks;
- Favourable financial conditions (such as tax relief, affordable land prices or leases, as well as co-financing from local self-government);
- Intensive promotion of the potential of the area designated for economic activity (the area has to stand out and be an attractive location for potential investors);
- Proper legal background (the zone should adhere to the local development plan with clear and regulated ownership of land;
- The location of the zone should not cause spatial conflicts (it is necessary to respect planning regulations, especially spatial order and sustainable development);
- A conducive social-cultural climate, which demonstrates the awareness of local residents of the advantages of having the zone, which causes a favourable attitude of investors;
- Availability of human capital (businesses set up in the zone should have access to workforce, especially to qualified staff;
- Support from other sectors of the economy (building a cooperative relationship at a local level);

All the mentioned determinants related to the creation and development of economic activity zones depend directly on the policy of local self-governments (Pierzyna, 2019) and can be applied in different ways.

2. Research Approach

A critical literature analysis reveals many factors significant for developing business and locations companies choose for their activities. It can be argued that in addition to objective macroeconomic factors, such as interest rate, labour costs, and unemployment level, the decision to choose the location for business activity is also influenced by many factors directly related to the place, and in a broader context, to the commune or region in which the company plans to locate its office. Although local determinants of business development are extensively described in the literature, little research directly refers to the factors determining the attractiveness of infrastructure and services dedicated to business by communes, i.e., municipal economic activity zones.

When the authors started working on the concept of research on the municipal economic activity zones in Poland, they first tried to find previous studies on similar topics conducted in other countries, e.g. in Central and Eastern Europe. They identified several studies on this subject, mainly in Asia (Wang, 2013; Wei & Leung, 2005; Aggarwal, 2022; Jumaniyazov & Hazratov, 2022) and other parts of the world (Zhan, Casella & Bolwjin,

2019; Ravi, 2018; Radev, 2022; Arbolino, Lantz & Napolitano, 2023). However, the authors did not identify studies whose results could directly relate to their original research concept. Therefore, they relied on Polish literature and previous research results (Smutek, 2017; Czyżowska & Żmija, 2022; Dorożyński, Świerkocki & Dobrowolska, 2021).

The authors of the work have tried to fill this research gap by conducting research in 15 economic activity zones in Poland. Considering, in Poland, there is no database presenting all municipal economic activity zones existing, and there is no specific law defining the formal criteria to recognise an area as such a zone, the authors gained the research sample based on the monitoring of municipality websites and review of the zones governed by the local self-governments. The authors created a purpose (non-random) research sample as a set of municipal economic activity zones matching the following conditions:
- the zone has been formally established by the local self-government, which is an owner of the land;
- the zone has started selling the plots of land and found investors;
- at least several companies are working actively in the zone area;
- the local self-government is eager to share experiences and observations and participate in research.

The study aims to identify factors determining the development of municipal economic activity zones. The paper sets the following secondary objectives:
1. Defining the objectives of creating economic activity zones by the local self-governments.
2. Assessing endogenous factors affecting the development of such municipal economic activity zones.

To achieve these goals, the authors formulated the following research questions:
1. What motivates local self-governments to create economic activity zones?
2. Which endogenous factors significantly influence the development of zones from the perspective of local self-governments that manage and investors who operate in them?

The research target group were local self-governments running municipal economic activity zones (15) and investors, i.e., business entities operating in the zones (45). In this research, respondents were people making strategic decisions on behalf of these entities: in local self-governments - they were mayors or other local self-government officials supervising the zones; in cases of investors, they were managers responsible for developing the businesses in the zones.

The research timeframe covered secondary sources for 2020–2022. The spatial scope of the research is the Silesian, Małopolskie, Podkarpackie, and Kujawsko-Pomorskie provinces (Poland).

The research was conducted in an interpretative trend, using a qualitative approach, i.e., qualitative detailed research methods were used as follows:

- five individual in-depth interviews with representatives of local self-governments responsible for developmental zones were carried out, they served to collect the information necessary to design the questionnaire interviews, and they expanded the research data enabling answers to research questions;

- CATI and CAWI structured interviews were conducted, including 15 interviews with the representatives of local self-governments governing municipal economic activity zones and 45 interviews with the representatives of investors, i.e., business entities operating in the zones, to obtain the data necessary to answer the research questions.

The study employs the method of incomplete numerical induction. It consists in moving from individual phenomena or empirical processes obtained as a result of observation, through their justification and theory construction, to the evaluation of its value. The entire research process and all undertaken activities are subordinated to the inductive generalisation of facts as a way of theory building (Apanowicz, 2002; Lisiński, 2016). The study uses the triangulation of data sources, methods, and research techniques. The authors are aware that the obtained results are subjective and incomparable, which makes it impossible to generalise them to all municipal economic activity zones in Poland.

3. Main Findings

Objectives of Creating Economic Activity Zones in Communes

A critical literature review revealed many factors and potential benefits motivating local self-governments to take on the challenges of creating zones. However, both individual interviews and surveys (Table 1) indicate that the most important challenge that communes developing zones want to face is job creation, i.e., the fight against unemployment. In recent years, despite the pandemic, the Polish economy has recorded relatively good results, but the variation in the level of economic development between individual areas is still significant. Certainly, rural communes still note a higher unemployment rate than cities. Attracting external investors to smaller but more business-friendly communes is seen as a way to provide the local community with employment close to their places of residence and counteract economic migration to cities. An almost equally important problem is to find new functions for degrading areas, including brown field post-industrial areas and infrastructure that has lost its original purpose as a result of economic transformation and is now an untapped resource. More than ¾ of respondents strive to increase the area's investment attractiveness, which may have many multiplier effects for the commune, e.g., attract new residents. In turn, more than 1/3 of local self-governments want to profile the communes' economic development by creating zones, which can also be combined with the desire to modernise local business and create better conditions for technological development for companies. The respondents pointed out that such activities are undertaken as business-related services, e.g., by creating technology parks, business incubators, local development agencies, etc.

Table 1. Purposes of creating economic activity zones in communes (based on the opinions of local self-government representatives)

Specification	Percentage of replies
Creating new jobs	77
Increase in the region's investment attractiveness	77
Development of the existing economic assets and economic infrastructure	46
Exploiting the potential of local human capital	46
Development of specific domains of business activity	38
Development of new technical and technological solutions and their application in the national economy	31
Development of unused natural resources with respect to the rules of environmental sustainability	23
Increasing competitiveness of the manufactured products and rendered services	15
Development of export	8

Source: Own study

Assessment of Endogenous Factors Affecting the Development of Municipal Economic Activity Zones

The assessment of endogenous factors, i.e., related to the location of zones and conditions created in them for business development, was based on the opinions of representatives of local self-governments and representatives of investors who operate in the studied zones. Several key problem areas directly related to the zones' functioning and importance were analysed (Table 2).

The research proves that the analysed areas were assessed by both groups of respondents differently. Regarding infrastructural preparation of the area, the greatest impact on the zones' development is attributed to the area's accessibility (connection with a public road) and territorial development. However, representatives of local self-governments and investors also attribute importance to the zone's integration into the national and regional communication network. The survey demonstrates that representatives of the local self-government attach more importance (decisive) to this factor than representatives of investors.

Most representatives of local self-governments and investors also stress the importance of land purchase and lease prices available to companies within the zones, recognising these factors and the proposals for tax reliefs as a significant or decisive factor affecting the zone development. Representatives of investors discern a greater role of the financial conditions for investing in the zones in their development than representatives of local self-governments.

Three other factors, i.e., appropriate promotion of the area, application of spatial order and sustainable development principles, and the residents' attitude to the zone emerging in the commune, usually were assessed as factors of moderate or significant but rather not decisive importance for the development of such areas.

The availability of human capital, which is perceived as a significant or even decisive factor in the zone development, was assessed much higher. This factor is, to a large extent, related to other activities undertaken by the local self-government, e.g., the development of sectoral education, investing in the education of residents, attracting residents of working age to the commune or offering them a good base for childcare (nurseries, kindergartens).

The importance of factors related to support for investors from the commune is assessed higher by representatives of local self-governments than the investors themselves. We mean especially the knowledge and competencies of local self-government employees responsible for the development of zones and communication with investors, but also, for example, the speed and quality of investor service.

A factor whose importance was assessed differently is the possibility of cooperation with other sectors of the economy, including, e.g., the availability of supply chains. This factor, which is slightly dependent on the local self-government, was considered decisive by 22% and significant by 41% of the surveyed enterprises, while representatives of the local self-government assessed it as at most significant (46%).

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Table 2. Assessment of the degree of influence of individual factors on the municipal economic activity zones development (based on the opinion of representatives of local self-governments and investors)

No.	Individual elements	Influence of individual elements on the launch of business activity in the municipal economic activity zone (evaluation in %)									
		none		minimal		moderate		significant		decisive	
		S	I	S	I	S	I	S	I	S	I
1.	**Infrastructure preparation**										
1.1.	Basic media coverage	0	11	0	7	0	19	46	41	54	22
1.2.	Access to a public road	0	0	0	7	8	22	31	30	62	41
1.3.	Integration into a local transportation system	0	0	0	11	23	19	54	44	23	26
1.4.	Integration into a regional transportation system	0	0	0	15	23	15	38	48	38	22
1.5.	Integration into a national transportation system	8	0	0	15	15	11	23	44	54	30
2.	**Offer of financial terms**										
2.1.	Proposal for financial relief	8	7	8	11	31	22	23	44	31	15
2.2.	Land prices	0	4	0	4	23	26	54	37	15	30
2.3.	Lease prices	38	22	0	4	15	22	31	30	15	22
2.4.	Local authority co-funding	38	15	15	11	31	19	8	41	0	15
3.	**Promotion of the area designated for the activity**	15	7	8	7	31	37	31	44	8	4
4.	**Location of the area for the CEAZ**										
4.1.	Respect for the rules of spatial order	15	4	8	0	38	44	38	48	0	4
4.2.	Respect for the rules of sustainable development	15	4	8	0	31	44	38	48	0	4
5.	**Socio-cultural context**										
5.1	Involvement of residents and their awareness about the functioning of MEAZ	23	7	8	11	38	33	31	44	0	4
6.	**Human capital**										
6.1	Access to the workforce	0	4	0	15	23	30	46	30	31	22
6.2	Access to a qualified workforce	0	7	0	11	38	30	31	26	31	26
7.	**Support in the municipal/ commune office**										
7.1	Competences of self-government staff responsible for functioning the MEAZ	0	4	8	7	15	26	46	44	31	19
7.2	Materials concerning the possibilities of investments into the MEAZ	0	0	8	7	23	37	62	44	8	11
7.3	Relevant expertise of self-government staff responsible for functioning the MEAZ	0	0	0	4	23	30	54	52	23	15
7.4	Quality of service of investors	0	4	8	4	0	19	62	44	31	30
7.5	Speed of service of investors	0	4	8	4	0	26	65	41	27	26
8.	**Cooperation with other sectors of the economy**	15	4	8	4	23	30	46	41	0	22

Legend: Municipal Economic Activity Zone (CEAZ) Investors (I), self-governments – (S).
Source: own study

Determinants of the Municipal Economic Activity Zones Development – Main Theses from the Interviews

The surveys were complemented by in-depth interviews with five representatives of local self-governments developing the zones. The respondents were asked to comment on the surveys' results. They also answered additional questions about creating zones and preparing the offer for investors. The main theses resulting from the interviews are presented in Table 3.

Table 3. Main theses from interviews on the development of municipal economic activity zones

Problem	Summary of responses
Problems prompting local self-governments to create zones	- The creation of the zone is a project that must be based on the diagnosis of the commune's problems and potential, bearing the costs for creating the zone, and be justified by the future benefits of its activity; - Zones often are created not so much to solve some unique problems of the commune but rather to take advantage of some opportunity, such as undeveloped land or access to resources; - Solving the commune's economic problems and obtaining long-term benefits from the zone's operation always depends on how do the companies functioning in the zone operate, e.g., how many jobs they create.
Objectives of the zones' activity	- A strong motivation is the success of communes that develop zones and other local self-governments that take them as an example; - Residents should not be promised quick effects of the zones' development, e.g., unemployment reduction because the time from the zone's creation to the start of companies' operations is even several years; - Defining the zone's objectives requires imagination to properly configure its shape and offer with the needs of business, but also to build the zone's competitiveness against the background of other similar ones; - The zone is not only an area for the investor but also a comprehensive offer of support that must be provided; - When shaping the zones' objectives, one must also consider the interests of companies that are to be located there, e.g., the possibility of building cooperative relationships with entrepreneurs.
Zone-creating process	- If a commune has a favourable location, good transport accessibility, an appropriate spatial development plan, and entrepreneurial self-government authorities enjoying social support, it will certainly create a zone more efficiently than a commune in which these elements are missing; - Local self-governments creating zones put much more emphasis on territorial development and preparation for construction than investors expect because they are aware of problems that may arise at further stages of investment in the zone, which may adversely affect relations with investors; - The zone creation requires its proper communication with the regional and national roads. The volume of traffic must be estimated after starting a business there, as congested access to the zone may become a disincentive for companies' further investments; - The zone creation requires social dialogue because these are costs that will return to the commune only after some time, so all stakeholders must accept the deferred benefits; - In recent years, many local self-governments have used EU funds and created zones because they could get funding for it, but attracting investors to the zone is much slower; - The good preparation of local self-government employees to communicate with potential investors and cooperate with companies operating in the zones is very important in the zone development.

Source: own study

Table 3 presents only selected theses from interviews concerning the development of economic zones. The respondents agreed with the survey's results, simultaneously drawing attention to the revealed differences in the assessment of some elements by representatives of local self-governments and investors, e.g., in terms of the possibility of cooperation with other industries. They considered the investors' opinions particularly valuable, which should be taken into account by local self-governments that create zones because it is important in preparing a marketing offer for investors.

4. Discussion and Conclusion

In the works of many authors, there are theses about the importance of economic activity zones for the development of entrepreneurship at the local (Gryculak & Zdrojek, 2015) and even the regional level (Kaźmierczak-Piwko, 2017). However, before investors appear in the zone to create jobs and pay taxes, local self-governments must put a lot of effort to create and prepare the zones for business needs. The literature on the subject mentions many tools and actions (Markowska-Bzducha, 2013) that communes should employ to attract investors to the zones. They coincide, e.g., with the research conducted by the authors and emphasize the strong need to coordinate strategic studies with spatial development plans and long-term financial and investment plans, which is necessary for the local self-government to find funds for the zone development. Therefore, an economic activity zone should be treated as a long-term public investment that will generate direct benefits and socio-economic multiplier effects for communes only after some time.

According to the surveys and interviews, the zones' objectives are primarily aimed at solving economic problems and developing their potential (land, infrastructure, favourable location, workforce resources, etc.) to boost entrepreneurship and create jobs. Therefore, local self-governments expect much more from the zones' operation than just an increase in tax revenues. They expect a qualitative change in the approach to business in the commune, which will also positively impact development processes in other areas, such as education, consumption, etc. In many cases, the goals of the local self-government and investors diverge. For example, it applies to the land purchase prices in the zone, where the local self-government strives to obtain the best price, and the investor wants to buy the land as cheaply as possible. Agreeing on a solution satisfying both parties requires appropriate communication and negotiation competencies and capabilities to build investor relations, which is particularly difficult to obtain in the case of local self-government staff. The convergence of local self-governments and investors' objectives may concern, e.g., building cooperative relations between investors and local entrepreneurs, where cooperation with local self-government may also play an important role. Therefore, achieving the objectives of the economic activity zones development in communes requires not only a proper definition of their activity's objectives but also the provision of tools to achieve them.

One of the conditions for attracting investors to the zone is to offer a territorially developed area and to prepare a communication system ensuring zone's accessibility, e.g., for suppliers or customers of companies operating there. Such action on the part of the commune is necessary to attract companies looking for locations for activity. Research shows that real actions of communes increasing the zone's attractiveness for investors appeal to business more than, for example, sophisticated marketing or public relations activities.

It is difficult for entrepreneurs to identify one decisive factor that affects the economic activity zones development, but in their opinion, the mentioned infrastructure preparation and the financial conditions offered them by the communes inviting them to the zones play a significant role in this project. In practice, the land purchase is based on a tender procedure, but the price that the local self-government can obtain from their sale is derived from the degree of zone preparation to accept companies investing there. An important aspect for investors is also respect for the principles of spatial order and sustainable development, which communes should consider when creating, for example, low-emission zones.

For nearly half of the investors, access to human capital (above all, to a qualified workforce) is decisive or significant in terms of zone development. Therefore, the zones creation should go hand in hand with activities developing intellectual capital in communes, such as training in professions important for local business, or creating conditions preventing educational migration of young people to larger agglomerations, which causes a permanent outflow of potential workers. It is important to systematically improve the quality of life in the commune, which can attract new residents.

An important factor which, in the opinion of local self-governments and investors, determines the zones development, is the support from the local self-government, primarily the speed and quality of the investor's service, but also the competence and experience of local self-government employees in cooperation with investors. Therefore, at an early stage of creating the zone, it is extremely important to provide a professional team of employees prepared for marketing and communication activities but also familiar

with the law, including construction law, and prepared to carry out activities related to the zone preparation for investors. Although this factor is rated lower than the preparation of infrastructure, in the authors' opinion, it is equally important in practice. It is the marketing and negotiation skills of local self-government employees that can determine the investors' interest in a given zone. The knowledge of local self-government employees handling the process of attracting investors to the zone should include information about the industries they represent. The research results indicate that investors pay attention to the possibility of establishing cooperation with entrepreneurs, which is why proposals to create such cooperative relationships may be important to attract investors.

Summary

When analysing the objectives of creating economic activity zones one can assume that crucial macroeconomic problems on the communal are baselines for this process. However, the study on the process of development of the zones revealed that this solution is not relevant in the areas where local self-governments are not entrepreneurial enough and skilful. Mitigating the rate of unemployment in the commune or finding a use for the infrastructure which has lost its original purpose thanks to creating an economic activity zone is a long-time process. It should be connected with the in-depth diagnosis of the commune's potentials and recourses and suitable with the vision of the development of the area. One should state that the development of the municipal economic activity zone is a cost-consuming process which should be started after the multifactorial analysis of its efficiency only if it is profitable for the commune and its society. Local self-government motivated to develop the zone should always consider many factors determining this undertaking's success.

Local self-government motivated to develop the zone should always consider many factors determining this undertaking's success. These factors were presented in Table 2 and included in Table 3 as conditions and features of the process of development of the zones, which should be included when the process is starting. Their detailed analysis is presented in section 3., however, summarising, it should be stated that the local self-government should be aware of the differences in perceptions of these factors by their staff and representatives of investors. Attracting investors to the economic activity zones means creating an offer which they expect and might be interested in, not only preparing the offer aligned with the potential and the resources of the commune and agreed with the other stakeholders. Thus, good orientation in the expectation of the potential investors is a minimum condition to start the process of development of the economic zones.

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Tools to Support Effective Communication, Conflict Prevention and Conflict Resolution in Family Businesses

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Abstract

The article deals with the topic of open communication in the family business and focuses on the possibilities of conflict prevention. The article aims to define the factors influencing communication in family businesses and to identify their possible interdependence with selected characteristics of the business. The effect of complicated communication or conflicts could be not only negative, which could even result in the closure of the business, but also positive when constructive conflict can stimulate change and innovation. It is advisable to take measures to prevent conflicts and set up processes to resolve them. It is also advisable to clearly define the company's organisational structure, establish norms for dealing with work and family situations, and introduce governance tools. All of these measures promote open and effective communication and a sense of belonging among family business members. The paper presents the results of a survey of 98 family businesses. The findings suggest that family businesses perceive that effective and open communication is essential to their functioning. In most cases, family businesses attempt to separate business-related conflicts from family conflicts, which are related to personal family relationships and ties. Efforts to separate family and work-related conflicts increase as the number of employees increases.

Key Words

communication, family enterprise, conflicts, governance, family business

JEL Classification: M10, M13

Introduction

Family businesses are a very important part of any advanced economy (Memili et al., 2015). It is therefore desirable that they are resilient, able to adapt to changing conditions, and thus support the further development of society in all dimensions of sustainable development. It is a unique type of business in which family and business coexist. The intermingling of these two systems can be a source of conflict in the family and also in the business (Harvey and Evans, 1994; Kellermanns and Eddleston, 2004), with positive and negative effects (Alvarado-Alvarez et al., 2019). Any family problems spill over into the enterprise and vice versa. Family members who work at the same time in the business face role conflict (Memili et al., 2015). Their decision-making is driven by a combination of emotional relationships and economic interests (Daspit et al., 2021; Alvarado-Alvarez et al., 2019) and they have to pursue economic and family goals simultaneously (Kotlar and De Massis, 2013). On the other hand, the same goals, mutual trust, family culture, social respect and proper communication are some of the main advantages of the family business (Hanzelkova, 2004).

Inadequate or poor communication means not only the potential end of the family business but also the disruption of family relationships (Morris et al., 1996; Habbershon et al., 2003). Nothing is more stressful in a family business than the threat of conflict between family members and the futile effort to reach agreements. (Astrachan and McMillan, 2003; Kellermanns and Eddleston, 2004). The close link between family communication and the firm, and the inappropriate adjustment of the interpersonal communication and cultural foundations of the family business can result in complications associated with its performance. Additional communication problems may arise as the business grows, when extended family members, representatives of other generations, or non-family members who often do not share the same values and means of communication as the founding family, become involved (Sciascia et al., 2013; Nordqvist et al., 2014).

To resolve conflicts constructively, prevent conflicts and maintain trust and family harmony, family businesses should strive for effective open communication and transparency and develop processes for conflict management (Caputo et al., 2018; Suess, 2014). It is advisable to define a specific formal organizational structure (Harvey and Evans, 1994), define clear authority and responsibilities and set up communication processes. To promote cooperation and open communication, it is advisable to implement some governance tools such as family councils, family meetings, intergenerational meetings, or joint family activities (Alderson, 2015; Nordqvist et al., 2014). Family meetings are informal gatherings where family and business matters are discussed. It is usually attended by family members who work in the business (Alderson, 2015). It is an effective and simple way to encourage communication between family members and help busy families stay connected (Nordqvist et al., 2014).

A family council is a formal type of family meeting attended by all family members, regardless of whether they work directly for the company. Issues related to the management of the family and its relationship to the business are discussed. (Nordqvist et al, 2014; Suess, 2014) Meetings provide a space for open debate, expressing the needs, expectations and values of family members about the business and the family, and developing policies that protect the long-term interests of the family and the business. (Suess, 2014) They set visions and rules for the whole family and establish principles for the management of the business (Kets de Vries, 1993), thus linking senior management, the board and the family (Suess, 2014). It could be also the stimulus for the creation of a family constitution (Suess, 2014), which could address issues such as hiring and terminating the working process of family members, fair compensation policies for the family, disclosure procedures and policies for selling family members' shares. In addition to improving the level of communication in the family firm, it also helps to professionalize the governance of the firm, which also leads to a reduction in the risk of conflict (Alderson, 2015).

The family constitution is one of the most important corporate governance tools and an important tool in preventing or resolving conflicts. It is a written normative agreement that contains the basic principles and procedures according to which the family organizes its relationship with the enterprise (Suess, 2014). It sets the way to act in common as well as unexpected situations. The constitutions cover a range of topics such as hiring and firing family members, information transfer, procedures for valuing the business when it would be sold to other family members, what happens to an employed family member in the event of substance abuse problems, and rules for selling and buying shares. The

preparation of a constitution is a lengthy process that involves a large group of family members (Alderson, 2015).

Joint family activities are often used by family businesses where several generations are represented. It may be a trip, a weekend event, making a family tree, or a joint holiday where family members meet distant relatives. Family members who are not involved in the business can gain information about the business and a sense of belonging (Alderson, 2015). The above-mentioned governance tools are primarily intended to strengthen the family's relationship with the company (Suess, 2014).

Effective communication is further supported by clearly writing down all the rules, whether in the form of a family constitution, norms or standards. In some cases, professional counselling or mediation may be appropriate. A mediator is a facilitator who can resolve conflicts that arise with insight and without emotion, coming up with new ideas and positively directing the behaviour of family members. The mediator can also play a major role in court disputes, this function is more widely used abroad (Prince, 1990). Education of family business members should also be part of conflict prevention and promote open communication. Education should include both the development of communication skills and training in conflict management techniques, as well as education on the specifics of managing a family business (Nordqvist et al., 2014).

A well-chosen communication strategy is one of the key factors for the proper functioning of a family business. The study focuses on how the evaluated family businesses approach conflict prevention and whether they use tools for conflict elimination. It also investigates whether family businesses consider open and effective communication to be important for maintaining family and workplace satisfaction and whether they separate family and work conflicts. It also examines whether the size of the business or the industry in which the business operates affects the separation of family and work conflicts. The study also examines the use of tools to prevent and eliminate employment-related conflicts between family and non-family members.

The findings of this study may be beneficial to family businesses that are solving communication conflicts. Family businesses can gain inspiration and beneficial information to improve their communication strategies. The study can also serve as support for family businesses that are trying to separate family and work conflicts and are looking for tools to eliminate them. Furthermore, the findings of this study may be useful for academics and researchers working on family businesses and communication conflicts. The study provides new insights and contributes to the existing scholarly knowledge in this area.

1. Methods of Research

The definition of possible factors influencing appropriate communication and efforts to eliminate conflicts is based on data from research carried out in 2020-2022 based on a call by the Ministry of Industry and Trade of the Czech Republic, which annually evaluates the quality of family businesses. The research sample was family businesses that volunteered based on the call, and the years examined were 2022 (23 respondents), 2021 (42 respondents) and 2020 (42 respondents). Representatives of family businesses responded to thirty questions, which were grouped according to themes in the

administrative, managerial and financial modules. The data assessed came from the management module and only questions related to communication and conflict in the family business were assessed. Respondents answered questions on a five-point Likert scale and supplemented their answers with verbal ratings, providing both quantitative and qualitative data.

Based on the data obtained about the respondents, verification of the selected hypotheses can be done. Specifically, a correlation was made between the level of the evaluation criterion and turnover, number of employees or main business sector. This statistical evaluation was carried out using regression analysis and analysis of variance. The IBM SPSS Statistics Base software was used to test the hypotheses. For the regression analysis, two numerical variables were used (number of employees and turnover). For the verbal variable (business sector) analysis of variance was chosen as the most appropriate method given the number of responses obtained. Homoskedasticity was verified by Levene's test of the agreement of variances and normality was verified by the Kolmogorov-Smirnov test. Due to the size of the sample, the significance level was set at 5%. Since the enterprises were self-reporting and were not selected by random sampling, the obtained results cannot be generalized.

2. Results of the Research

2.1 Reflection - findings from qualitative responses

The first statement that family business respondents commented on was: Conflicts within the family are strictly separated from conflicts within the business, and communication in conflict resolution is open and effective.

Respondents answered on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The average response was 4.25, indicating that in most family businesses, family and business life are strictly separated and family businesses realize that it is better not to transfer conflicts from business to family life. Family businesses consider open and effective communication as the foundation of business while maintaining the quality of family life. In most cases, they try to separate business problems and conflicts from personal life, although this is not always entirely possible.

Conflict prevention tools mentioned by respondents include:

a) Involvement of a mediator or coach.
b) Elaborated family constitution, guidelines, and standards.
c) Overview. Trying to solve situations without unnecessary emotions.
d) Determination of a family member with veto power. If a conflict arises, one specific person is determined to adjudicate the conflict with veto power. In most cases, it is the owner and founder of the family business.
e) Family Council.
f) Informal family meetings.

From the companies which admitted that work conflicts interfere with their personal life, most of them try to separate it and prefer to resolve the conflict immediately and not

waste time with it. Companies try to separate family and work life but often admit that it is not always 100% possible.

Statement 2 related to tools that can help reduce conflict: The family business employs non-family members and the enterprise has tools to avoid favouritism towards family members.

The average response on a Likert scale from strongly disagree (1) to strongly agree (5) was 4.45, so it means, that most family businesses also employ non-family members and they have the necessary tools to help the business run more efficiently, prevent conflicts, and facilitate communication between family members and non-family employees.

These tools include for example:

a) Family constitution.
b) Clearly defining the qualifications, expectations and benefits of the position. In order not to favour family members, family businesses have clearly defined qualification requirements for a specific job that each applicant, including family members, must meet or they cannot perform the job. Respondents often stated that in the case of family members, higher requirements are set so that they have to do more to earn their position in the company. There is also a need to clearly define the incentive system and then follow it for all family and non-family employees.
c) Perception of non-family members as family. To do this, respondents use, for example, sharing family stories and employing multiple generations.

According to the results of the survey, non-family employees in family businesses often hold lower positions than family members and have decision-making powers mostly at the operational level. Family members, who are expected to hold top management positions in the future, should progress through all levels of management and work their way up to a top management position. Although companies consistently stated, that they do not allow the promotion of a family member, because of potential conflicts, it is very often, because family members occupy senior positions in the company, which may bias this evaluation criterion. In most cases, non-family members are not employed in small companies, where the entire operation is handled solely by the family. In one case, the respondent indicated that due to negative experiences with the employment of family members, he no longer envisaged their involvement in the future.

2. 2 Determination of hypotheses

Based on linear regression analysis and analysis of variance, it was statistically examined whether the value of responses on a five-point Likert scale is related to the number of employees, the amount of turnover and the sector in which the family business operates. The primary sector was excluded from the research due to the low number of respondents.

The claim of separating family and corporate conflicts was examined using hypotheses:

H0: The larger the company (in terms of turnover and number of employees) is, the more conflicts related to business and family are separated. This hypothesis was examined using regression analysis.

H0: Whether a business can separate conflicts within the business from conflicts within the family, depends on the business sector in which it operates. This hypothesis was examined using an analysis of variance.

The assumption is, that the separation of family business from family life is more likely to be solved in smaller enterprises, where the percentage representation of the family is in most cases larger.

The claim of favouritism family members and setting tools so that favouritism does not occur and is not a stimulus for the conflicts were investigated based on the hypotheses:

H0: The larger the company (in terms of turnover and number of employees) is, the more tools are set up to prevent the favouritism of family members.

H0: Whether a company has tools in place to help prevent the favouritism of family members and thus conflicts within the company, depends on the sector in which the company operates.

2.3 Verification of Hypotheses

At the 5% significance level, was with regression analysis verify only the first hypothesis. That is why it could be concluded, that the more employees a company employs, the more the business tries to separate conflicts within the company from conflicts within the family. All the other hypotheses of interdependence could not be verified at the 5% level of significance and it could be said, that the way the company deals with potential conflicts within the company and whether it has tools to prevent favouritism of family members, does not depend on the size of the company, the turnover or the sector in which the company operates.

3. Discussion

Effective communication is a key factor for success in family businesses. According to Hubler (2018) in a family business, the future direction of the business cannot be precisely defined at the beginning, which highlights the importance of effective communication among family members. As the business grows and ages, conflicts within the family and the business tend to increase exponentially (Kets de Vries, 1993). Therefore, it becomes crucial for family businesses to separate conflicts within the family from conflicts within the business.

Research shows that most family businesses recognize the importance of separating work and family conflicts and make efforts to do so, especially as the number of employees increases. While complete separation of work and family life may not always be possible, family businesses use various conflict prevention tools to manage conflicts effectively. These tools include for example creating a family council, engaging mediators or coaches, developing a family constitution, establishing guidelines and standards, designating a family member with veto power to adjudicate conflicts and holding informal family meetings. Among these tools, the family council and family constitution are considered as the most important corporate governance tools for improving communication and reducing conflict (Alderson, 2015). The family council not only enhances communication

within the family business but also contributes to professionalizing the management of the business. Larger family businesses make more use of the family council and the family constitution. Furthermore, when family businesses employ non-family members, it is important to clearly define the necessary qualifications, expectations and benefits of each position. The study suggests that the way family businesses deal with potential conflicts and prevent nepotism does not depend on the size of the business, turnover, or sector. It is important to note that the results of the study may have limitations due to self-reporting and a small number of respondents. However, they still provide useful insights into the functioning of family businesses.

Future research could focus on exploring additional tools to improve communication and prevent conflicts in family businesses, taking into account the age and size of the businesses. Understanding how these tools evolve over time and with the growth of the business can contribute to the sustainability of family businesses.

Conclusion

In conclusion, effective and open communication, along with the use of conflict prevention and resolution tools, are essential to maintaining the satisfaction, resilience, sustainability and competitiveness of the family business. Understanding how these tools work and implementing them into the management system concerning the specific characteristics of the enterprise is crucial for successful conflict management in the context of the family business.

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The Influence of Review Richness and Valence on the E-WOM Trustworthiness

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Abstract

This study aims to examine the relationship between review richness and valence in the context of the trustworthiness of electronic word-of-mouth when choosing a coffee shop. The study collected data through an experiment on a simulated restaurant aggregator platform involving eight coffee shops and reviews with varying richness and valence. Participants (130 individuals) were asked to rate the cafés based on their preferences for selecting one. The findings highlight the relative importance of review richness compared to the review's positive or negative sentiment in influencing trustworthiness. Moreover, the study reveals that review richness has a more significant impact on credibility for positive than negative valence. Consumers associate richer reviews with higher quality and credibility, while shorter, less detailed reviews are deemed less valuable to provide sufficient evidence to enhance trustworthiness.

Key Words

Online reviews; e-WOM; Review valence; Review richness; Trustworthiness

JEL Classification: M30, M31

Introduction

The increasing online presence of individuals worldwide, the development of Web 2.0, and the emergence of multiple social media platforms facilitate consumers worldwide to participate and produce content without limitations. The online community considers the internet a socio-economical space in which the perception of cohesion drives their involvement and participation and enhances their level of satisfaction (Ray et al., 2014). An active online presence encourages more probing and decision-making activities among users (Kapoor et al., 2018). Every unit of information produced and exchanged online creates a network of knowledge. This expanding network paved the way for an evolving new domain in the field of word-of-mouth (WOM) marketing called electronic word-of-mouth (e-WOM). Electronic word-of-mouth (e-WOM) is an emerging marketing research field that addresses how customers find information and purchase online. E-WOM is any negative or positive reviews and ratings made about a product or service by prospective, existing, or former customers made publicly available to many people and establishments online (Hennig-Thurau et al., 2004).

This consumer-generated information can be found via online platforms such as websites, social media accounts, discussion forums, and other product review pages. It is a vital source of information to aid consumers' decision-making process because it provides consumers with an indirect experience (Ali et al., 2021). Reviews are the most common form of E-WOM. Reviews most commonly involve positive or negative remarks called

review valence. There are two variations of reviews, informative and recommending. Informative reviews give an overall idea about the product while recommending reviews provide negative or positive ideas about a product or service (D.-H. Park et al., 2007). A direct relationship exists between consumer interactions on online platforms and their purchase behaviour, making genuine reviews much more critical for consumers and businesses (Barger et al., 2016).

The trustworthiness of e-WOM among consumers is a well-established fact. Research suggests that positive reviews are crucial for a consumer to evaluate the reputation and develop trust in a producer or website (Sparks & Browning, 2011). A firm's reputation increases and builds a consumer's trust when the reviews are framed positively (Sparks & Browning, 2011).

According to Brightlocal's local consumer review 2022 edition, people who only read a few reviews before deciding are reduced from 2021, and most tend to focus on overall evaluations (Pitman, 2022). Other research indicates that average customer evaluations significantly impact the purchasing decisions of younger consumers. A lengthy review is more likely to offer specific, product-attribute-based information, facilitating third parties' evaluations of the product's performance. A detailed review may be more personal and use adjectives to convey sentiments and emotions. Therefore, from the viewpoint of review readers, the usefulness or value of a subjective, emotionally charged experiential review may not improve significantly with review length (Pan & Zhang, 2011). According to Kwasniewicz et al. (2021), a more comprehensive review is more credible than a short one, especially when the reviewers are unknown. Therefore, the favourable impact of longer review length on trustworthiness is anticipated to be more pronounced than shorter reviews.

The intrinsic quality and the number of reviews are the factors that significantly impact sales and attitudes in the online environment (Purnawirawan et al., 2015). Positive reviews typically boost attitudes and sales, whereas negative reviews do the opposite. However, their impact also depends on the exposure to reviews, the reviewer's characteristics and the review's source (Ha et al., 2015).

Although both good and negative evaluations can influence consumer behaviour, some research suggests that each effect differs. According to Purnawirawan et al. (2015), negative assessments significantly impacted perceptions and usefulness, indicating that they may be more influential than positive reviews. However, according to additional studies, the negativity bias in consumer reviews of hedonic items weigh less than utilitarian items (Sen & Lerman, 2007). Wu (2013) also argued that while consumers may not give negative evaluations a higher priority per se, they consider them more insightful because they are frequently more uncommon and of higher quality. Sözer (2019) also stated that positive e-WOM messages increase consumer purchase intentions to spread the word about them to others.

Therefore, this study aims to address the gap by investigating the relationship between the review richness and valence on the trustworthiness of e-WOM when choosing a café on a restaurant aggregator platform. The research also analyses the inter-variable importance between the richness, valence and rating. The following hypotheses were formulated based on the previous studies:

H1: Richer (longer) reviews are more significant than shorter reviews.

H2: The richness of the reviews is more important than the valence of the reviews

H3: Richer (long) positive reviews are more trustworthy than Richer (long) negative reviews.

1. Methods of Research

This experimental design approach tests two key variables concerning the perceived e-WOM trustworthiness: the reviews' richness and valence of e-WOM. A website simulating a restaurant aggregator platform containing information on 8 cafés was created to facilitate realistic target constructions. The local cafes were selected for this study because local coffee shops can relate to local brand preferences from consumers (Mayasari et al., 2022). Furthermore, cafes are a homogenous representation based on service quality rather than product differentiation (Mayasari et al., 2022). According to Hantula (2005), web experiments can create a more real-life environment that is both indifferent and realistic for the respondents. An independent group's factorial design was used with two degrees of review richness (long and short) and two valences (positive vs negative).

Overall, 130 individuals from the student community in Liberec, Czech Republic, were randomly selected and asked to order the cafés based on their preferences and complete the questionnaire at the end of the website. The main reason for choosing students as primary respondents is because they are usually considered very homogenous representative samples across the countries and assume lower response bias (Hanel & Vione, 2016). Moreover, students are also considered to be the next generation of consumers. The sample consisted of 66 females (50.8% of the sample), 62 males (47.7%) and two non-binary individuals (1.5%) was included. Most participants were aged between 18 and 25 (80%).

The simulated restaurant aggregator platform contains standardised features, including the title of the cafés, illustrative pictures, inactive connections to other website sections, and cafés descriptions (cafés A to H). All other factors, such as the location, distance, ambience, and price of cafés in the simulated website, remain similar to control various factors present on websites, except the reviews (long and short [richness] and positive and negative [valence]). The respondents rated each café from 1, the most trustable e-WOM, to 8, as the least trusted, based on the e-WOM under each cafe profile.

According to a study by Meek, Wilk and Lambert (2021), eateries rated from 1 to 2.5 are classified as low ratings where the consumer has a poor opinion of the establishment. Eateries with a rating above 3.5 are considered to have excellent views among consumers. Using this measurement scale as a basis, this study used cafés rated high (5 stars).

The reviews were divided into long reviews and short ones. Long reviews consisted of more than 45 words, while short reviews were less than ten words. The text of the review contains emotional words such as “happy”, “pleasant”, and “disappointed” to express the feelings distinguishably (Ickes & Cheng, 2011). The reviews are similar to relevant scenarios, so the content of the review will not prime the participants.

The website simulator contained positive and negative reviews, and the participants were asked to rank the cafés based on how much they trusted the e-WOM message in the form

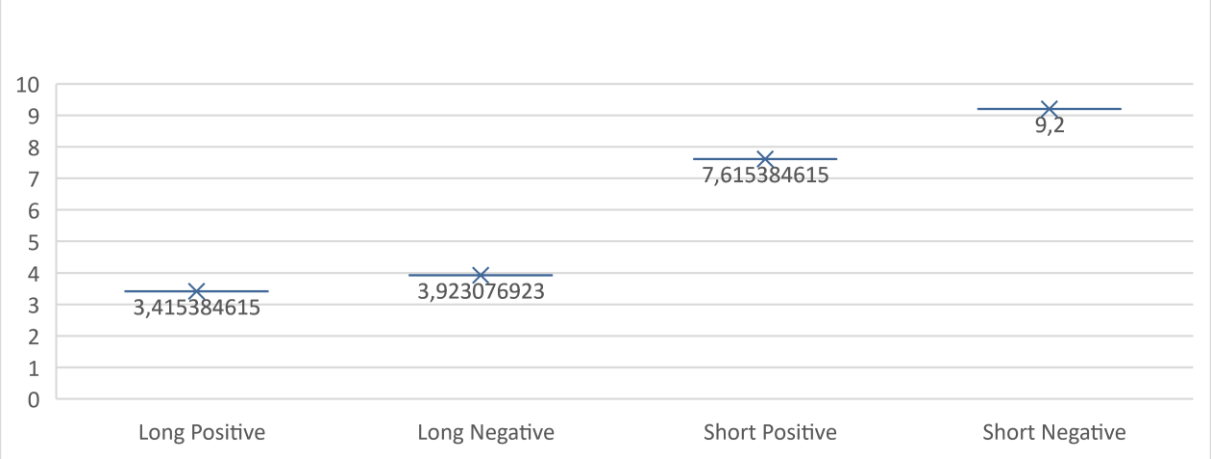
of a review. Consumers' opinion of the product is influenced by internet review valence, making it a crucial factor in purchase decisions. It appears that positive review sets with few or no negative reviews are most effective in influencing attitudes, whereas, primarily, negative review sets with few positive reviews had the most significant impact on perceived trustworthiness (Purnawirawan et al., 2015).

2. Results of the Research

The items were tested for reliability based on Cronbach's Alpha estimate. The Cronbach alpha value is 0.867, which shows that the data is reliable for analysis. The T-test is conducted for each variable.

The structural model and measurement mode are evaluated based on the factors using a statistical test called Harman's Single-Factor test to find potential standard method bias. For a single factor, the total variance explained was 37.88%. The number below the 50% cutoff point indicates no common method bias.

Figure 1: T-test for the mean of the café ranking



Note: Mean score based on the most preferred (1.0) to the least preferred (16.0)

3. Discussion

Reviews become part of online consumers' recommendations influencing their purchasing decisions. Reviews are an essential contributing factor in the consumer decision-making process; the lack of details makes a shorter review less helpful in the context of information-seeking customers and less trustworthy.

This research exclusively focuses on students due to their representation of a uniform demographic, allowing for the findings to be extrapolated to the broader population beyond students (Lucas 2003). This allows for a more targeted investigation, offering the opportunity to gain deeper insights into particular dynamics that may be obscured when studying a more heterogeneous group. Consequently, the study's outcomes hold promise for enriching our understanding not only of student-related matters but also of their potential implications for society at large.

The study reveals that longer reviews are more valuable than shorter ones (3.42 > 7.62). This result aligns with hypothesis 1, indicating that consumers perceive longer reviews as more trustworthy than shorter ones.

Furthermore, regardless of the valence, longer reviews have higher mean scores than shorter reviews (3.42, 3.923, > 7.62, 9.2). These results align with hypothesis two, indicating that consumers perceive longer reviews as more trustworthy regardless of the valence. Furthermore, the result also supports the third hypothesis, indicating that longer reviews are more trustworthy than valence.

Conclusion

This study investigates the relationship between customer review length and valence on consumer trust in online electronic word-of-mouth (e-WOM). The primary objective is to assess the impact of review length on consumer trust while effectively controlling for review valence. The existing body of research has yielded inconsistent findings regarding the influence of review length and valence on consumer decision-making, warranting further investigation to elucidate these factors' significance in online consumer behaviour, with a particular focus on students. The findings of this study indicate that the dimensions of e-WOM, namely richness and valence, contribute to the perceived trustworthiness of consumer reviews among students. Specifically, long and positive e-WOM is deemed more trustworthy than short and negative e-WOM. Notably, the richness of reviews exerts a more pronounced influence on perceived credibility than valence. Consequently, longer reviews are more credible than shorter ones, followed by positive ones. In sum, this study augments our understanding of consumer behaviour within the context of online reviews and ratings, thereby making a valuable scholarly contribution.

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Preferences of Active Sports students at Charles University within Online Shopping in Response to the COVID-19 Pandemic

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Abstract

The aim of the research was to identify the current preferences of active sports students at Charles University within online shopping in response to the Covid-19 pandemic. The research sample consisted of students from 5 faculties of Charles University. The method of electronic survey was used to obtain data. The results show changes in purchase behaviour and increased digital adoption, impulse buying and use of mobile marketing. Specifically, the results show that there has been an increase in online shopping and an increase in the use of cashless payments. In addition there was a tendency to save more on spending. A reduced frequency of individual purchases and a focus on smaller volume purchases were evident. At the same time, the majority of respondents showed a more sensitive relationship in relation to the price of goods. There was a consensus among respondents in their perception of the benefits of using the online shopping format as a whole, and the key factors that determine the decision to buy from a particular e-shop in price sensitivity and the emphasis placed on reviews by other customers. Preferred categories of purchased goods included clothing and footwear, purchases in the service sector, restaurant meals, cultural events, food delivery and sports equipment. The average purchase amount spent corresponded to 41% of their income. Respondents browsing the range and possibly buying online preferred websites over mobile apps, while the increase in modern forms of payment was confirmed.

Key Words

marketing research, e-commerce, online shopping, consumer behaviour, Covid-19 pandemic

JEL Classification: M31

Introduction

Consumer buying behaviour changed significantly during 2020-2022. During this period there have been significant shifts in the consumption psychology of individuals (Alsuksah et al., 2020). The pandemic has affected people's lifestyles and motivations, forcing them to change the way they shop. Consumers were forced to rethink their established shopping habits and/or adopt completely new ones. In this situation, due to emergency measures that resulted in social distancing and defacto restrictions on the population's daily activities, some consumers had to switch to services they had never used before and often had not even considered (Pantano et al., 2020).

The first change was the consumer shift to the online business environment. As reported by Jiang and Nikolaos (2021), advances in digital technology have enabled consumers to shift to online shopping, in which their activity has increased significantly. Beyond this, however, there have been other noticeable changes in their shopping behaviour. In the

early stages of the Covid-19 pandemic, consumer behaviour exhibited impulsive to panic behaviour (Barnes et al. 2021).

Lower disposable income and general economic uncertainty have led to a decrease in consumer spending on services, fashion and entertainment, but on the other hand, an increase in spending on food and protective equipment (hl-display.com, 2020). Furthermore, there has also been a shift in consumers towards healthier lifestyles and eating at home. The same is confirmed by Accenture's (2020) research, which states that consumers in most regions of the world prefer value-based purchases that allow for maximum consumer value. Other motives that influence online shopping versus brick-and-mortar stores, according to Koch et al. (2020), are sustained availability, financial and time efficiency, customisation of products and services and ease of purchase execution. The results of a survey by Bazaarvoice (globenewswire.com, 2021), conducted on a sample of 9,000 consumers worldwide, indicate that 54% of consumers use online shopping versus shopping in brick-and-mortar stores.

In order to achieve flexibility and accessibility for customers, retailers have started investing more in electronic solutions such as e-shops and mobile apps. Sychov and Bakaev (2020) report that customers are choosing smartphone apps over websites for online shopping more due to the fact that they are easier to use.

According to a survey by Mastercard (mastercard.com, 2021), which was conducted on a sample of 15,000 consumers worldwide, 63% of respondents tried a new payment method during the covid pandemic that they would not normally have tried. And 93% of consumers said they are willing to try new payment options that include everything from QR codes to mobile payments.

1. Methods of Research

The aim of the research was to identify the current preferences of active sports students at Charles University for online shopping in response to the Covid-19 pandemic.

A quantitative questionnaire survey was used for the research; the respondents were students from 5 faculties of Charles University. The selection of faculties and their students was done as an intentional two-stage sample. The first, feature was the affiliation to a certain faculty, and the second feature was whether the student does sports. A total of 418 respondents from five faculties of Charles University participated in the research. The distribution of respondents among the faculties was as follows:

26% of respondents were from the Faculty of Physical Education and Sport

19% of respondents were from the Faculty of Medicine – 1st Faculty of Medicine, 2nd Faculty of Medicine, 3rd Faculty of Medicine, Faculty of Hr. LF Plzeň

18% of respondents were from the Faculty of Education

18% of respondents were from the Faculty of Law

19% of respondents were from the Faculty of Science

Only sports students were included in the research, of which 290 were solely engaged in running, 162 in other individual sports (e.g. tennis, squash, etc.), 131 in team sports, 97 in fitness activities, 87 in swimming, 15 in other sports, where roller skating dominated. Respondents could give up to 3 options.

While most authors and agencies are looking at these changes in the general population, we were interested in the purchasing behaviour of the younger generation between the ages of 19-27 (Generation Z and Millennials) and in the college segment.

Four research questions were defined for the research:

1) How much has online shopping increased among respondents as a result of the Covid-19 pandemic and its associated restrictions?
2) On average, how much money, out of their income, do respondents spend on online shopping?
3) What factor plays the biggest role in respondents' decision to shop at a particular e-shop?
4) What electronic medium do research participants use most often to browse e-shops and make subsequent purchases?

Due to the selection of the sample from the five faculties of Charles University, we chose the method of electronic survey for the research, which allowed us to quickly spread the research among groups of respondents and collect a sufficient amount of data. To avoid bias in the results, measures were activated in the questionnaire design to prevent multiple completion of the questionnaire from one IP address. Data collection took place between 14 April and 15 May 2022.

On the basis of the problem under study, an operationalisation was developed that reflects a complete overview of the information gathered from the applied questionnaire. The operationalisation is shown in Figure 1.

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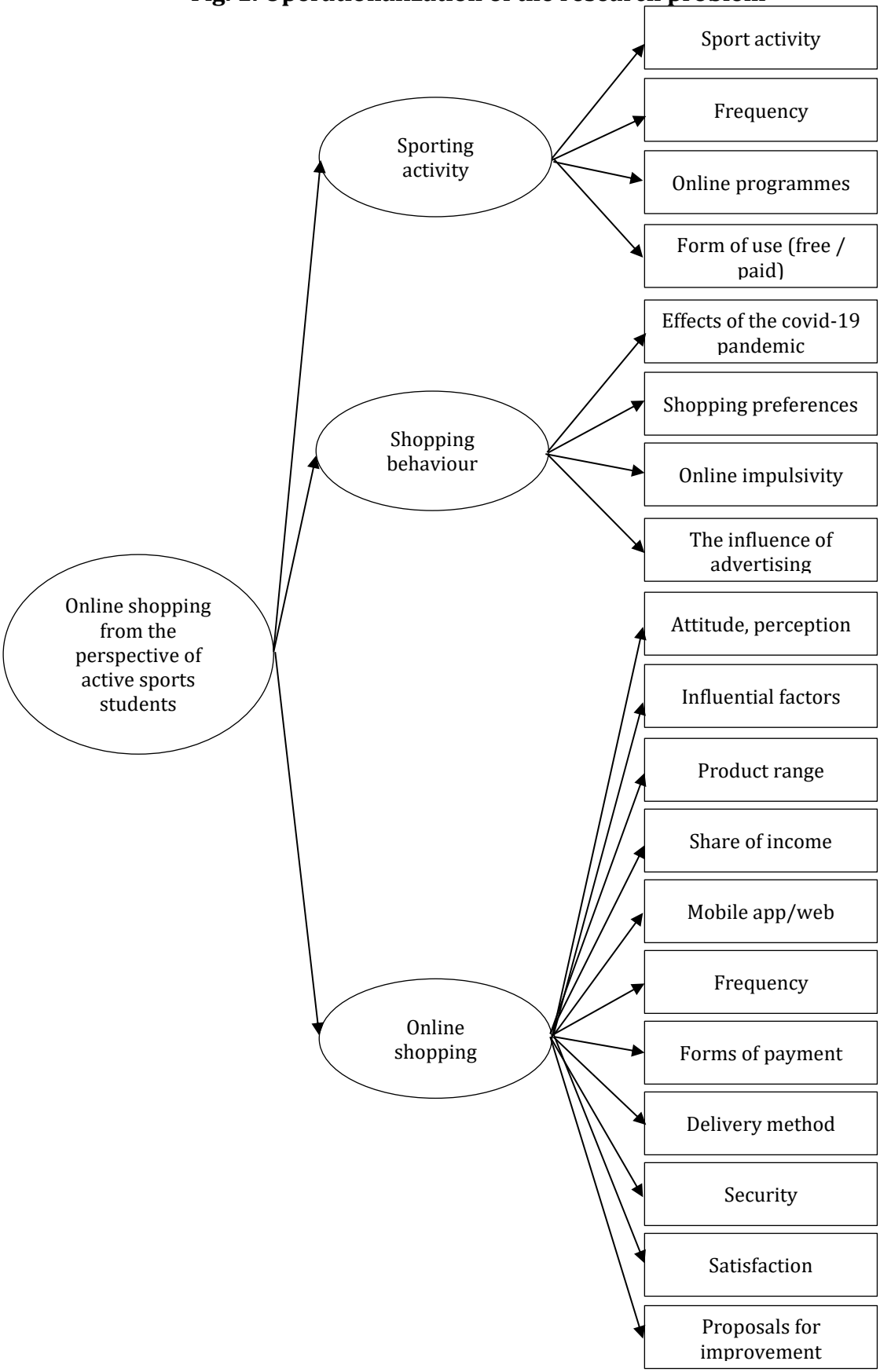
Fig. 1: Operationalization of the research problem



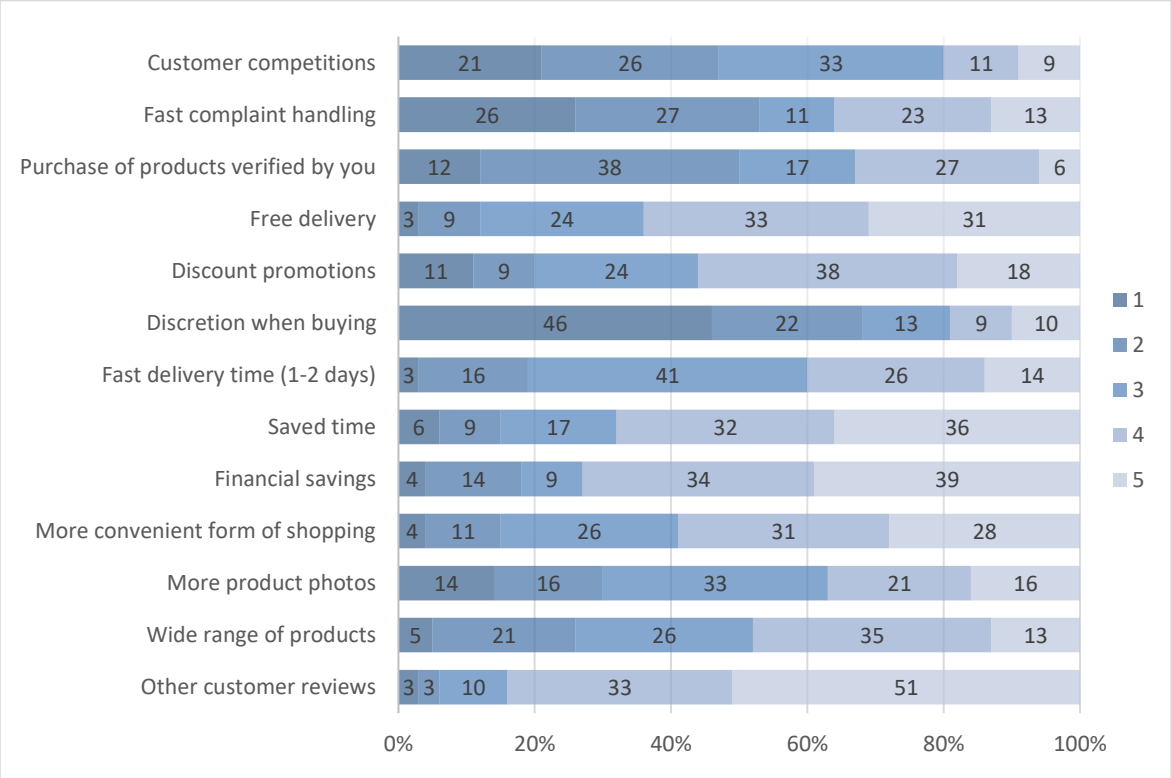
Source: authors' own processing

2. Results of the Research

2.1 Changes in shopping behaviour and increased digital adoption

During the pandemic, students started shopping more in online stores, up 16% compared to brick-and-mortar stores. They were most driven to shop online by the options it provides (see Figure 2).

Fig. 2: Evaluation of the opportunities provided by online shopping

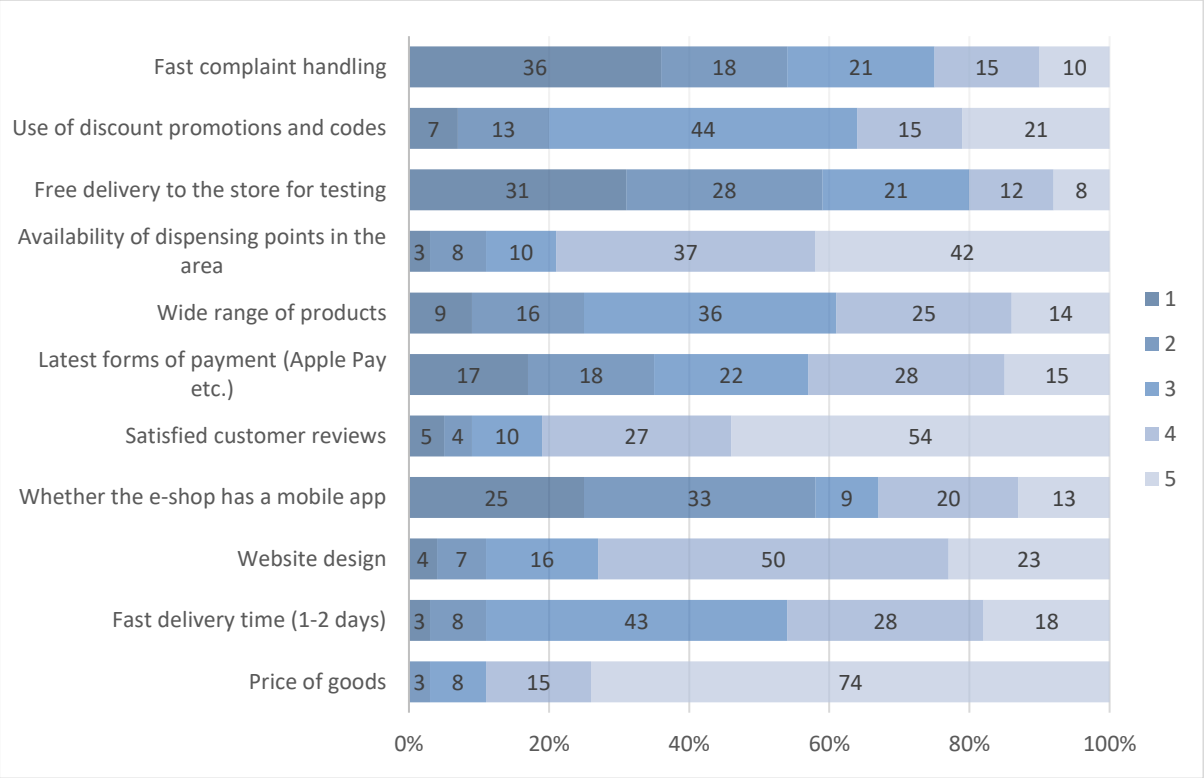


Source: authors' own calculations

In Figure 2, respondents assigned a level of importance to each factor, with a value of 1 representing the lowest importance and a value of 5 representing the highest importance. Thus, they attributed the highest importance to reviews from other customers, followed by financial savings and time saved. Conversely, Figure 2 shows that discretion has the lowest influence on online purchasing behaviour.

Regarding the key factors that students preferred when shopping at a particular e-shop (see Figure 3), they ranked the price of goods, satisfied customer reviews and availability of dispatch points among the most important factors. In the second order they attached great importance to website design, support for the latest forms of payment (Apple Pay, QR codes, etc.), a wide range of products and short delivery times. The results also showed that the decision on whether to buy from a particular e-shop is not influenced by the quick handling of complaints or whether the e-shop has a mobile app or free delivery of goods to the store for testing.

Fig. 3: Factors determining the decision to buy from a given e-shop



Source: authors' own calculations

Respondents indicated, as a priority in open-ended responses, that they made greater use of cashless and contactless payment methods. At the same time, in relation to the previous, they had started to buy more via the internet. Other results noted a tendency to save more, with respondents limiting impulse purchases and preferring to buy goods at a discount. Related to this was a reduction in the frequency of individual purchases and a preference for a smaller amount of goods purchased. Respondents began to plan their purchases more and generally showed more balance in their larger expenditures.

When selecting a specific category of goods in online shopping, clothing and footwear became the most purchased categories. Based on the frequency, respondents assigned it a 7.1 out of 9. Services (including sports) were ranked second. Cultural events, eating out in restaurants, and tourism were the next top categories with a rating of 6.7. In third place was the purchase of sports equipment with a rating of 5.5. This was followed by food (5.1), in terms of delivery of ready meals, then the purchase of books, magazines and printed materials (4.9) and drugstores and cosmetics (4.8). Next are listed household equipment (4.2) and electronics (3.9), and the classification is rounded off by the food category (2.9). In terms of sports, students made more use of online training programmes, with spending on fitness machines featuring individually among the expenditures.

Increased digital adoption is not only reflected in the aforementioned increase in e-shopping and the factors that influence this purchase in terms of their importance, but also in the frequency of purchases and the amount of income spent. 36% of respondents purchase goods a couple of times a month, 32% several times a week, 17% make online purchases once or twice a month. 7% of respondents make purchases exclusively on special occasions, and 7% said they make online purchases every day. For this group of respondents the average amount spent on online shopping represents 41% of their income.

When it comes to sports, students were more likely to use online training programmes, with spending on fitness machines being a single item among the expenditures.

2.2 Impulsive shopping

Although respondents reported that they plan their purchases and consider their spending more during the covid pandemic, 58% of them admitted to impulse buying online from time to time. Conversely, 23% of respondents do not do this at all and 19% of respondents do it regularly. Those who do succumb to impulse buying behaviour when shopping online said they are most influenced by social media posts, followed by website advertising and referrals from friends.

2.3 Mobile shopping

In the context of mobile shopping, we investigated whether respondents prefer to use mobile apps or browse websites. In response to Research Question 4 („What electronic medium do research participants use most often to browse eshops and make subsequent purchases?"), 60% of respondents indicated that they use websites for this activity. In terms of the importance of factors determining the decision to buy from a given e-shop, respondents again considered the design of the website to be more important.

The increase in mobile shopping was also supported by mobile payments. They were chosen by 306 respondents and ranked second in the results. Respondents chose Apple Pay/Google Pay/Samsung Pay payment options, where they pay via a digital wallet with a payment card loaded on it. Respondents ranked card payments first (365 respondents), followed by cash or cash on delivery (263 respondents). They also used QR code payments as part of mobile shopping (181 respondents).

3. Discussion

Collecting adequate information and data to reflect respondent preferences in relation to online shopping meant designing an adequate questionnaire. In this context a questionnaire that included 25 questions was developed. The return rate for fully completed and displayed questionnaires was 63%. It can therefore be expected that the larger number of questions, together with the time taken completion, may have resulted in a lower return rate.

Given the even distribution of respondents in terms of gender, current degree level (other than PhD) and faculty, the survey can be considered sufficient to identify the main preferences regarding online shopping among this generation.

If we focus on the comparison of our research results with the findings of published studies, it can be said that our research results, in line with Alkusah et al. (2020), Pantano et al. (2020), Jiang and Nikolaos (2021), confirmed that even millennial students in the Covid-19 pandemic started to prefer online shopping to a greater extent. The proportion of online shopping increased by 16% among respondents during the study period

(Research question 1, see Chapter 1). In relation to this, the Research question 2 of an increase in online shopping expenditure was also answered. The results showed that respondents on average spend 41% of their income on online shopping.

Contrary to published research (Accenture, 2020, hl-display.com, 2020), the college millennial generation continued to prefer shopping for clothes and shoes and eating out at restaurants, which they combined with home delivery. These respondents did not abandon the search for cultural events online, although the situation in this respect was complex. Buying groceries was last in terms of interest for them. This is probably because this group of respondents is not that interested in cooking. There was also an answer to Research question 3, as 74% of respondents assigned the highest degree of importance to the price of goods. To Research question 4, 60% of respondents confirmed that they use websites to browse the product range and make purchases through e-shops.

The use of contactless payments is also relevant to the discussion of comparison data from the expert studies. In line with the authors this form was very popular among our survey respondents. According to the authors Sychov and Bakaev (2020), consumers choose smartphone apps rather than websites for this activity. But respondents to our research tended to confirm the views of Forrester (2020), in that they are more likely to use websites where they find it easier to make purchases. That is, they use a laptop or desktop computer more than a smartphone.

Conclusion

The Covid-19 pandemic has accelerated the acceptance of digital adoption, even among the millennial generation. This generation has also started to make more use of online shopping and cashless payments. It also showed a reduced frequency of individual purchases, as well as a lower volume and more price-sensitive relationship with goods.

It took a critical position on the low use of cashless payments by individual e-shops and on the security of e-commerce, which according to the respondents are related. They suggest the creation of two separate payment systems, where one would be focused on the iOS operating system and the other on Android as a suitable solution for the application of QR codes. If successful, they believe it would be appropriate to expand the payment options to include Apple Pay and Google Pay, which they believe are among the most secure forms of payment.

A large number of comments were made on the quality of e-shop websites, which they said lacked a visually attractive list of security recommendations, a greater number of product photos for individual items and a greater number of outlets offered. In relation to websites, consumers would also welcome the possibility to add reviews of individual products and the abolition of 'fake discounts'. They consider these discounts to be easily detectable in the context of the possibility to install various browser extensions that show the real price of the product.

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Crowdfunding and Sustainability. UN SDG Goalsversus Campaign Goals in Developing and Developed Countries. Does it Matter?

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Abstract
Sustainability can be perceived as a life belief as well as a way to impress when presenting a business plan, or a combination of both. Cr
owdfunding can be the way to finance such a business plan linked to sustainability. For example, the UN has established 17 sustainability goals, the so-called Sustainable Development Goals (SDGs). According to the several sources, especially the World Economic Forum survey, it was possible to indirectly deduce that in developing countries the goals perceived in the survey as top-ranked are accentuated, while in developed countries rather the goals perceived as least-important. In view of the above, the aim of this contribution is to identify and describe how crowdfunding campaigns work with the concept of sustainability with regard to the SDG goals, using the case of a selected crowdfunding platform (indiegogo). The monitored variables were the nature of the campaign in relation to the SDG goal being met, the degree of development of the economy in which the campaign was launched, and the percentage of the received amount from the target amount. The work concludes that the analyzed campaigns do not systematically communicate their intention with regard to the SDGs, which are perceived as important for their environment. I.e. the dependence between the nature of the campaign fulfilling the SDG goal and the degree of economic development was not identified. On the other hand, it is still possible to observe that campaigns respecting the SDGs in relation to their economy are more successful in terms of the amount collected.

Key Words
crowdfunding, sustainability, sustainable development goals, corporate finance

JEL Classification: G30, M14

Introduction

This article connects the topics of sustainability and crowdfunding. **The aim of the paper is to identify and describe, on the case of selected crowdfunding platform, how crowdfunding campaigns work with the concept of sustainability with regard to the sustainable development goals (SDGs) settled by the UN**. An additional goal is to reveal whether and how intensively respecting the SDG goal helps the crowdfunding campaign to be successful. The subsequent part of the introduction is devoted to sustainability in general. Then, the article works with sustainability within leading international institutions as well as with the perception of sustainability by the public. Naturally, the topic of crowdfunding in connection with sustainability from the point of view of the current state of knowledge within academic publications is also mentioned.

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Sustainability

Sustainability can be viewed from different perspectives. Cambridge Dictionary (2023a) states as a **general definition** of sustainability: „*the quality of being able to continue over a period of time*". A definition of sustainability **in relation to the environment** is available ibid: „*the quality of causing little or no damage to the environment and therefore able to continue for a long time*", but also with regard to **production**: „*the idea that goods and services should be produced in ways that do not use resources that cannot be replaced and that do not damage the environment*" or **performance** „*the ability to continue at a particular level for a period of time*". Some of the collocations relates to sustainability in the word of economics **finance** such as „corporate sustainability", „debt sustainability", „sustainability of the economic recovery", „sustainability of traditional pension systems", „fiscal sustainability" etc. (Cambridge Dictionary, 2023b). It is evident from the above that sustainability includes the dimension of time (often a long period) and the dimension of eliminating harm, damage or decay. For example, it is with the dimension of time that both academics and practitioners work to determine key indicators that will help the sustainability of business in a certain sector. See e.g. (Moktadir et al., 2021).

Sustainability and leading economic organizations

Top international organizations such as the United Nations (UN) as well as leading international economic institutions such as the World Bank (WB), the International Monetary Fund (IMF) or the OECD work strategically with the topic of sustainability.

The UN has elaborated 17 goals, which it refers to as Sustainable Development Goals (SDGs). These goals include, for example „no poverty", „zero hunger", „good health and well-being", „affordable and clean energy", „climate action", and others (United Nations, 2023). Arora and Mishra (2019) states that six goals (6, 7, 12, 13, 14, and 15) are devoted to sustaiable environment. 6 goals can also be perceived as very economical, specifically goals no. 1, 3, 7, 8, 9, and 12.

In 2019, the World Bank started its Global Program on Sustainability (GPS) which includes many sub-initiatives (such as WAVES – Wealth Accounting and the Valuation of Ecosystem Services) (The World Bank, 2021, 2023). This program is based on three pillars (Pillar 1: Global Data and Analytics; Pillar 2: Country and Regional Level Support; Pillar 3: Sustainable Finance). Thanks to Pillar 1, data is systematically collected and analyzed using analytical products to measure and value natural capital. Pillar 2 is focused on specific countries and regions, assisting with the production of data and analysis, informing policy and investment decisions at the country level. Pillar 3, which is focused on sustainable finance, helps integrate environmental criteria into financial markets, both at the level of state and private entities. In connection with Pillar 3, it is possible to encounter the term ESG, i.e. Environmental, Social and Governance data. ESG data is to be integrated into decision-making and terms such as, e.g., *greening financial system* or *finance for nature* appear. (The World Bank, 2021, 2023)

The International Monetary Fund (IMF) operates a sustainability tool „Resilinece and Sustainability Trust" (RST). Through this long-term financing tool, IMF helps countries with limited budgetary options, usually vulnurable middle-income and low-income countries, to tackle long-term challenges such as climate change. (IMF, 2023)

The OECD supports the goals defined by the United Nations within the framework of the SDGs. The OECD offers its knowledge, unique tools and experience, including creating synergies between the public and private sectors. For this purpose, the OECD has developed a so-called Action Plan on the Sustianable Development Goals within the Framework Better Policies for 2030. (OECD, 2023)

Sustainability and its perception by the public

It is possible to work with the topic of sustainability not only socially (see, for example, the UN, WB, IMF or OECD above), but according to some sources (see e.g. Jones (2008) (2008) or Dabija et al. (2019)) also purposefully as part of a company's communication campaign. This is supported by the perception of urgency and awareness of sustainability in the population, respectively by the public. For example, according to a WEF survey conducted by Ipsos Group in 2019, 74% of respondents worldwide were aware of the above-mentioned SDGs (WEF, 2019), while the results differ by region. Among the 28 monitored countries, India and Turkey showed the highest awareness of the SDGs (55, respectively 53%), on the contrary, the least awareness was found in developed countries (Japan 8%, France 11%). The goals of *Zero hunger*, *Clean water and sanitation*, *Good health and well-being*, and *Affordable and clean energy*, and *Life below water* were at the forefront of the perception of importance in aggregate across all 28 countries. On the contrary, *Gender equality*, *Reduced inequality*, *Industry, innovation and infrastructure*, *Responsible consumption and production*, and *Peace, justice and strong institutions* were ranked among the least important goals. However, as the WEF further states (2019), the perception of the importance of the goals also naturally changes according to individual territories. For example, *Gender equality* is one of the most important goals for Sweden. According to other study on knowledge and perception of the SDGs in the world (see (Schlange & Co, 2020)), SDG 13 (Climate Action) is coming to the forefront of importance. The last place among the six SDGs perceived by the respondents as the most important is SDG 12 (Responsible Consumption and Production). It is worth noting that SDG 12 was ranked among the 5 least important in the aforementioned WEF survey (However, it should be noted that, unlike the survey for the WEF, in the case of this newer survey, 73% of respondents were from Europe or North America, i.e. from regions where advanced economies predominate). Anyway, even this survey continues to state that in developing countries (typically African economies) goals solving other, more urgent social problems prevail (e.g. the above-mentioned SDG 2 – Zero Hunger).

Based on the above, one can indirectly deduce that for developing countries, the goals of basic human needs will be a priority, while for developed economies, goals from the higher levels of Maslow's pyramid. The above subsequently results in a hypothesis contributing to the fulfillment of the goal of the contribution:

H0: The nature of the economy (developing or developed) in which the crowdfunding campaign was launched does not depend on the assumed importance of the SDGs communicated in the campaign.

However, campaigns are created primarily in order to collect the intended amount of money needed for the implementation of the plan. And therefore, the following research question is added to complement the analysis.

RQ: Does respecting the SDG goal help the success of the campaign in terms of the relative amount of funds collected?

Crowdfunding and sustainability

The academic community is already engaged in crowdfunding research in connection with sustainability. In the Scopus database, with the combination of "crowdfunding AND sustainability OR sustainable" (searched in article title, abstract, keywords) for the period of the last 10 full years and the current year (i.e. 2013 to 2023), 267 English-written documents with the characteristic article/conference paper/review/conference review can be found (Note: valid as of May 2023). The analysis of the results shows that the most given outputs fall into the areas of business, management and accounting (94), social sciences (91), followed by computer science (90), and with smaller distances then energy (72), engineering (72), and environmental science (71).

As for the actual content and findings in the field of crowdfunding and sustainability, considering the limited possibilities of using resources within the conference paper, at least the following can be mentioned. For example, Hashinaga et al. (2023) on a sample of students from three different countries (Switzerland, Japan, and China) investigate the willingness to use crowdfunding as a way to support goals related to sustainability and social justice. The study concludes that motivational bases are far from universal and vary by country and sustainability goals. For example, in the case of Swiss students, it is human rights and environmental protection.

The authors Corsini and Frey focus on the analysis of crowdfunding as a support tool for the development of sustainable products in a broader perspective (Corsini & Frey, 2023b), but also on the differences of the crowdfunding campaign for sustainable products intended for niche and mass markets (Corsini & Frey, 2023a). In the first case, the authors conclude that the importance of crowdfunding for the development and commercialization of sustainable products is limited, and even the mere generic inclusion of the keyword "sustainable" in the product description can weaken the chances of the campaign's success (Corsini & Frey, 2023b). In the second case mentioned, Corsini and Frey come to the conclusion that crowdfunding platforms are not a completely suitable tool for solving completely new customer needs with sustainable products or for developing completely new technologies, as the success rate of such campaigns is very low. On the other hand, sustainable products developed for the niche market are more successful in campaigns than disposable products for the mass market.

Leone et al. (2023) work with reward-based crowdfunding and its potential for circular economy and for more sustainable innovation. From selected case studies from the Kickstarter platform, they derive best practice for sustainable projects. The authors conclude that „*reward-based crowdfunding shapes circular business models (CBM) in informational mechanisms, collaborative innovation networks, and marketing aspects*“. The authors also add a note to their conclusions that reward-based crowdfunding reduces the uncertainties and long-term perspectives of circular business models.

Cicchiello et al. (2023) also work with crowdfunding, circular economy and sustainability. In their case, sustainability is considered in terms of sustainable development and environmental sustainability. And, what is more, equity-based crowdfunding is involved this time. In their study, the authors conclude that there is a positive relationship between renewable energy consumption and crowdfunding performance (measuerdy by a deal value, i.e. the amount of money finally raised within a campaign) related to renewable energy sources.

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The mentioned articles indicate that simply declaring sustainability within the presentation of a crowdfunding campaign does not bring much success, and campaign creators must deal with this aspect in a targeted and sensitive manner according to the various characteristics of the area where the campaign is to secure a targeted volume of funds.

1. Methods of the Research

Kearl and Klammer (2022) list these 6 best crowdfunding platforms considering various aspects:

- Best Overall: Indiegogo
- Best for Startups: SeedInvest Technology
- Best for Nonprofits: Mightycause
- Best for Investing: StartEngine
- Best for Individuals: GoFundMe
- Best for Creative Professionals: Patreon

For the purposes of this study, the Indiegogo platform (https://www.indiegogo.com/) was chosen, which according to the above list is ranked as best overall and which can also sort listed crowdfunding campaigns with regard to the keyword "sustainability" or "sustainable".

The list of campaigns for analysis was determined in May 2023 using the above filter. From the identified campaigns that the platform evaluated as relating to the words "sustainability AND sustainable". At the same time, however, it had to be true for the campaign after a manual review that its main goal (focus) fell within the top-ranked or lowest-ranked SDGs. In addition, the total number of investigated campaigns was influenced by the requirement for the feasibility of a statistical test about independence in a contingency table, when the theoretical frequencies for the chi-square test in the table should be higher than 5 (see chapter Results below). Thus, given the requirements, 50 campaigns were randomly selected for follow-up analysis. Other restrictions (for example, whether it is an ongoing, soon-to-be-ending or on the contrary beginning campaign, or an already ended campaign) were not considered.

The information shown in Table 1 was collected for individual campaigns from their labels provided on the platform. Depending on whether the output of the campaign contributes to the fulfillment of one of the goals (SDGs), such a campaign was assigned to the relevant goal. Naturally, some of the campaigns fulfill or should have fulfilled several SDGs with their output. In such a case, the research team reached consensus on the primary objective.

About the campaigns, it can be said that they were reward-based crowdfunding campaigns. Given the different conditions of different crowdfunding campaigns, it is also appropriate to add that in the cases mentioned, these were so-called campaigns with

Tab. 1: Crowdfunding campaigns and their relation to the SDGs

	Indicator (SDG)	The nature of the campaign output	Region		Number of campaigns in total
			Developing	Developed	
SDG 2	Zero hunger	snacks using insects and food waste; a bar that meets the WHO's criteria for nourishment; build a cricket farm; oyster mushroom growing project; sustainable farm to feed orphans	2	3	5
SDG 3	Good health & well-being	educate kids about healthy living; optimizing personal dieting techniques; an operational retreat center with an emphasis on physical, emotional and spiritual healing; shrimp farm to help community stay healthy; anti-inflammatory sprouts; to provide basic mental health services through art workshops; setting up a mobile clinic; solar light and water filtration equipment to reduce the number of bacteria-related deaths	3	6	9
SDG 5	Gender equality	media projects, events, retreats and trauma healing program for the Iranian community, especially women	0	1	1
SDG 6	Clean water and sanitation	farm growing seaweed to clean water and selling the seawead; to collect water for the garden and provide drinkable water	1	1	2
SDG 7	Affordable energy	energy and climate plan for America	0	1	1
SDG 9	Industry, Innovation and infrastructure	innovative green aircrete high performance concrete mixture; composting equipment; biological nitrogen fixation; develop concept of CSR in Madagascar; organic farm that is self-sustainable, be it energy or food; greenhouses with hydroponic irrigation systems, a rainwater capture system and solar panels	3	3	6
SDG 10	**Reduced inequlaities**	–	0	0	**0**
SDG 12	**Responsible consumption and production**	campaigns generally encourage consumption that will reduce, for example, all kinds of waste (such as plastics), greenhouse gas emissions, etc., or, on the contrary, consumption will support other secondary goals (social inclusion, affordable housing, recycling, reusability, clean water etc.).	2	19	**21**
SDG 14	Life below water	protect animals in water by reducing illegal fishing; waste from ocean used to make pants; developing a cement to build our reefs; teach local kids about the reef to protect it	2	2	4
SDG 16	Peace, justice and strong institutions	book about contributing to a more peaceful, just and sustainable world	0	1	1
Total			**13**	**37**	**50**

Source: authors' processing, data from (INDIEGOGO, 2023)

Note: Shaded in light blue are the goals that, according to the WEF survey, were the most perceived as important. On the other hand, the least perceived as important are shaded in light red. We did not work with campaigns that had neither top-ranked nor least important as their main goal. Whether a country falls into the developed or developing category is based on the MSCI classification (see https://www.msci.com/our-solutions/indexes/market-classification)

a so-called flexible goal (i.e. even if 100 percent or more of the intended amount is not collected, the amount is paid out and is not returned to the contributors ; a fairly common setting for crowdfunding campaigns is the so-called all or nothing, i.e. the selected amount is paid to the campaign creators only if 100 percent or more of the target amount is selected).

In Table 1, it is possible to notice that the most identified characteristic of projects supporting the fulfillment of the SDG goal is *SDG 12 Responsible production and consumption*, and the overwhelming majority are campaigns launched in developed countries. On the contrary, none of the campaigns included in the analysis fulfilled the main goal of *SDG 10 Reduced inequality*. At the same time, it is possible to notice that, overall, campaigns launched in developed economies predominate, in a ratio of approximately 1:3. It is also possible to notice that more campaigns, by their nature, primarily fulfilled objectives considered as least important, rather than top-ranked (29 least important vs. 21 top-ranked).

2. Results of the Research

In this section, the results of the tested hypothesis about the independence between the level of economic development and the focus of the crowdfunding campaign from the perspective of the SDGs are first presented. Subsequently, an analysis is presented with the task of answering the research question posed above, whether campaigns that respect the importance of the SDG goal in their economy achieve a better selection of money than campaigns that do not respect the perceived importance of the SDG in the economy.

Economy and the SDGs in a crowdfunding campaign

Based on Tab. 1, the following Tab. 2 was derrived. In the table, the rows show the outputs of the campaigns that contribute to the fulfillment of the objectives perceived by the WEF respondents as the most/least important. The column then indicates where the crowdfunding campaign was launched.

Tab. 2: The nature and output of the crowdfunding campaign fulfilling the SDGs and the region where the campain was launched

		The campaign was/is launched in		**Total**
		Developing economy	Developed economy	
The nature of the campaign output fulfills the SDG goals rated as	***top-ranked SDGs*** in perceived importance	8	13	**21**
	the lowest-ranked SDGs in perceived importance	5	24	**29**
Total		**13**	**37**	**50**

Source: authors' processing

Note: Whether a country falls into the developed or developing category is based on the MSCI classification (see https://www.msci.com/our-solutions/indexes/market-classification)

Tab. 3: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2,753[a]	1	*0.097*		
Continuity Correction[b]	1.776	1	0.183		
Likelihood Ratio	2.733	1	0.098		
Fisher's Exact Test				0.116	0.092
Linear-by-Linear Association	2.698	1	0.100		
N of Valid Cases	50				

Source: authors' processing

Note: [a]0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.14. [b]Computed only for a 2x2 table.

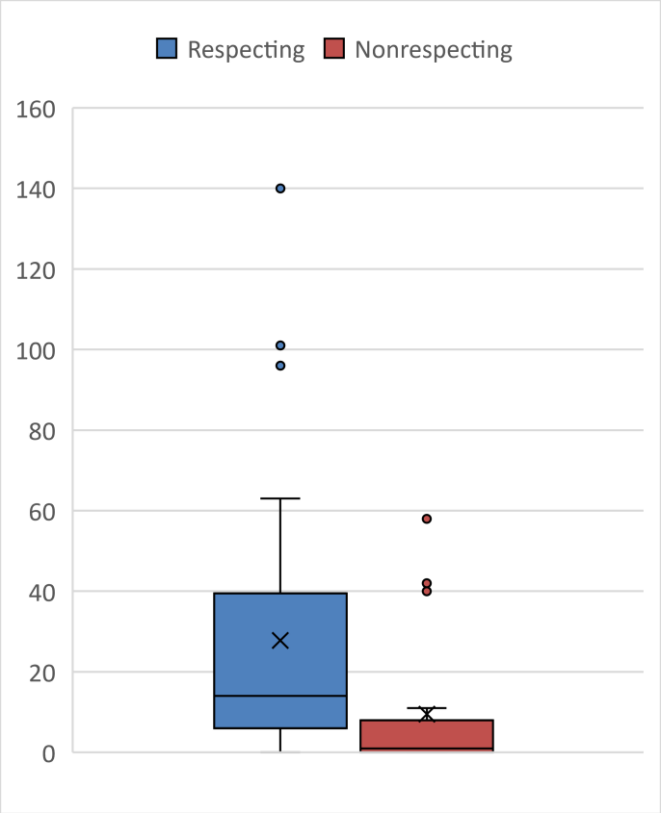
Table 2 indicates that the top-ranked SDGs predominate in developing countries (62% of campaigns considered), while the lowest-ranked SDGs significantly predominate in developed countries (65% of campaigns considered). This finding corresponds to the assumption stated in the Introduction chapter. However, is this initially identified relationship strong enough to be identified as a statistically significant dependency? Therefore, this relationship (in accordance with the null hypothesis of independence also stated in the Introduction of this paper) was tested using a chi-square test in a 2x2 contingency table. The results of this test can be seen in Table 3. The result of the test shows that the null hypothesis of independence cannot be rejected when the p-value > 0.05. A statistically significant relationship was not identified. It is therefore possible to say that this analysis did not prove the dependence between the contribution of the crowdfunding campaign to the fulfillment of the SDG goal and the emphasized goals for the economy of the given level of development where the campaign was launched.

The success of the campaign with regard to (non)respecting the SDGs

For every crowdfunding campaign, it is important whether it ultimately fulfills the expectations of its backers. In the case of a campaign with a "flexible goal", the more successful campaign is the one that brings the most funds collected in relation to the target amount of the campaign. The answer to whether campaigns respecting or not respecting the SDGs are more successful is provided by the following figure (see Fig. 1).

From Figure 1, it can be seen that campaigns respecting the SDG goals (in blue) have on average a higher success rate than campaigns that do not respect the SDG goals. Within both groups, there are exceptionally successful campaigns that are statistically evaluated as outliers (see dots above the boxes). The average respecting campaign receives approx. 27.78% of the target amount, while the non-respecting campaign receives 9.5% (After excluding outliers, the averages drop to 19.03% and 2.07%, respectively.). In terms of median values, the median for respecting campaigns is 14%, while for non-respecting campaigns it is 1%. From the above, it can be concluded that campaigns that respect the SDGs have a higher performance than campaigns that do not respect the SDGs.

Fig. 1: Boxplot – Campaigns respecting and not respecting SDGs, their success rates (in %) and descriptive statistics



Source: authors' own calculations

3. Discussion

Dabija et al. (2019) pointed out the potential of using the topic of sustainability with young Gen Z customers. In addition to that Hashinaga et al. (2023) pointed out that it is appropriate to work with the topic of sustainability also with regard to the perception of sustainability by residents of different regions. What is more, Corsini and Frey emphasized that working with the word sustainability within the communication strategy of crowdfunding campaigns must be sophisticated, not haphazard (Corsini & Frey, 2023b), and that a crowdfunding campaign focused on a sustainable product (output) has a higher chance of success with products targeting the niche, not the mass market (Corsini & Frey, 2023a). However, the results presented in this text do not indicate that publicized crowdfunding campaigns systematically work with the perception of sustainability with regard to the SDG goals and the location of the publicized campaign, thus reducing their potential to succeed, i.e. to collect the intended amount of money, or at least to get as close as possible to the target amount.

In our opinion, the following circumstances may have influenced the results of our analysis. Firstly, limitations in the case of the analyzed campaigns, which were built with regard to the so-called flexible goal, which naturally does not push the campaign creator to such an effort as campaigns with an "all or nothing" limitation. The creators of such campaigns can naturally overlook various details that increase the chances of a significant campaign success. Second, the determination of the main feature of the campaign that

contributes to the achievement of one of the SDG goals was subjectively assessed by the author's collective. And finally, the results presented here can naturally only be related to campaigns launched on the indiegogo crowdfunding platform.

Conclusion

Using the example of multinational institutions (United Nations, World Bank, IMF, and OECD), it was demonstrated how the topic of sustainability is worked within these institutions. The Sustainable Development Goals (SDGs) compiled by the United Nations (2023) can be emphasized. In addition to that, OECD openly declares to contribute to their fulfillment (OECD, 2023). The article also presented a WEF survey (WEF, 2019) focused on how sustainability is perceived in society, including consideration of different economies, respectively countries or regions. At the same time, contributions pointing to the possibility of using especially the environmental aspect of sustainability as part of the communication strategy in retail, or business in general, were presented (see (Dabija et al., 2019; Jones et al., 2008)).

In the case of the selected crowdfunding platform (indiegogo.com), it was demonstrated that the listed campaigns work with the theme of sustainability. The analysis carried out here further sought to reveal how projects tendered in a certain territory respect the perceived importance of the SDG goals. From the conclusions of the WEF survey and other sources (e.g. (Schlange & Co, 2020)), it was possible to indirectly deduce that developing countries place more emphasis on the SDGs evaluated as top-ranked, while developed countries tend to focus on goals from the lowest-ranked category. At first glance, the structure of the listed campaigns also corresponded with this reasoning. However, the performed statistical test did not prove this dependence. On the other hand, if the campaigns respected the SDGs perceived as the most important for the local economy (population), they had on average a larger response measured by the amount of money raised. From the above, it is clear that work with crowdfunding campaigns with a focus on sustainability has room for further development, perhaps with an emphasis on contributing to the fulfillment of the SDG goals which are perceived more urgently in a certain territory.

The research team wants to develop the topic of crowdfunding and its success in relation to sustainability and SDG goals in terms of expanding the number of considered crowdfunding platforms, as well as to deepen the analysis carried out by looking at the secondary main feature of the campaign contributing to the fulfillment of the SDG goals.

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Efficient Order Picking in a Warehouse with Double Demand Seasonality

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Abstract

In this paper we highlight the advantages of adopting a broad simulation model of material flows as a useful foundation for developing system support for warehouse procedures that use WMS. The warehouse under consideration has a rectangular shape with parallel lanes and operates in two distinct seasons, necessitating different storage methods. The modified simulation model incorporates several strategies to enhance efficiency. Firstly, the S-shape routing technique is employed to optimize the movement of order pickers within the warehouse, minimizing travel time and increasing productivity. Additionally, a return technique is integrated to minimize empty travel distance, further reducing operational costs. Storage assignment within the warehouse is determined based on the frequency of item occurrence and the required storage technology. To establish an effective layout for each season, the study examines historical demand data and utilizes ABC analysis to classify goods. This dual layout design approach accounts for the unique demand patterns of each season, enabling the warehouse to maximize storage capacity and minimize operational bottlenecks. By considering elements such as seasonal demand, storage technologies, labor routing, and product classification, this research provides valuable insights for improving order picking efficiency, reducing costs, and enhancing customer service in seasonal warehouses. Implementing the proposed simulation-based technique can empower businesses to optimize their operations and thrive amidst changing market conditions, ultimately leading to increased profitability and customer satisfaction.

Key Words

logistics, order picking, seasonal demand,warehouse layout , simulation

JEL Classification: M21, C63

Introduction

The process of picking customer orders is the most significant activity that takes place in distribution facilities in terms of operating costs (Boysen et al., 2021). Although automation technology is becoming more widely available, many warehouses still rely on human employees to carry out order picking duties (de Lombaert et al., 2022). In that case up to 50% of the picking time is spent by operators moving to reach items localized at picking stations, which takes up a lot of time and accounts for up to 55% of the expenditures associated with the warehouse operation (Loske et al., 2023). Good work organization is essential for the effectiveness of order picking in the warehouse since consumer behavior is characterized by ongoing demand to shorten the order processing time and by purchasing smaller quantities more frequently (Altarazi and Ammouri, 2018). There are several key factors influencing the system performance encompassing a warehouse layout, a picking system type, an order picking strategy, a storage assignment policy and a routing of workers responsible for order picking between the individual locations (Bottani et al., 2019).

In this paper we focus on a conventional rectangular warehouse layout arrangement with parallel aisles (Diefenbach and Glock, 2019) and the low level picker to part system characteristic with a movement of workers to goods that is firmly located and within the reach of the workers that are standing on the ground (Hwang et al., 2003). The warehouse is operated by a small company growing agricultural crops and trading these crops together with accessories for growing plants and other additional items (i.e. food products, beverages, tea etc.) via e-shop. As the company sells not only its own harvest from June to December (i.e. 6-12 season) but also the seeds, bulbs and young plants during the spring months (i.e. 1-6 season) there are two different seasonal periods with a certain demand pattern and also with a necessity to use different storage technology located in the order picking area. These technologies involve traditional shelves for picking out of plastic crates and carton boxes, mobile racks with watering tubs for young plants picking and also ground palette positions for picking high volume items coming from the harvest Double seasonality distinctively affects storage assignment and routing in a considered individual order picking strategy (Van Gils et al., 2018) and makes warehouse management to be a very challenging task. To optimize the performance of such order picking system while maximizing the utilization of space in the picking area we employ the modification of the general simulation model of material flows in supplier systems (Dyntar, 2018) proposed by Kašparová and Dyntar (2021). This modification is proven to be suaitable for applications in the design and optimization of order picking systems (Dyntar and Kašparová, 2021). We extend the modified simulation model by incorporating the S-shape routing (Cano et al., 2017) combined with the return method (Kostrzewski, 2020). Furthermore we add in a storage assignment policy based on a frequency of occurrence of an item in orders (Dijkstra and Roodbergen, 2017) combined with the maintenance of assortment groups in certain fixed zones according to required storage technology (Sooksaksun, 2012). We use the extended model to simulate one year picking list based on a historic data and determine required number of pickers.

1. Methods of Research

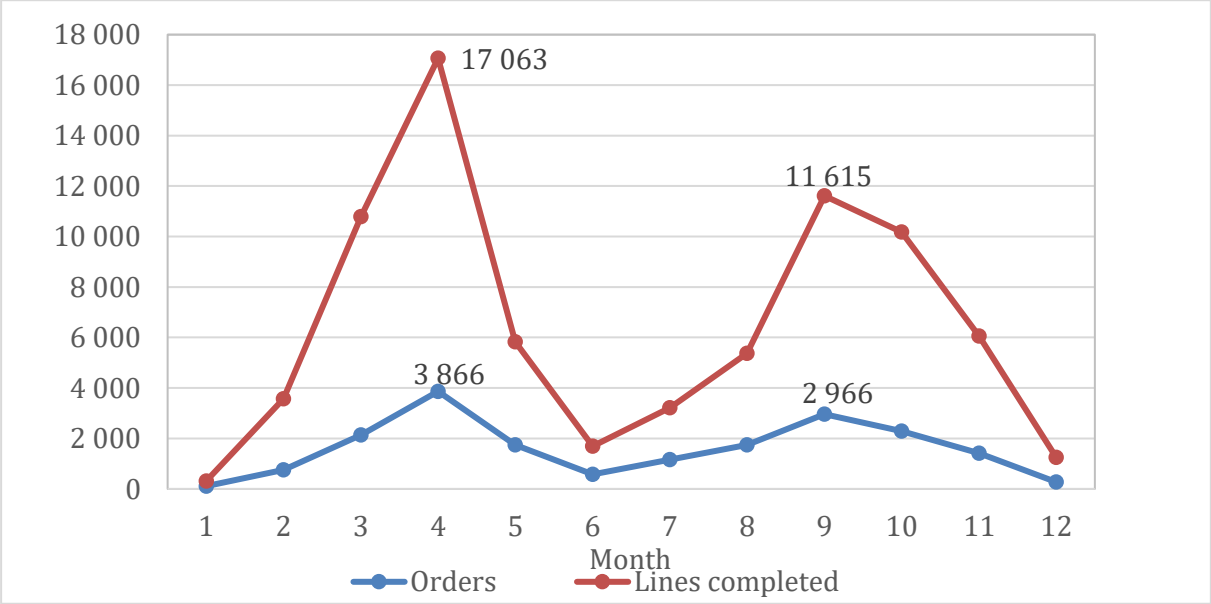
Based on the historic demand data we first analyse seasonal peaks to describe an intensity of a season in term of a number of picked orders as well as in a number of completed lines. Then we use ABC analysis (Shah, 2016) to categorize sold items according to their frequency of occurrence in orders. We also categorize items according to their placement in a certain storage technology within the seasonal warehouse layout as it is important to localize the items correctly during the routing of pickers. We import demand data together with parameters of items coming from both categorization procedures into extended simulation model which is proposed in Witness Horizon disrete-event simulation software environment. This simulation model consists of modified basic modelling structures representing pickers (Kašparová and Dyntar, 2021). Number of pickers in the simulation is set in Initialization Actions using pre-defined Witness function SET QUANTITY OF for each simulated day separately to achieve the maximal utilization of workers. In simulation, a picking route is constructed for each order individualy based on the described categorizations of items. Based on the the categories, a storage location of an item in an order is generated randomly within specified zones using UNIFORM() distribution. Uniform distribution is recommended by literature (Bottani, 2010) as the best at modelling random component of picking from starage locations. Based on this randomly generat ed storage locations of items a certain part of the longest possible picking route is returned for an order representing a distance the workers have to travel during order picking. We expect order pickers to move with an average speed 3,5 km/h,

an average time of a handling at a storage location 20 s/completed line and an available time 7,5 h/worker, shift in 5 days/week 1 shift warehouse operation schedule. Above mentioned criteria fullfills definition of so called full time employee. We consider 80% utilization of pickers. All simulations are carrriedout on a computer with an Intel Core i7 7600U – 2.9 GHz processor, 16 GB RAM.

2. Results of the Research

Outputs of historic demand data analysis show both Fig. 1 and Tab. 1 which also contains items categorization coming from ABC analysis based on frequency of occurrence of items in customer orders.

Fig. 1: Fulfilled orders and lines completed



Source: authors

Tab. 1: ABC analysis

	% of items in a group		
Category/Group	Season 1-6	Season 6-12	Additional sales
A (80% of completed lines)	22%	16%	26%
B (15% of completed lines)	34%	43%	34%
C (5% of completed lines)	44%	41%	39%
Offered items in a group	**669**	**163**	**155**
% of a group on total revenues	**44%**	**51%**	**5%**

Source: authors

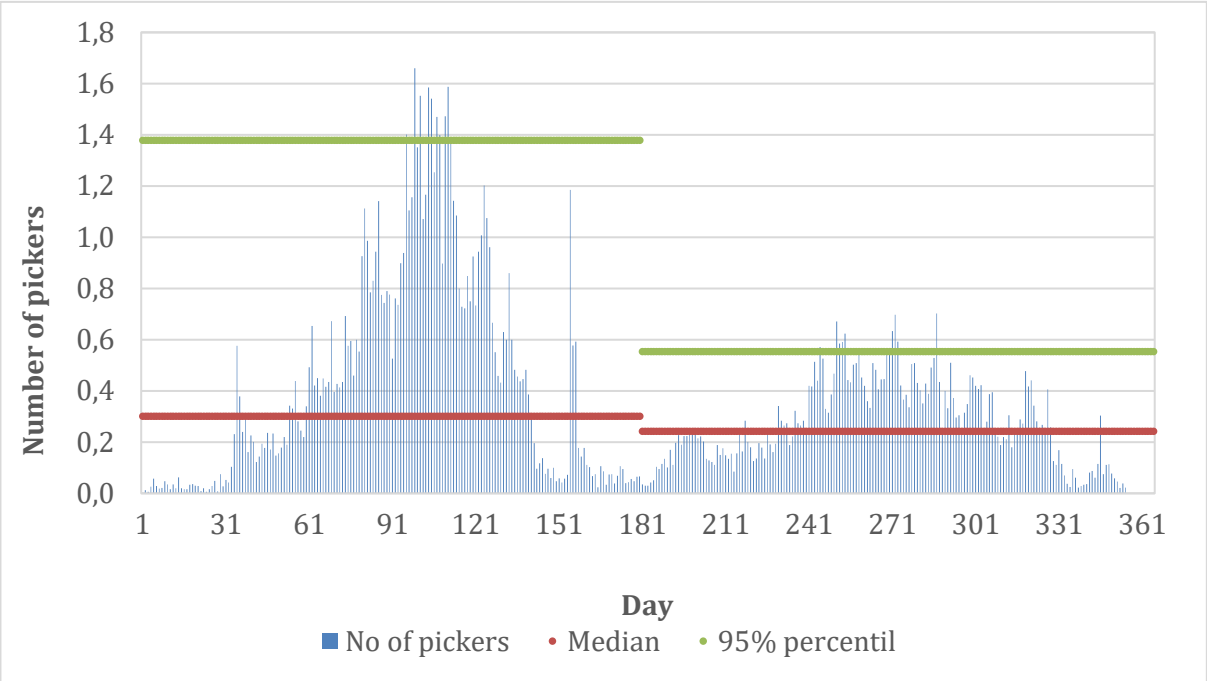
It can be seen that 1-6 season is stronger both in term of picked orders and number of lines completed. The ratio Lines completed/Orders is 4,4 for 1-6 season and 3,9 for 6-12 season. As number of demanded items in the 1-6 season (i.e. 669) is more than four times higher compared to 6-12 season (i.e. 163) one can expect the spring season to be more labour intensive and due to the revenues also less profitable.

Fig. 2 shows seasonal warehouse layout with different storage technologies for the seasonal goods (i.e. mobile racks for young plants picking during the spring season vs. palette positions for the harvest picking) and also with the zones specifications based on the results of ABC analysis. While the 6-12 season layout works mostly with S-shape routing, the 1-6 season layout arrangement includes the routing based on the return method for picking out of the mobile racks and S-shape routing which is used for the picking of orders out of plastic crates and carton boxes located in shelves.

Fig. 2: Dual layout warehouse design

Source: authors

Fig. 3: Number of FTE pickers coming from simulation



Source: authors

Outputs from the simulation shows Fig. 3:

Number of pickers is counted as number of full time employees utilized on 80 %. It can be seen that there is no big difference in 50% percentile of the optimal number of required pickers per day (i.e. 0,3 for 1-6 and 0,2 for 6-12 season) while the difference in 95% percentile is quite significant (i.e. 1,3 for 1-6 and 0,5 for 6-12 season). This is because the spring season is strongly affected by weather conditions and it generally concentrates in a narrower period of time while selling the harvest is rather gradual.

3. Discussion

ABC analysis is a showcased as a useful method for seasonal warehouse layout design because it allows to strategically locate high-demand items, which is a crucial premise for consequent picking system optimalisation. Two different layouts are proposed to optimize usage of space and storage capacity, considering seasonal differences. Another of the advantages is the simple changeability of the layout, which ensures a gradual transition in the intermediate period in which the warehouse ensures the distribution of items typical for both seasons.

As can be seen from the results, the 95% percentile of the number of pickers for the second season is more than double. This presents a challenge for the optimization of picking capacities, which according to most authors (eg. Boysen et al., 2021; Loske et al., 2023) make up a significant part of operating costs. Effective planning support for these resources therefore leads to a overall reduction in warehouse management expenditures. In this case simulation is used as a strong tool to enhance resource planning for the predicted mix of orders in a short time. This is proven advantageous, for example, to cope with dual season differences and transition periods between these seasons.

The dynamic simulation environment and the selected modeling approach also provide a lot of benefits in terms of system design and system support through WMS. According to Masae et al. (2020), most studies dealing with the optimization of picking routes mainly use heuristic, metaheuristic and exact algorithms. This study presents dynamic simulation as a useful method to achieve similar results. A number of authors (e.g. Law, 2015; Dyntar, 2018) see the main advantages of dynamic simulation in the possibility to test system concepts, even before their implementation, in a very short period of time. Proposed model modification can thus serve as tool for the best manner of system support determination prior to WMS installation.

As per Turner's work (2022), the integration of Discrete Event Simulation (DES) with these advanced technologies stands out as a pivotal avenue for prospective developmental trajectories. Evidently gleaned from online data sources, this integration holds the potential to confer a competitive edge upon enterprises engaged in the strategic delineation and operational orchestration of logistics systems. When amalgamated with the methodological approach expounded within this article, such a convergence may assume the role of a discerning instrument for the refinement of warehouse optimization at an operational echelon.

A primary merit characterizing DES, notably its velocity as highlighted by Dyntar (2018), accentuates its applicability. Consequently, it stands within the realms of feasibility for DES to complement and even extend the efficacy of Warehouse Management Systems (WMS), especially concerning their faculties in the domain of logistical planning. Thus, it is posited by the authors that forthcoming inquiries ought to pivot towards the establishment of linkages between DES and contemporaneous models that derive from live-streamed data sources.

Conclusion

Presented article utilizes a simulation-based technique to optimize order picking systems in seasonal warehouses. ABC analysis for both seasons is used as tool for seasonal warehouse layout design. Then the simulation outputs are used to determine seasonal number of pickers, S-shape routing system with return technique is introduced to maximize efficiency of picking routing.

By taking into account the particular problems and storage technology differences over different seasons, it gives practical insights applicable to comparable warehouses. In addition, the research provides an enhanced simulation model that includes S-shape routing, the return technique, and a storage assignment policy based on item occurrence frequency and necessary storage technology. This modification provides a more realistic picture of the order selection process and allows for the examination of various ways for enhancing system performance. It can serve as useful insights for warehouse managers looking to increase operational efficiency, save costs, and improve customer service in comparable scenarios. The study's findings may be used to assist decision-making processes, allowing warehouses to react to shifting demand patterns and optimize order picking procedures.

Due to its simplicity, model can be easily transferred to a different type of warehouse and it can be modified to fit new set of considered conditions. The outputs further confirm that model proposed by Kašparová and Dyntar (2021) is suitable for applications in the design and optimization of order picking systems.

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What Prevents Businesses from Carrying out Eco-Innovation Activities? Empirical Research on Barriers in Slovak SMEs

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Abstract

Eco-innovations seem to be an effective tool of the transformation process towards sustainability where enterprises must play an active role. As small and medium-sized enterprise (SMEs) are one of the key accelerators of this transition, particular attention should be paid to the main factors that influence eco-innovation activities in this business segment. The paper focuses on the identification and assessment of barriers that limit the more intensive development of eco-innovation activities in Slovak SMEs. It analyses empirical data on barriers to eco-innovations and explores possible relationships between perceived barriers to eco-innovation, size of enterprise, the share of foreign capital in the enterprise's financing and involvement in eco-innovation activities. The research sample contains 487 randomly selected Slovak SMEs. The article presents the results of the examination of the barriers importance in eco-innovation activities in Slovak SMEs assessed by Likert scale values, descriptive statistics, and selected statistical methods including the Shapiro-Wilk test, Spearman correlation, Friedman test and Wilcoxon signed rank tests. The conclusions provide some deeper insights into the perception of barriers to eco-innovation in Slovak SMEs according to their size, share of foreign capital in financing and implementation or non-implementation of eco-innovation, with some results showing similarities with other studies conducted abroad, while others are specific only to Slovak SMEs.

Key Words
eco-innovations, barriers, Slovakia, SMEs

JEL Classification: O31, Q52, G32

Introduction

The growing demand for environmental protection, improvement and the increasing importance of sustainable development in the transition to a green or circular economy require new environmentally friendly products, services, technologies, or processes. Ecological innovations (often referred to as eco-innovations) that aim to reduce the consumption of raw materials and natural resources in general, decrease the amount of harmful emissions, and improve life conditions of people are an effective way to steer humanity towards its sustainability. Therefore, they are often labelled as sustainable, responsible, or green. Carfora, Passaro, Scandurra and Thomas (2022) define them as a change in economic activities improving both the economic and environmental performance of the society, according to the win-win situation for both the economic and environmental perspectives. It is expected that eco-innovations would play a crucial role in the quest for more competitive, environmentally friendly, and sustainable societies

(Machiba, 2010). In the context of this transformation that changes patterns on the path to sustainability, businesses must take an active part (Jové-Llopis and Segarra-Blasco, 2018). Particular attention should be paid here to small and medium-sized enterprises (SMEs) which are considered to be an accelerator of the transition towards environmental sustainability.

The field of eco-innovations is now increasingly complex. The multifaceted perspectives of the eco-innovation concept including social, organisational, technological, financial, managerial, and some other aspects are highlighted by several authors (Arranz et al., 2019; Martinez-Conesa et al., 2017), thus pointing to its broadness and complexity. The factors influencing eco-innovation activities vary depending on the type of business (Cai and Li, 2018). Therefore, it is necessary to examine them separately in the SMEs segment. The high heterogeneity of the environment coupled by frequent and turbulent changes in the environment in which SMEs nowadays operate is not supportive enough for the introduction of innovations (Ciambotti and Palazzi, 2015). Therefore, these enterprises increasingly suffer from many problems and face obstacles on their way to innovation. Understanding determinants of eco-innovations in SMEs may provide a more comprehensive insight into their reality (Markowska, 2021). Many studies investigating the perception of barriers to the involvement of enterprises in eco-innovation activities depending on different characteristics can be found, among them the business´s size, share of foreign capital and previous involvement in eco-innovations are often mentioned. Cecere et al. (2018) argue that the difficulties associated with these activities as well as the eco-innovation performance of enterprises are related to their size. Others confirm that previous experience with innovations (including eco-innovations) might influence the business's future involvement in this area and also the drivers and barriers they face here (Peiró-Signes and Segarra-Oña, 2018). Several authors have already found that internationalisation is also among the important factors influencing the eco-innovation activities of businesses (e.g., Torrecillas and Fernández, 2022), while many also acknowledge that the dependence between the pursuit of eco-innovation and the presence of foreign capital in the financing of the business needs to be further explored in more depth. In this paper, we aim to focus on the barriers that prevent SMEs from becoming more involved in eco-innovation activities and in particular on their relationships with the above three characteristics.

The structure of the paper is as follows. First, the research methods are described. The research findings are presented in Section 2. The paper is completed with discussion and conclusions.

1. Methods of Research

The aim of the paper is to identify and assess the main barriers to eco-innovations among SMEs in Slovakia. Empirical data was collected using the online questionnaire. To assess the barriers to eco-innovation, we asked respondents to select the value of importance on the Likert scale from 1 to 5, where 1 represented the lowest importance and 5 the highest importance of barriers. Respondents were allowed to add their own barriers (in addition to those chosen in questionnaire), but no one used this opportunity and respondents only assessed the offered barriers. The research sample (respondents) was randomly selected from the Finstat database. The questionnaires were distributed online and

collected from November 2022 until April 2023. In total, we received 672 responses from companies in the Slovak Republic. We rejected 185 questionnaires due to missing responses or untrustworthy information. The research sample consisted of 487 Slovak SMEs, of which 465 were micro enterprises, 17 small enterprises and 5 medium enterprises. We verified the representativeness of the research sample using the Chi-square goodness of fit test. With the p-value 0.08, we confirmed that the research sample was representative of the SMEs population in Slovakia according to the size criterion.

We analysed the correlation of barriers importance and the characteristics of selected SMEs (size, share of foreign capital in financing and previous involvement in eco-innovation). We formulated following three hypotheses for our research.

Firstly, we assumed that smaller enterprises might suffer from different barriers in comparison to larger ones due to limited human resources available for eco-innovations or limited financial sources. This assumption was verified by hypothesis H1: The size of enterprise is significant to the importance of the barriers to eco-innovations.

Secondly, we chose the share of foreign capital in financing as an independent variable for the correlation analysis of the importance of the barriers. Hypothesis H2 was: The different levels of foreign capital determine importance of barriers perceived by SMEs. We assumed that the availability of stronger foreign capital, often accompanied by larger knowledge and experience with eco-innovations (Torrecillas and Fernández, 2022) might influence the perception of the barriers` importance to eco-innovations. We divided the respondents into four categories based on the share of foreign capital (see Tab. 1).

Tab. 1: Structure of SMEs sample according to the share of foreign capital

	Share of foreign capital			
	0 %	**up to 25 %**	**from 26 % to 50 %**	**over 50 %**
micro	409	44	6	6
small	13	1	0	3
medium	1	0	2	2

Source: authors` own calculations

Finally, we analysed the research sample of SMEs in terms of the eco-innovation activity of the respondents (see Fig. 1). Those enterprises that implemented any eco-innovation activity before 2022 referred to as 'innovators', the rest of respondents were 'non-innovators'. Among micro enterprises there were only 24% of innovators, by medium – sized enterprises, 100% of respondents introduced some eco-innovation.

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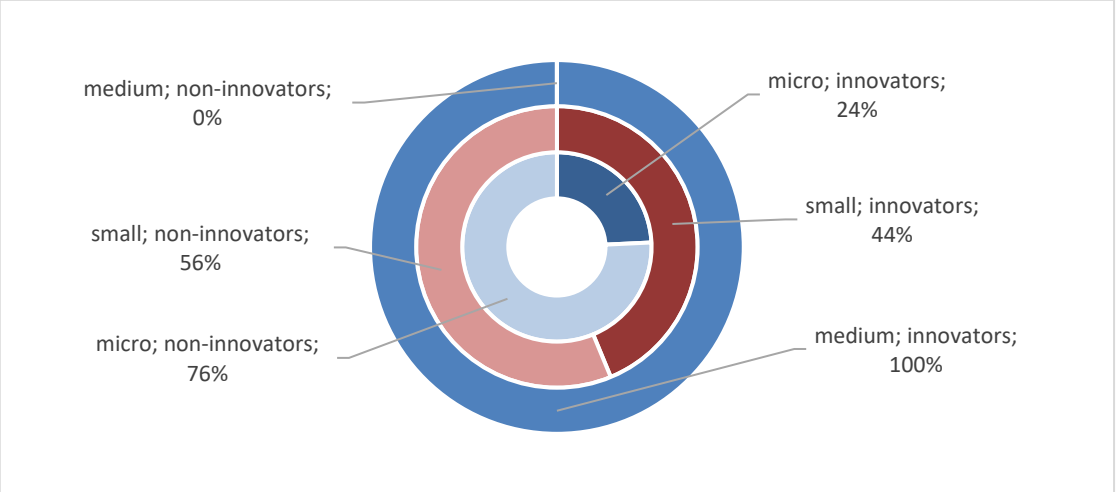
Fig. 1: Structure of the research sample



Source: authors` own calculations

To examine a possible correlation between the past experience of SMEs with eco-innovations and the perception of barriers` importance, we set hypothesis H3: Past experience with implementation of eco-innovation determines the perception of the importance of barriers to eco-innovation among SMEs.

Using the Shapiro-Wilk test, we tested the normality of the distribution of responses in the research sample. As the result of the test has not confirmed the normality, we continued with the nonparametric tests. In order to investigate the dependence between the perception of barriers to eco-innovation and the size of the enterprise, the share of foreign capital in financing and previous involvement in eco-innovation, we conducted a Spearman's correlation test.

Finally, we tested the order of importance of all barriers to eco-innovations separately, disregarding all other characteristics (size, foreign capital share, and experience with eco-innovation). For this purpose, we used the Friedman test. Subsequently, the order of barriers (overall rank) was tested on the SMEs population in Slovakia using the Wilcoxon signed rank test. At the 0.05 level of significance, we reached the order of importance of eco-innovation barriers in Slovak SMEs as presented in Tab. 3. The top positions of the rank are held by the most important barriers.

2. Results of Research

The following tables present the results of the assessment of the significance of barriers to eco-innovations in Slovak SMEs. They show the average values of particular barriers` importance in relation to the selected sorting features of the respondents – enterprise size, previous eco-innovation activity (see Tab. 2) and the share of foreign capital in the total capital of the enterprise (see Tab. 3).

Tab. 2: The mean values of importance of the barriers to eco-innovations I

Barrier	micro	small	medium	innova-tors	non-innovators
Lack of internal financial sources	4.00	4.24	4.00	4.18	4.03
Difficult access to external sources of funding for eco-innovations	3.94	4.29	4.00	4.11	3.95
The high cost of eco-innovations	4.16	4.35	4.20	4.22	4.21
Lack of qualified staff to create or implement eco-innovations	3.51	3.59	3.60	3.51	3.54
Lack of willingness of business´s management to innovate	3.07	2.82	2.00	2.91	3.17
Lack of cooperation with other businesses	2.93	2.59	3.40	3.04	2.91
Lack of cooperation with research institutions and universities	2.91	2.82	3.40	3.13	2.86
Insufficient state policy to support innovative activities of businesses	3.66	3.59	3.80	3.78	3.64
The high level of bureaucracy (when drawing financial support, dealing with various permits, etc.)	4.14	4.47	4.60	4.30	4.15
Lack of awareness of the benefits of eco-innovations in a business	3.54	3.65	4.00	3.49	3.63
Uncertain returns on investments in eco-innovations or a too long payback period	3.76	3.88	3.40	3.72	3.86
Limited access to external sources of information and knowledge on eco-innovations	3.53	3.53	4.20	3.47	3.65
Lack of support services (from state institutions) for the introduction of eco-innovations in a business	3.77	4.00	4.40	3.98	3.79
Uncertain customers` demand for eco-innovations in the current market	3.34	3.18	3.80	3.29	3.47
Existing technical and technological constraints in the economy (e.g., outdated technical infrastructure)	3.50	3.41	3.40	3.44	3.52
Existing legal restrictions in a country	3.30	2.82	3.00	3.30	3.24
Macroeconomic uncertainties (COVID-19, war in Ukraine, inflation, etc.)	3.70	3.35	3.80	3.87	3.63

Source: authors` own calculations

In terms of the size categories of the respondents, the high level of bureaucracy was the dominant barrier. SMEs perceived it as the most significant obstacle (4.47 and 4.60 respectively on a Likert scale from 1 to 5). Micro enterprises considered the high cost of eco-innovation as the most significant barrier to eco-innovation, the high level of bureaucracy was the second most significant for them. If we disregard the size of enterprises and divide them into innovators and non-innovators, we noticed that enterprises implementing eco-innovation considered the high level of bureaucracy to be the strongest barrier, just like small and medium-sized enterprises, while non-innovators were mostly hindered in their eco-innovation activities by the high cost of eco-innovation, just like micro enterprises. Although examining the barriers to eco-innovation using a Likert scale suggests some differences in perceptions depending on the size of the enterprises and their previous involvement in eco-innovation, the results of statistical testing for dependence using the Spearman correlation test showed that the perception of barriers is independent at the 0.05 level of significance of neither the size of the enterprises nor their previous experience with eco-innovation. Thus, we reject hypotheses H1 and H2.

Tab. 3: The mean values of importance of the barriers to eco-innovations II

Barrier	Share of foreign capital in company				Overall rank
	0%	1% - 25%	26% - 50%	over 50%	
The high cost of eco-innovations	4.24	3.98	4.13	4.18	1.
The high level of bureaucracy (when drawing financial support, dealing with various permits, etc.)	4.22	4.00	4.00	4.09	1.
Lack of internal financial sources	4.08	4.02	3.50	4.18	2.
Difficult access to external sources of funding for eco-innovations	4.00	3.93	3.88	3.91	3.
Uncertain returns on investments in eco-innovations or a too long payback period	3.83	3.82	3.75	3.73	4.
Lack of support services (from state institutions) for the introduction of eco-innovations in a business	3.83	3.87	4.00	4.00	4.
Lack of qualified staff to create or implement eco-innovations	3.56	3.44	3.38	3.09	5.
Limited access to external sources of information and knowledge on eco-innovations	3.61	3.64	3.50	3.36	5.
Uncertain customers` demand for eco-innovations in the current market	3.41	3.51	3.63	3.55	5.
Existing technical and technological constraints in the economy (e.g., outdated technical infrastructure)	3.49	3.53	3.63	3.45	5.
Insufficient state policy to support innovative activities of businesses	3.68	3.64	4.00	3.45	5.
Lack of awareness of the benefits of eco-innovations in a business	3.59	3.80	3.38	3.27	5.
Macroeconomic uncertainties (COVID-19, war in Ukraine, inflation, etc.)	3.70	3.60	3.13	4.00	5.
Existing legal restrictions in a country	3.28	3.22	3.00	2.64	6.
Lack of willingness of business´s management to innovate	3.10	3.42	2.88	2.00	7.
Lack of cooperation with research institutions and universities	2.91	3.11	3.00	2.91	8.
Lack of cooperation with other businesses	2.92	3.22	3.25	2.45	8.

Source: authors` own calculations

Comparing the perception of barriers by respondents based on the share of foreign capital in financing, we identified similar order of barriers` importance as by the size or previous eco-innovation experience variable. Dominant gap in perception of importance can be seen just by the barrier related to willingness of management of the company to eco-innovate. The lower was the share of foreign capital, the stronger was the barrier perception. However, similarly to the size of enterprises and their previous involvement in eco-innovation, the statistically significant relationship between the perception of barriers and the presence of foreign capital in the financing of enterprise was not confirmed. Thus, we also reject hypothesis H3.

Looking at the overall ranking of barriers in Slovak SMEs, which was compiled regardless of other characteristics, and was statistically confirmed (the last column in Tab. 3), we see that SMEs perceive the high level of bureaucracy as well as the high cost of eco-innovations as the major barriers to eco-innovations. On the other hand, the lack of cooperation with research institutions, universities and other enterprises, as well as the lack of their management willingness to innovate, did not prevent enterprises from implementing eco-innovations to such a large extent.

3. Discussion

As mentioned before, the results of our research confirm that the high level of bureaucracy and high costs of eco-innovation are among the dominant barriers for Slovak SMEs. High cost has traditionally been ranked among the most relevant barriers to eco-innovation (Hinojosa, 2022). It appears to be the most important barrier for Slovak non-innovating SMEs; in terms of size, this is the most important barrier to eco-innovation for micro enterprises, but small and medium enterprises also ranked it among the top three barriers. Some authors (Aloise and Macke, 2017) that examined barriers to eco-innovation in emerging countries have found that process bureaucracy, poor governance, inadequate support and incentives, and lack of coordinated action between companies, government agencies, and academia are among the biggest ones. This has also been partially confirmed in Slovak SMEs. The high level of bureaucracy is perceived frequently as the most significant barrier. The lack of support services does not appear among the top barriers but is still in the first third of the most intensely perceived barriers. Many scholars often rank difficulties related to qualitative and quantitative capital allocation as one of the main barriers (Arranz et al., 2019; García-Granero et al., 2020). It is evident that Slovak SMEs are also currently facing a lack of internal and external sources of finance and perceive difficult access to capital as the second most pressing problem after the high level of bureaucracy and the high cost of eco-innovations. On the contrary, although the lack of collaboration and networking with research institutions or businesses is often cited as a major barrier to eco-innovation (Carfora et al., 2022), the results of our research show that Slovak SMEs rank networking with research institutions and other businesses among the least pressing barriers. Interestingly, micro enterprises on average perceive barriers to eco-innovation activities less intensively than small and medium enterprises.

It can be assumed that pressure from foreign investors can significantly encourage investment in eco-innovation (Calvo et al., 2022; Díaz-García et. al., 2015). Peñasco et al. (2017) highlight the growing importance of international drivers influencing the eco-innovative attitude of businesses involving capital provided by foreign investors. They point out that with increasing internationalisation of eco-innovation come knowledge flows and productivity gains in addition to sources of finance, which is particularly important in countries with comparatively lower levels of investment in eco-innovation. Therefore, eco-innovation needs to be examined in these contexts as well. Although our results did not confirm a statistically significant dependence between the perception of barriers to eco-innovation in Slovak SMEs and the share of foreign capital in their financing, within our research sample it is possible to assess their significance according to the individual intervals of the share of foreign capital. The high cost of eco-innovations, which is generally the biggest barrier for all Slovak SMEs, is also the most significant constraint for enterprises in all intervals according to the share of foreign capital, except for enterprises with its share between 1% and 25%, where, however, it is still among the top three. In contrast to the statistically confirmed ranking of barriers in all Slovak SMEs, where the high cost of eco-innovation and the high level of bureaucracy dominated, after taking into account the presence of foreign capital, we can see that its growing share pushes the problem with inadequate bureaucracy gradually to the second or third place in the order of significance. With the growing share of foreign capital, the importance of limited access to knowledge and information on eco-innovations and the awareness of benefits of eco-innovations is falling.

The importance of barriers to eco-innovation from 'innovators' and 'non-innovators' point of view indicates that 'innovators' consider lack of financial sources, lack of cooperation with research institutions, bureaucracy and low state support as more dominant barriers than 'non-innovators'. On the other hand, the barriers like lack of information, uncertain demand, uncertain return on eco-innovations, and unknown benefits from eco-innovations are more important for 'non-innovators'. The high costs of eco-innovations and lack of qualified employees was equally evaluated by both groups of respondents. Considering the character of top barriers among 'innovators' and 'non-innovators', there is a large potential for state institutions and academia to stimulate the interest of customers (demand side) in eco-innovative products as well as to coordinate cooperation between enterprises (supply side) and academia (e.g., innovation vouchers, tax relief, etc.).

Although the results of our research so far have not confirmed any statistically significant dependence between the perception of barriers to eco-innovation of Slovak SMEs and their size, share of foreign capital in financing or previous involvement in eco-innovation, we think that even partial results indicating differences in the perception of barriers in individual groups of enterprises in the research sample may be interesting and useful for those who influence the creation of the business environment, as well as for further research, especially if these dependencies have already been confirmed in some other, especially developed, countries. In the statistically confirmed order of perceived importance of barriers, which can be generalized for all Slovak SMEs (as the sample proved to be representative) the most pressing problems of introducing eco-innovations in Slovak SMEs appear to be the high costs and the high degree of bureaucracy associated with their implementation. Barriers related to the lack of adequate sources of capital are next in the ranking. It will be necessary for the competent authorities to look more intensively for ways to alleviate these barriers. One of the ways is to step up and facilitate the use of financial resources from the EU funds. Lagging behind in this area, coupled with excessive bureaucracy, has long been a criticised problem in Slovakia. An important task of the new Slovak political establishment will therefore be to seek solutions in the area of support for eco-innovation activities of SMEs, which are an important accelerator and carrier of innovation potential, the support and development of which is essential for the competitiveness of the economy and its long-term sustainable development.

Conclusions

The results of our research revealed that Slovak SMEs consider the high cost and high level of bureaucracy to be the biggest constraints in implementing their eco-innovation activities. A specific feature of Slovak enterprises is that, in contrary to the results of several foreign studies, they do not consider the lack of cooperation with research institutions, universities and other enterprises, as well as the lack of willingness of their management to innovate, to be a significant barrier. The ranking of the individual barriers differs slightly if we look at a more detailed breakdown of enterprises by size, by their previous eco-innovation activities, and by the share of foreign capital. However, a statistically significant relationship between these characteristics and the intensity of perceived barriers to eco-innovation was not confirmed (all three hypotheses have been rejected).

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There are several limitations of our research, but the most important one is the current global situation. We believe that extraordinary health (Covid 19 pandemic), political (war conflict in Ukraine), and consequent economic situation (lack of raw materials and other supplies, high rate of inflation) literally influenced the results of our research in terms of more urgent need for eco-innovations as well as stronger importance of barriers related to costs of eco-innovations and accessibility of financial sources.

The added value of the paper lies in the identification of the main barriers that currently prevent SMEs from more intensive introduction and implementation of eco-innovations. These findings can be helpful for policy makers to look for appropriate tools that might be targeted to specific barriers to eco-innovations.

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Challenges and Opportunities in Knowledge Management in the Concept of Industry 5.0

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Abstract
We live in a fast-paced world with companies needing to adopt new technologies as fast as possible to stay competitive. Digital technologies are central to people's lives and could play a key role in enabling more sustainable business models and a regenerative vision for European industry. Organisations need to be able to adopt, embrace, optimise and integrate modern technologies into their organisational culture. This paper aims to present a literature review of advances in Knowledge Management (KM) in the concept of Industry 5.0 to enhance organisational practices and increase the efficiency of KM. Industry 5.0 has three core elements: human-centricity, sustainability and resilience, and artificial intelligence (AI) plays an important role in this framework, as it can analyse data, identify patterns and optimise production processes. The review is conducted via the systematic review method PRISMA 2020, which was used to screen 63 publications from Web of Science and Scopus databases from 2010 to 2023 to analyse chosen articles on digitisation, human resources and knowledge management under the concept of Industry 5.0. The systematic review provides a valuable overview of the challenges and potential advantages of interactions between AI and humans and the merits of implementing AI-powered methods for managing knowledge.

Key Words
digitization, knowledge, human resources, literature review, technology

JEL Classification: D83, M1

Introduction

The transformational impact of digital, data-driven and interconnected industries has far-reaching effects beyond the organisations' technological change. Such transformative development will have an influence on society not only in a way of changing roles but in a way where increased reliance on advanced technologies will require new skills and new ways of collaboration, specifically human-robot or human-AI collaboration (Breque et al., 2021). Through the Knowledge Management (KM) perspective as a human-centric process, this paper aims to explore how advanced technologies associated with the concept of Industry 5.0 can enhance organisational practices and increase the efficiency of knowledge management initiatives.

Industry 5.0 emphasises research and innovation as drivers for the transition to a sustainable, human-centric and resilient European industry and has its roots in the concept of Industry 4.0. It is a concept that combines the benefits brought by information technologies, including artificial intelligence (AI), the Internet of Things (IoT), automation, and robotics. The concept of Industry 5.0 focuses on creating an integrated industrial ecosystem where smart factories support efficient production processes with a clear utilisation of these modern resources. The academic literature on this topic is still in

its infancy (Broo et al., 2022); hence it is necessary to specify the following concepts closely related to implementing this concept in organisations worldwide. From a sustainable point of view, the concept of Industry 5.0 should develop circular processes, reduce waste and environmental impact, and advanced technologies should help the industry to optimise efficiency and minimise waste (Carayannis and Morawska-Jancelewicz, 2022).

1. Theoretical Background

1.1 Industry 5.0, Knowledge Management and Advanced Technologies

Industry 5.0 has three core elements: human-centricity, sustainability, and resilience. Human-centricity in this framework puts human needs and interests at the centre of the production process, meaning what the new technology can do for us as human workers, not the other way around. Technology, in this sense, should support and guide the worker. Industry 5.0 may support and empower workers rather than replace them by developing breakthrough technologies in a human-centric manner by which the resilience and sustainability of industries could be enhanced (Breque et al., 2021). AI plays a significant role in the concept of Industry 5.0 as through processes of machine learning, deep learning and industrial machines, AI can self-learn (Christian, 2020). As emphasised by numerous technology companies, the aim is not to replace humans but to empower them by enabling decision-making in designing technology that humans can control. Another significant factor in this concept is the Internet of Things (IoT). It allows for rapid interconnection and mutual linking of machines, sensor devices, and other equipment. This increases transparency and accuracy in production processes (Li et al., 2019), enabling faster and more efficient process management. IoT is a new paradigm transforming traditional lifestyles into high-tech ones (Frauke, 2017).

Digital technologies are becoming a central part of people's lives, both as citizens and as employees, and could play a key role in enabling more sustainable business models and providing a regenerative vision for European industry through an Industry 5.0 approach, by offering the opportunity to integrate resilience objectives into the business (Renda et al., 2022). In the concept of Industry 5.0, the role of the industry worker changes considerably and is considered rather as an „investment“ than a „cost“ for the organisation (Breque et al., 2021). This means that human capital due to this narrative, is more appreciated and that organisations should be interested in developing their employees` skills to obtain a competitive advantage. Organisations, especially Human Resource Management (HRM) leaders, need to address several challenges concerning the interaction and collaboration between humans and robots. These challenges may be as follows: workers' fear of working with AI, fear of losing a job thanks to the adaptation of new technologies, trust building and more. Organisations may support their employees by offering training opportunities, a supportive environment and clear communication addressing possible uncertainties related to such technological changes in the workplace (Arslan et al., 2021). Advanced technologies should support human workers in their day-to-day work by, for example, minimising repetitive tasks by automating them and providing workers with a more inclusive and safer workplace by reducing possible accidents. Additionally, AI-based technology could guide workers through more specialised tasks (Breque et al., 2021). Therefore, organisations must be able to embrace this cultural change and ensure that people and machines collaborate efficiently and, most importantly, safely.

Du Plessis (2007) defines knowledge management (KM) as a careful approach to optimising a company's knowledge economy that includes several elements such as human resource management, technology, culture and organisational structure. Marr et al. (2003) define KM as a collective term for an organisation's set of processes and practices to increase its value by improving the efficiency with which it generates and uses its intellectual capital. Knowledge management facilitates the understanding of knowledge, while AI provides the ability to expand, use, create and unlock knowledge in ways that are beyond imagination (Goncharova & Murach, 2020, Pai et al., 2022). AI has the potential for revolutionary transformation, changing both the function of management and the necessary organisational processes (Jarrahi, 2018; Kshetri, 2020; Jatobá et al., 2023). Organisations are nowadays investing in AI-enabled innovations that can store, share and create new knowledge in various cloud databases and other platforms. Knowledge will not stay in the organisation unless it is transformed into organisation-wide knowledge so that others can access it, and for that purpose, knowledge-sharing activities are used within organisations. Knowledge sharing is transferring knowledge between individuals, groups or organisations using various means of communication (Alavi & Leidner, 2001). While there are different viewpoints on how to design interactions between employees and organisational systems, there is also a need to understand further the AI-knowledge-sharing intersectional perspective. Insights from such an understanding are critical for envisioning employee interactions with AI-enabled organisational processes and for improving learning curves from activities driven by knowledge-sharing exchange (Olan et al., 2022). AI has the potential to facilitate and develop environments for implementing a knowledge-sharing system that encourages employees to interact and share with each other (Culer et al., 2019; Olan et al., 2022). Knowledge sharing in the context of adopting new technologies will play a critical role in influencing human workers' attitudes, intentions and perspectives, which has been acknowledged in the existing research (Wamba et al., 2020, Chowdhury et al., 2022).

Industry 5.0 emphasises the importance of the skills and expertise of humans when working in tandem with robots. Knowledge management ensures that valuable expertise and experience are documented and available to humans and robots, allowing tacit knowledge to be captured and shared. This facilitates better collaboration and improves performance. Due to the advanced and complex nature of robots, knowledge-sharing within organisations and training of employees are critical. Knowledge management can facilitate explicit knowledge sharing, training programmes and contextual knowledge integration. Collaborative platforms and communication are essential to enable humans and robots to interact and share information. Knowledge management can iteratively improve human and robot capabilities by leveraging insights from collaborative interactions.

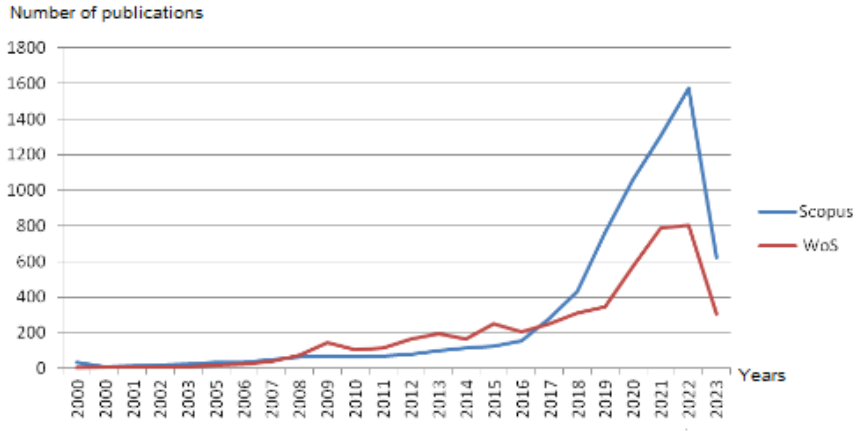
2. Methodology

Understanding the literature on the researched topic is one of the key steps in conducting research activities. According to et Page al. (2021), systematic reviews serve many critical roles. They can provide in-depth syntheses of the state of knowledge in a given field in an easier and more accessible form. There are various ways to perform a proper systematic analysis of the field under investigation. For the purposes of this article and literature review, the PRISMA method, which stands for Preferred Reporting Items for Systematic Reviews and Meta-Analyses, was selected. Academic journals frequently endorse this

method, and its development and methodology is well known throughout the science community (Shorabi et al., 2021). The original method was published in 2009 and was designed to assist in systematically reviewing and transparently reporting how and why the literature review was conducted. The latest iteration of this guideline is the 2020 version. PRISMA consists of a 27-item checklist that focuses on the introduction, methods, results, and discussion of systematic reporting. The method itself is composed of a flow diagram that identifies the following stages: 1) Identification: defining the sources and criteria used for the research, 2) Screening: specifying the sample under investigation and narrowing it down based on the defined criteria, 3) Eligibility: testing the eligibility of the samples through a deeper analysis and 4) Included: listing the articles that will be assessed and included in the literature review.

The authors utilized a systematic literature review method, using source analysis to select a sample from 2010-2023. The study focused on the growing trend of digitization and knowledge interconnectedness in the field. The work of Pan and Froese (2023) served as the basis for selecting the keywords. Key terms were identified, and the analysis was conducted using keywords such as "digitization," "digitization," "knowledge," and "human resources." The study period was limited to 2010-2023, and areas of Social Sciences, Business, Management and Accounting, Economics, Econometrics and Finance research areas. Fig. 1 shows the trend of publication count from two databases, whereas a significant increase in papers could be seen mainly within the past few years from 2018 to 2023. The analysis was conducted using Web of Science and Scopus databases, and 8,996 records were obtained. The screening was performed using the PRISMA 2020 methodology, narrowing it down to conferences, scholarly publications, and articles. As of 272, publications that did not match the desired source type were excluded. Furthermore, 328 articles that were not in the English language were removed. The last step involved eliminating duplicate records, resulting in the exclusion of 38 articles.

Fig. 1: Count of publications on the given topic



Source: Own processing based on the data from Wos and Scopus (2023)

In the eligibility phase, publications unrelated to the studied groups were removed. For example, in the WoS database, fields such as agriculture, mathematics, neuroscience etc. were excluded. In the second database (Scopus), areas such as art, humanities, nursing, chemistry, psychology, etc., were eliminated. This selection led to the exclusion of 5148 publications. In the following two steps, citation relevance was assessed, and publications with 35 or more citations were selected. A total of 3026 publications were selected. Based

on abstracts, an additional 121 documents were subsequently excluded. Furthermore, 63 publications were included in the next phase.

3. Results and Discussion

A content analysis was conducted on these 63 publications. Based on this analysis, a final selection of publications was made, which were subsequently used in the literature review section. In addition to publications obtained using the PRISMA 2020 method, other sources were included in the literature review, such as books cited in the theoretical area and other documents related to the topic. Fig. 2 shows the graphic visualization of PRISMA 2020 screening of the literature on the given topic. Although the literature reports various factors affecting AI-human interaction and collaboration, other authors argue that Human Resource Management (HRM) has benefits and opportunities in incorporating advanced tools within organisations. Few benefits of AI-HRM practices could be as follows: enhanced employee commitment, job engagement and employee satisfaction (Castellacci & Viñas-Bardolet, 2019, Budhwar et al., 2021), effective decision-making (Azadeh et al., 2018, Budhwar et al., 2021) and enhanced productivity (Wirtz, 2019, Budhwar et al., 2021). AI can collaborate with, learn from, and adapt to employee interactions. Thus, to successfully introduce and integrate AI into an organisation, it is critical to examine its social dimensions (Makarius et al., 2020). This requires having employees with knowledge and experience in AI, IoT, software engineering, and data analysis, all working towards a single clear goal, as stated by Leng et al. (2022, p. 283): “placing "human well-being" at the centre of production systems and achieving specified social objectives beyond mere employment growth. The aim is to ensure prosperity and sustainable development for all of humanity”.

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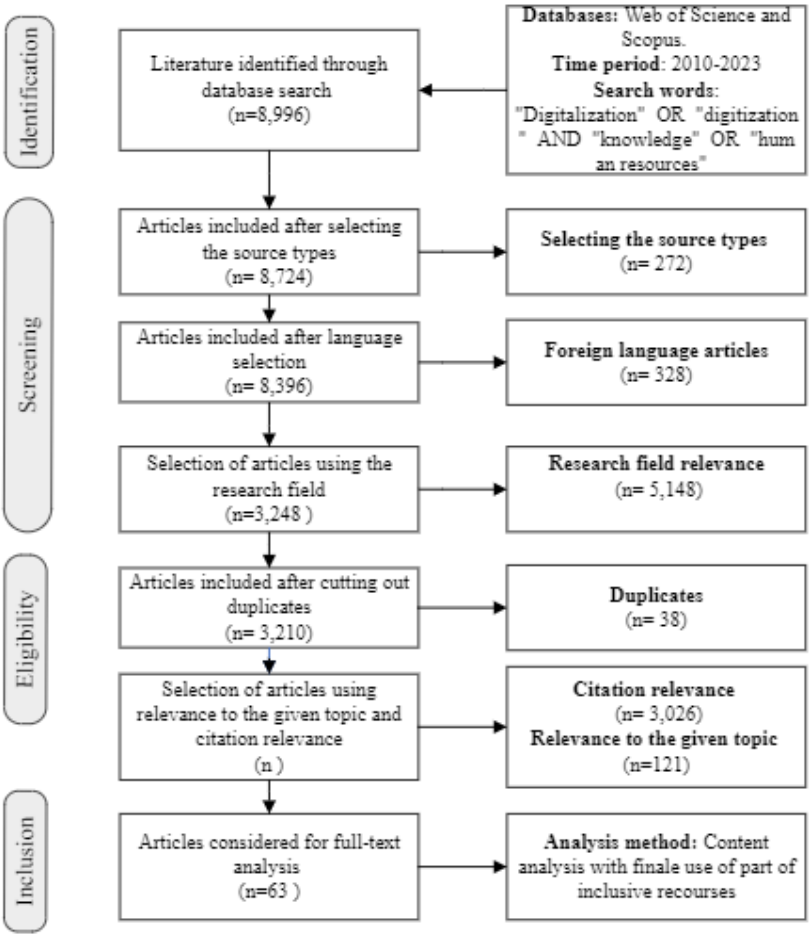
Fig. 2: Graphic visualization of PRISMA 2020 Screening



Source: Own processing, 2023

Nevertheless, human workers need more knowledge of the influence of AI technologies on their professions, which results from a lack of trust, limited expertise and AI abilities and understanding of the potential benefits of their work. According to (Chowdhury et al., 2023) to address this challenge, research studies and empirical evidence should examine the role of knowledge sharing and exchange within organisations to facilitate effective collaboration between AI systems and human workers and in the end, its potential impact on overall business performance.

Conclusion and Limitations

Digital technologies are becoming an integral part of people's lives, both as citizens and as workers and could play a significant role in enabling more sustainable business models and providing an Industry 5.0 vision. The PRISMA 2020 method was used to screen 63 publications to analyse chosen articles on the topic of digitization, human resources and knowledge management under the concept of Industry 5.0. The article covers the challenges and opportunities of AI-Human interaction and collaboration and the benefits of AI-driven knowledge management practices. To successfully integrate AI into an organisation, examining its social dimensions and having employees with knowledge and experience in AI, IoT, software engineering, and data analysis is important. Nevertheless,

companies in the 5.0 era should aim to place human beings at the core of innovation processes to improve quality of life, social responsibility, and overall sustainability. New technologies should work as a supportive tool and guide the worker in order to make the work of the human more efficient.

The paper covers a topical issue; however, due to the chosen method, it has some limitations. The current systematic review was constrained by the databases employed, the chosen search terms, and the established criteria for including or excluding studies. Considering the limitations of the paper, this opens an opportunity for future research, which could pay attention to broader scientific databases and explore scientific articles deeply. Future studies can address the benefits of AI-driven knowledge management practices from a primary data perspective.

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Impact of Monetary Policy Sustainability Indicators on Economic Growth in Transition to Inflation Targeting

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Abstract
Foreign experience in the transition to inflation targeting has been studied empirically. The foreign experience shows that countries with inflation targeting regimes have not abandoned and have not returned to other alternative monetary regimes. This indicates that the inflation targeting regime has been successfully tested in practice. It should be noted that inflation targeting has led to new approaches to monetary policy targets. As a result, international economists and experts have started to research inflation targeting as a new path in the scientific arena. The aim of the study is the study is to investigate the influence of indicators of monetary policy stability of Uzbekistan on economic growth using various economic-mathematical models. In the paper was investigated the impact of Uzbekistan's monetary policy stability indicators on economic growth by using four criteria from the 4×2 matrix model in 2011–2020. Based on obtained results, the Phillips-Perron and extended Dickey-Fuller tests determine whether variables are stationary. The long-term correlation between the variables is checked using the Johansen cointegration test. The results show that increases in bank capital adequacy, loan portfolio, money supply, and lower inflation help maintain macroeconomic stability. However, the rising volume of bank deposits and foreign currency appreciation against Uzbek sum hurts economic growth. In addition, liquidity ratio, state gold and foreign exchange reserves are insignificant and do not affect economic growth.

Key Words
monetary policy, sustainability indicators, economic growth, inflation targeting

JEL Classification: E31, E52, F43

Introduction

While President Richard Nixon eliminated the US dollar exchange to gold in 1971, New Zealand's economy experienced volatile inflationary processes until 1989. As a result, the New Zealand Parliament and Reserve Bank put on the task of abandoning the Bretton Woods monetary system, transitioning to an inflation targeting regime, and adjusting the operational and strategic goals of monetary policy. After such a sudden decision to change monetary policy by the New Zealand government, many developing countries such as Brazil, Chile, the Czech Republic, Hungary, Israel, Korea, Mexico, Poland, the Philippines, South Africa, and Thailand also took steps to adapt to inflation targeting regime in the 1990s. (IMF, 2020).

The foreign experience shows that countries with inflation targeting regimes have not abandoned and have not returned to other alternative monetary regimes. This indicates that the inflation targeting regime has been successfully tested in practice.

The Central Bank of Uzbekistan introduced inflation targeting in 2017, targeting 5% in 2024. Today, the Central Bank of Uzbekistan, based on the strategic goals of monetary policy in the medium term, has implemented systematic measures such as conducting inflation expectations of individuals and businesses, the introduction of new monetary policy instruments such as overnight loans and deposit auctor to reach the target which keep the inflation rate at 5% until 2024. Operational mechanisms of the bank also have been developed. The bank is using new instruments to absorb and provide liquidity.

It should be noted that inflation targeting has led to new approaches to monetary policy targets. As a result, international economists and experts have started to research inflation targeting as a new path in the scientific arena.

Researchers studied the efficiency of the inflation targeting regime, creating a favourable macroeconomic environment for the regime, and selecting appropriate targets for Central banks over the past few years. However, it has turned out that those approaches are not perfect for stabilizing monetary policy. Thus, because of disparities in different views, research on inflation targeting is still relevant today.

This article studies the employment of monetary policy instruments and the establishment of favourable macroeconomic conditions in the transition to inflation targeting based on the numerous viewpoints mentioned above.

1. Methods of Research

Literature Review

To understand the relationship between inflation targeting and macroeconomic processes (indicators), we must look at several studies by some of the world's top scholars. Although there is no clear definition of whether this policy belongs to fiscal or monetary policy, the processes connected with inflation and its limitation are interpreted within the monetary policy framework because the primary goal of most central banks is to ensure low and stable price levels.

In particular, Junankar & Wong (2020) emphasizes the need for an independent and fully functioning Central Bank to influence consumption and investment spending. He mentions that inflation may also increase, often due to non-monetary and external factors, including weather and oil prices. Moreover, it became apparent over the investigation period that inflation rates were falling in nations that target inflation (21%) and countries that did not target inflation at all (10%). Both countries that apply the regime (5%) and those that do not have good economic development (18%). However, inflation and economic growth volatility have diminished in all groups of countries.

According to a study by Marcelo Arbex, Sidney Caetano & Wilson Correa (2019) on the macroeconomic effects of inflation targeting, random shocks that lead to stochastic changes in inflation targeting affect the monetary government and its macroeconomic targeting fluctuations. It also shows that as the volatility of the inflation target increases, unemployment increases, and inflation decreases regardless of the interest rate rule.

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Using a dynamic model based on panel data, Kartaev et al (2016) investigated the influence of the inflation targeting regime on GDP dynamics in the short and long term. This influence was also evaluated using data from 141 countries from 1980 to 2012. The study concludes that the transition to inflation targeting in developed countries will not lead to a decline in production. It, on the other hand, has a favourable impact. This is because high public confidence in the monetary government in industrialized countries avoids high inflation expectations. On the other hand, this regime does not result in increased production in developing countries.

The study of Ayres et al. (2014) focused on the regional characteristics of inflation targeting policy, examining the impact of a particular time choice on policy decisions and its impact on the six developing regions of the world. Although the direct impact of inflation targeting policy on real GDP is limited, statistically only in certain regions, including Europe, Latin America, North Africa and the Middle East, the impact on real GDP is positive, while in Asia, Africa-Sahara countries, the inflation rate rose, and there was no economic growth. In general, this regime's impact is short-lived and aimed at reducing inflation, not stimulating economic growth.

According to B. Bernanke et al. (2004), an essential aspect of inflation targeting is stable inflation expectations of business entities concerning future changes in price levels. Bernanke's approach is vital at a macroeconomic scale because stable and clear expectations are essential for Central Banks to determine monetary indicators and predict price changes, fluctuations of exchange rates and unemployment in future.

Kurihara (2013) and Walsh (2009) studied the correlation between inflation–targeting regimes and economic growth. They found that inflation targeting policy does not directly lead to GDP growth. Studying the macroeconomic implications of inflation targeting and its impact on price dynamics makes it even more essential.

S. Moiseev (2000) proposed "overnight" interest rates, medium-term interest rates, and monetary indicators as operational monetary policy objectives for central banks adapting to inflation targeting, as well as the central bank's interest rate corridor system, specifically methods of managing interest rate corridor, and its benefits and drawbacks.

Moiseev also notes that because of its ineffectiveness, commercial banks can avoid this instrument with the help of financial innovations in developed markets. According to Moiseev, most European countries have abandoned reserve requirements for financial institutions as they adapt to an inflation targeting regime. Due to its ineffectiveness, commercial banks can avoid this instrument through financial innovations in most developed countries.

It's worth noting that the research above came to different conclusions about the positive, negative, and neutral macroeconomic effects of inflation targeting. There has been little research on the influence of inflation targeting on economic growth. While most research has concluded that inflation targeting is effective, some have come to the opposite conclusion. In addition, inflation targeting is ineffective in some studies. The paper then examines the economic aspects of the switch to inflation targeting.

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Empiric Analysis of Foreign Countries

The global economy is in a state of flux. The complex situations of the world economy have had a significant impact on the financial systems of stable economies, rather than developing countries with low incomes, over the last decade. The general economic and social situation in the United States has deteriorated because of the economic crisis, financial crisis, and breakdown of market regulation, and it has taken the form of a large-scale worldwide crisis in a short period.

The chaotic and inefficient operation of the financial sector, large-scale capital losses, and the reversal of capital flows geographically have resulted in fiscal disruptions in developed countries due to the crisis of large financial institutions that are critical to the stability of the economic system. As a result, international financial institutions and the G7 and G20 countries have started to utilize monetary policy instruments more actively to address economic instability. The primary objectives were maintaining price stability, regulating the money supply, and avoiding the budget deficit.

Some countries have used gold and foreign exchange reserves to maintain currency stability in these circumstances. In contrast, others have attempted to control inflation by raising key policy rates to avoid an excess of the money supply. At that time, these measures showed that monetary policy was one of the most effective tools in the crisis period, and its scope would be more comprehensive and even more successful if the economy were under stable conditions. However, against the backdrop of the economic crisis, currency depreciation and the rise in the consumer price index necessitated managing the inflation of the national currency. As a result, the European Central Bank was one of the first to utilize the inflation targeting strategy to control euro inflation.

The effort to limit inflation eventually paid off, as the Eurozone faced deflation for the first time in 30 years in 2011. This, in turn, proved the possibility of implementing inflation targeting not only in monetary policy but also in ensuring macroeconomic stability.

It became apparent that monetary policy, which aims to control inflation, has a unique role in regulating the economy and achieving economic development targets.

As a result, monetary policy and the country's role in the global economy have been pushed to the background, and some theories that place a premium on the financial market have faded away, replaced by theories that see monetary policy as one of the most critical components of government economic policy. Econometric models for factor analysis of monetary policy have been developed based on novel methodologies, and many scientific investigations have been done in this area.

B. Bernanke, a professor at Princeton University and F. Mishkin, an expert at the National Bureau of Economic Research, investigated the prospect of the broader inflation targeting regime (1997) based on the experience of industrialized countries. The study proves that inflation targeting was not a simple theoretical concept then. It was not only a support for monetary policy to monitor the consumer price index but also a tool to stabilize the national economy and establish a program for its implementation. The inflation targeting regime was only considered a theoretical strategy based on the consumer price index at that time. It was only partially implemented in 1990 in New Zealand, 1991 in Israel and Canada, 1992 in the United Kingdom, 1993 in Australia, and 1994 in Sweden.

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T. Petursson (2005), a professor at Reykjavik University, examines the outcomes of inflation targeting implementation with the example of 21 prosperous countries. According to his research, the average inflation rate in countries implementing a targeting mechanism was 31.4% five years before, 7.2 % one year before, and 4.5% one year after implementation.

G. Debelle (1997), an expert at the International Monetary Fund, examines the outcomes of inflation targeting, the issues that have arisen and the methods used to overcome them. He developed some systemic interrelationships by examining the impact of national economic policies on lowering inflation. Inflation can be kept lower through reduced excise taxes in Canada, a higher key policy rate in New Zealand, and stiffer mortgage lending rules in Australia. Based on his findings, the economist proposes the introduction of "soft" and "hard" marginal inflation corridors.

A. Vredin (2015), an expert at the International Bank for Reconstruction and Development, studies the importance of inflation targeting in ensuring the financial sector's stability. He develops a Taylor rule-based model to examine the influence of inflation targeting on financial stability. His research reveals that financial market imbalances hinder the efficiency of inflation targeting, while social sector support, particularly social protection measures, helps to lower inflation.

T. Ito (2010), a professor at the University of Tokyo in Japan, argues that inflation targeting should consider market conditions before setting target limits, remarkably the price of assets in the capital market. He harshly criticized the flexible inflation targeting strategy, claiming it failed to work during the 1997 Asian crisis, the 2001 dot-com bubble, and the 2007-2009 global financial crisis. Instead of such an inefficient strategy, he advocates essential inflation management and offers the implementation of a tight regulation system of banks and financial markets.

4×2 Matrix Model for Uzbekistan

As previously mentioned, the global financial and economic crisis has left a long-term and highly complex mark on the global financial system. As the worldwide financial system began to exert new influences on global economic stability through new channels, the world's leading economists and experts set out to develop an integrated model that reflect the influence of wholly new variables by using a novel technique. Due to two years of research, a committee of specialists formed at the World Bank's initiative has developed a new 4×2 matrix model. This model examines the general state of the financial system (investment and capital flows) as a healthy banking system (monetary policy) using four criteria: two systems that were unable to sustain the severe blows of the global financial and economic crisis. This model, which has a simple empirical structure, uses a chain technique to represent the overall condition in the banking and financial markets based on various criteria.

Because central banks conduct monetary policy and banks operate on a monetary system, the banking system (monetary policy) section of the 4×2 matrix model is selected in this article, and the practice of Uzbekistan from 2011 to 2020 is assessed using four criteria (Tab. 1).

Tab. 1: Stability Matrix of monetary policy in Uzbekistan in 2011-2020

Criteria	*Significance (scope)*			*Money-currency*			*Stability*		*Regulation*	
Indicators	The ratio of the banking system's loan portfolio to GDP	The ratio of assets of financial institutions to GDP	The ratio of deposits of financial institutions to GDP	The ratio of the money supply to GDP	The ratio of gold and foreign exchange reserves to external debt	Exchange rate fluctuations (annual change against the US dollar)	Capital adequacy ratio	Liquidity ratio	Key policy rate	Reserve requirement rate
2011	0.202	0.353	0.231	0.165	2.657	-0.095	0.242	0.651	0.12	0.15
2012	0.211	0.370	0.211	0.173	2.412	-0.105	0.243	0.650	0.12	0.15
2013	0.223	0.369	0.219	0.188	2.344	-0.110	0.243	0.651	0.12	0.15
2014	0.240	0.388	0.197	0.196	2.128	-0.100	0.238	0.646	0.10	0.15
2015	0.249	0.381	0.208	0.185	1.943	-0.160	0.236	0.645	0.09	0.15
2016	0.217	0.347	0.153	0.193	1.740	-0.130	0.147	0.644	0.09	0.15
2017	0.365	0.551	0.197	0.207	1.674	-0.602	0.188	0.561	0.14	0.15
2018	0.329	0.527	0.172	0.234	1.672	-0.026	0.156	0.815	0.16	0.15
2019	0.415	0.535	0.178	0.197	1.544	-0.123	0.235	0.891	0.16	0.14
2020	0.447	0.631	0.198	0.178	1.347	-0.093	0.184	0.674	0.14	0.14
characteristics of influence										

positive variable neutral

Source: authors' calculations

Monetary policy instruments had a diverse impact during the study period. Reducing the refinancing rate boosted the money supply, but a shift in reserve requirements stifled inflation. Also, the ratio of the money supply to GDP was variable. The economic-mathematical model used in this article is based on econometric analytical methods, which were implemented in two stages. Initially, the regression equation was constructed using the least squares method of aggregating indicators from the 4×2 matrix method in the criteria for regulating the economy. To reduce standard error and normalize probability, more extended-period data were analyzed. The chosen model revealed that monetary policy instruments such as refinancing and required reserve requirements hurt economic regulation from 2011 to 2020 in the framework of inflation targeting. Multivariate regression analysis is the simplest and most fundamental way of econometric modelling, and it is on this foundation that more complex and reasonably high-precision analytical models have been developed today.

Based on macroeconomic principles, current monetary theories, top economists' conclusions, and the characteristics of the Uzbek economy and monetary system, the following model was developed based on the indicators analysed in the matrix (based on the Monetary Policy Sustainable Indicators). Measurement units of indicators were different in this example, so they were transformed into a natural logarithm.

$$LnGDP = \alpha_0 + \alpha_1 LnCAR_t + \alpha_2 LnLCR_t + \alpha_3 LnBLP_t + \alpha_4 LnBND_t + \alpha_5 LnMNM_t + \alpha_6 LnRSD_t + \alpha_7 LnEXC_t + \alpha_8 LnINF_t + \mu_t \quad (1)$$

GDP is economic growth (GDP) in period *t*, *CAR* is capital adequacy ratio in period *t*, *LCR* is liquidity ratio in period *t*, *BND* is the volume of deposits in period *t*, *BLP* is the volume of the loan portfolio in period *t*, *MNM* (M2) is broad money supply in period *t*, *RSD* – the ratio of gold and foreign exchange reserves and public debt in period *t*, *EXC* – exchange rate in period *t*, *INF* – inflation rate in period *t*, μ_t – standard error.

2. Results of the Research

The co-integration, a complex econometric method, was used to make the results obtained reliable and stable based on the data collected. A unit root test was performed to determine the interaction properties and stationary signs and to obtain *T*-statistics, *F*-statistics, and corresponding values of R^2. In conducting the unit root test, the Phillips-Perron and extended Dickey-Fuller tests examined the integration procedure, i.e., stationary, by determining the simple-level, first-, and second-order differences.

Tab. 2: Determination of stationery based on Phillips-Perron and extended Dickey-Fuller tests

Variables	Phillips-Perron test	Extended Dickey-Fuller test
LnGDP	-1.3127	-1.3568
LnCAR	-3.3411	-3.3127
LnLCR	-7.4852	-7.2415
LnBND	-6.9455	-7.0214
LnBLP	-0.4706	-0.4251
LnMNM	-5.1145	-4.9726
LnRSD	-3.2388	-3.4372
LnEXC	-5.1642	-4.8528
LnINF	-1.7284	-1.5769

Source: authors' calculations

The results in Tab. 2 show that there is no stationary in the unit root test at the normal level. The zero hypothesis was confirmed by the Phillips-Perron and extended Dickey-Fuller tests, which showed that values more significant than the critical values of 1%, 5%, and 10% suggested the presence of a unit root at a normal level. Since there is no normal stationery, the stationary variability of the variables in one difference is checked (Tab. 3).

As can be seen from Tab. 3, all variables are stationary in one difference and in I (1) order, satisfying the stationary conditions. The co-integration method is typically used to analyze non-stationary long-term equilibrium relationships. In other words, a co-integration relationship exists if the non-stationary variables change in a mutually consistent manner and are in equilibrium over time. Therefore, their linear combination can be stationary even if the time intervals are not stationary. Such a combination is called a co-integration equation and has a co-integration vector. As a result, the Johansen co-integration test was used to examine the long-term connection between the variables in our model (Tab. 4).

Tab. 3: Determination of stationary in one difference based on Phillips-Perron and extended Dickey-Fuller tests

Variables	Phillips-Perron test	Extended Dickey-Fuller test
LnGDP	-2.8499	-2.8499
LnCAR	-1.3389	-1.3389
LnLCR	-3.5462	-3.5462
LnBND	-5.1196	-5.1196
LnBLP	-0.7633	-0.7633
LnMNM	-4.1224	-4.1224
LnRSD	-3.8137	-3.8137
LnEXC	-2.1468	-2.1468
LnINF	-1.2577	-1.2577

Source: authors' calculations

Tab. 4: Johansen co-integration test results

The number of assumed cointegration equations	Unique number	Z statistics	Critic value	Probability (0.05)**
No*	0.56964	47.15223	39.11475	0.0001
1	0.44637	29.38628	32.58297	0.0912
2	0.26275	14.40413	18.17935	0.1485

** A zero hypothesis in the confidence interval with a coefficient of 0.05 is not valid.*
*** MacKinnon-Hugh-Michelis p-value*

Source: authors' calculations

Tab. 4 shows that the variables had a long-term relationship according to the Johansen co-integration test. The eigenvalue statistics, on the other hand, revealed that the zero hypothesis was not valid, and there was co-integration in the 5% confidence interval.

According to Engle Granger's theory, if the dependent variable (economic stability) and independent variables (reserve ratio, refinancing rate, and ratio of sterilization volume to GDP) are co-integrated, there must be an error correction mechanism. According to the Engle-Granger specification, the error correction mechanism of a co-integration relationship is as follows:

$$\Delta y_t = \emptyset_{10} + \sum_{j=0}^{s} \emptyset_{11j} \Delta p_{t-j} + \sum_{i=0}^{q} \emptyset_{12i} \Delta y_{t-i} + p_1 \mu_{t-1} + e_{1t} \quad (2)$$

$$\Delta p_t = \emptyset_{20} + \sum_{j=0}^{s} \emptyset_{21j} \Delta y_{t-j} + \sum_{i=0}^{q} \emptyset_{22i} \Delta p_{t-i} + p_2 \eta_{t-1} + e_{2t} \quad (3)$$

Here, Δ is the primary difference operator; μ_{t-1}; η_{t-1} is the error corrector had; e_{1t}, e_{2t}– is the residual.

Based on the above formula, the error correction model for our model (results see in Tab. 5.) is as follows:

$$\Delta LnGDP = \alpha_0 + \alpha_1 \Delta LnCAR_t + \alpha_2 \Delta LnLCR_t + \alpha_3 \Delta LnBLP_t + \alpha_4 \Delta LnBND_t + \\ + \alpha_5 \Delta LnMNM_t + \alpha_6 \Delta LnRSD_t + \alpha_7 \Delta LnEXC_t + \alpha_8 \Delta LnINF_t + \mu_{t-1} \quad (4)$$

Tab. 5: Error Correction Model (Dependent variable: GDP)

Variable	Coefficient	Standard error	t-statistics	Probability
C	0.2890	0.2457	1.9729	0.9527
$\Delta LnCAR$	0.047	0.7124	0.0198	0.0371
$\Delta LnLCR$	0.002	0.0533	0.0099	0.3628
$\Delta LnBLP$	0.014	0.3741	0.0722	0.0426
$\Delta LnBND$	-0.033	0.0047	-0.0013	0.1253
$\Delta LnMNM$	0.064	0.8364	0.0334	0.0488
$\Delta LnRSD$	0.182	0.9807	1.0829	0.4255
$\Delta LnEXC$	-0.083	0.0021	-0.0072	0.0324
$\Delta LnINF$	0.054	0.8179	0.9593	0.0038
μ_{t-1}	0.4618	0.2321	2.6816	0.0149
R^2	0.6132	Everage dependent variable value		0.1085
F-Statistics	4.9822	Durbin-Watson statistics		1.8771
Probability (F-statistics)	0.074			

Source: authors' calculations

The Durbin-Watson statistic (1.8771) revealed no autocorrelation. However, the F-statistic (4.9822) revealed that the Fisher variance was significant for GDP, as shown in Tab. 5.

3. Discussion

As mentioned, the economic-mathematical model used in this article was based on econometric analytical methods implemented in two stages. First, the regression equation was constructed using the least squares method of aggregation of indicators from the 4×2 matrix method in the criteria for regulating the economy. More data from an extended period were analyzed to reduce the standard error and normalize the probability. The basic model of the multivariate regression analysis (results see in Tab. 1) revealed that monetary policy instruments such as refinancing and mandatory minimum reserves damaged economic regulation from 2011 to 2020 within the inflation targeting framework. Regarding the development of monetary theories and the monetary system, a more complex but more accurate model was developed based on the indicators analyzed in the 4x2 matrix, the results of which make it clear (see results in Tab. 2.-5.) that in connection with the transition to targeting inflation in Uzbekistan monetary policy directly affected the regulation of the economy. It has been shown that there is a relationship between monetary policy instruments and long-run economic growth and that a change in these instruments impacts a country's GDP. Furthermore, it was established that improving the capital adequacy of banks, the loan portfolio, the money supply, and the decrease in inflation contribute to maintaining macroeconomic stability. Thanks to these more accurate models, it was further established that the negative impact on economic growth from the analyzed indicators was the growing volume of bank deposits and the devaluation of the Uzbek currency. However, the indicators of the liquidity ratio of banks, gold and foreign exchange reserves did not affect economic growth.

Conclusion

From the analysis presented in the Tab. 5., it can be concluded that in the context of the transition to inflation targeting in Uzbekistan, monetary policy directly impacts the regulation of the economy. There is a link between the monetary policy instruments in the model and long-run economic growth; the change of these instruments impacts the country's GDP. Improving bank capital adequacy, loan portfolio, money supply and inflation decline all help maintain macroeconomic stability. However, the increasing volume of bank deposits and depreciation of Uzbek currency hurts economic growth. In addition, the liquidity ratio of banks and gold and foreign exchange reserves are insignificant and do not affect economic growth.

For further research, we recommend that this analysis be carried out in the future to accumulate relevant data over as long a period as possible before the last possible decade of data was modelled here. It is necessary to advance research to develop more complex but more accurate economic-mathematical models. We recommend testing these models on additional data from other countries and comparing their results with classic basic multivariate regression analysis models.

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Relationship between Environmental, Social, and Governance Factors and Financial Performance in Central European Countries

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Abstract
Measuring financial business performance is a key assumption for the responsible management of a company. Traditionally, financial measures were mainly used, but in recent years the importance of non-financial measures has increased pronouncedly. Currently, companies are encouraged to reflect on their business's sustainability aspect. One way of measuring sustainability performance can be a company's ESG score. This article aims to analyse the relationship between a traditional financial performance measure (return on sales) and a modern measure (ESG score) in Central European countries. The research sample consists of two groups. The first contains 74 companies from the Visegrad Group countries (V4), and the second consists of 214 companies from Germany and Austria. The relationship between those two measures was studied using the Spearman rank order correlation coefficient. Subsequently, the amount of the ESG score was analysed in both of the groups. The research findings indicate no or weak relationship between the ROS and ESG score. However, based on the Levene's F-test, a statistically significant difference was also identified between the two country groups considering the amount of the ESG score.

Key Words
ESG factors, financial performance, return on sales, sustainability

JEL Classification: M14, G30, M21

Introduction

Business performance and its measurement have been the subject of interest for many studies and authors for a long time. Its definition in the professional literature varies. For example, Šulák and Vacík (2005) define business performance as "*the ability of a firm (a business entity) to evaluate best the investments made in its business activities*." This definition is focused on financial performance based on past financial results. However, the company's performance is not only determined by the financial performance measure. Other relevant criteria should also be included in the business performance evaluation. All business performance measures must be set thoroughly and with appropriate weights assigned to them so that the performance measurement system is balanced and interconnected. Therefore, the correct choice of the company's performance evaluation system is a difficult task for the company's management.

The origin of the search for the relationship between Environmental, Social and Governance (ESG) issues or its alternative to Corporate Social Responsibility (CSR) measure and firm performance can be traced back to the early 1970s. ESG performance reflects the sustainability component of the company´s CSR strategy. Since then, scholars

and investors have published hundreds to thousands of empirical studies and several review studies exploring this relationship. In 1970, Friedman (1970) published his "doctrine" about the concept of social responsibility in business and argued that companies' primary responsibility was to maximise profits for shareholders. The article presented his belief that business leaders should focus solely on their economic responsibilities and that any other considerations, such as social or environmental concerns, should be secondary to this objective. This paper is considered a key text in the history of corporate social responsibility and has been the subject of much debate and discussion in the field of business ethics.

Currently, the issue of corporate social responsibility is further focused on the problems of the sustainable functioning of companies. The companies are encouraged to include information about their sustainability in their reporting. Since 2025, it will be compulsory for many companies in the European Union to provide detailed sustainability reports as part of a digital management report based on the Corporate Sustainability Reporting Directive (CSRD). In 2013, an environmental, social and governance (ESG) score emerged as an essential pillar of CSR for developing sustainable strategies that affect the financial performance of multinational firms (Eccles and Serafeim, 2013). ESG score typically includes three components (Sustainalytics, 2021):

a) Environmental: This component assesses a company's environmental impact, including its carbon emissions, waste management practices, and natural resource use.
b) Social: This component evaluates a company's impact on its stakeholders, including its employees, customers, and local communities. It includes factors such as labour practices, human rights, diversity and inclusion, and community engagement.
c) Governance: This component evaluates a company's leadership and management practices, including its board structure, executive compensation, and transparency.

As for the Czech Republic, the Association of Social Responsibility introduced ESG Rating in 2022, and the first data will be provided in November 2023. ESG Rating was created to compare and educate companies in the Czech Republic and measured selected indicators within the individual pillars of ESG. It compares the extent to which domestic companies monitor and communicate their impact on the environment, society and company governance. (ASR, 2022)

The empirical studies examining the relationship between ESG and corporate financial performance use various financial performance indicators as dependent variables, or a mix of more of them: operational performance – return on assets, ROA (Buallay, 2019; Duque-Grisales and Aguilera-Caracuel, 2019), financial performance – return on equity, ROE (Moneva and Ortas, 2009), operating profit margin – return on sales, ROS (Aras et al., 2010), market performance measured by Tobin's Q (Elsayed and Paton, 2005), return on investment, ROI (Montabon et al., 2007), market performance measured by market value and earnings per share (Nisar et al., 2021), net profit margin, operating profit margin, etc.

As independent variables, empirical studies use, for example, the ESG scores retrieved from Thomson Reuters' Asset4 (Duque-Grisales and Aguilera-Caracuel, 2019; Cheng et al., 2014; Nisar et al., 2021), corporate environmental performance provided by Sustainable Investment Research International Company - SiRi Co. (Moneva and Ortas, 2009), Dow Jones sustainability index (López, 2007), total ESG score and a score for

each of the components of total ESG score from Sustainalytics which is the leading independent global provider of ESG and corporate governance research and ratings to investors (Yilmaz, 2021).

Empirical evidence strongly supports the importance of ESG investing for businesses, with approximately 90% of studies demonstrating a nonnegative ESG-CFP relationship; a significant majority of studies report positive results. (Friede et al., 2015). Based on contemporary research, a positive association between ESG and financial performance is widely assumed (Ameer and Othman, 2012; Kapoor & Sandhu, 2010; Eccles et al., 2014; Wang and Sarkis, 2017). Other empirical studies have found a negative relationship (Hussain et al., 2018; Lopez, 2007; Lee et al., 2009). Some authors have even found no link between sustainability and firms' financial performance (Garcia-Castro et al., 2010; Surroca, 2010).

This paper aims to analyse the relationship between a traditional financial performance measure (return on sales) and a modern measure (ESG score) in Central European countries, which can help inform business strategy and policy decisions. Firstly, it tries to determine a relationship between traditional financial performance and sustainability measure in companies residing in Central European countries. Research on this relationship has achieved limited advances in this region, probably due to insufficient data regarding the ESG of individual companies. Secondly, the analysis focuses on the ESG scores' values in both groups of countries. This paper addresses the research gap by focusing on the relationship between corporate financial performance and ESG dimensions expressed through the "ESC score" provided by the Sustainalytics database. Based on the conflicted findings, this study is based on the following hypotheses to investigate the issue further:

H1: No relationship exists between ESG score and operational performance (ROS) in companies from observed Central European countries.

H2: There is no difference in the level of the ESG scores of companies from the V4 group and the Germany+Austria group.

2. Methods of Research

The research sample is composed of two groups of companies. The first group contains 74 companies representing four Visegrad (V4) countries (9 from the Czech Republic, 5 from Hungary, 58 from Poland, and 2 from Slovakia). The second group consists of 32 companies from Austria and 182 German companies. These groups were selected as they incorporated the Czech Republic and neighbouring countries. The distinction between the two groups is based on historical development: the first group of countries consists of four former communist countries (V4 group), and the second group comprises companies operating in the market economies (Austria and Germany). The underlying consideration for selecting the sample of companies was the availability of ESG scores. The data were collected from the Sustainalytics database (2023). The sample only comprised companies with available financial (ROS) and ESG data. The companies with missing data were excluded from the sample.

Since the ROS data are not normally distributed and the ESG data contain outlying observations, the non-parametric test of Spearman's rank order correlation coefficient

was chosen to test the relationship between ROS and ESG, which uses the order of the values in the calculation. For analysing the amount of the ESG score, the two-sample t-test is used to compare the means in the two country groups. Before testing the relationship of means, the data were adjusted for outlying observations and tested for normality using Kolgomor-Smirnov and Shapiro-Wilk tests. Subsequently, before testing the consistency of the means in the two country groups, the equality of variances between the country groups was tested by Levene's F-test.

3. Research Results

Hypothesis H1 about no relationship between ESG score and operational performance (ROS) in companies from observed Central European countries was tested separately in both selected groups.

First, H1 was tested in a group of companies from Germany and Austria. Based on the results of the non-parametric test of Spearman's rank order correlation coefficient, we can state that there is a statistically significant correlation (p-value = 0,035) between the ROS and ESG score in this group of companies. Therefore, hypothesis H1 can be rejected for this group of countries. However, this is a weak inverse relationship (r_s = - 0,145). Detailed statistical testing information is provided in Table 1.

Tab. 1: Spearman's Rank Order Correlation Coefficient: Germany and Austria

		Value	Asymptotic Standard Error	Approximate T	Approximate Significance
Interval by Interval	Pearson´s R	-0.108	0.053	-1.578	0.116
Ordinal by ordinal	Spearman Correlation	-0.145	0.068	-2.126	0.035
N of Valid Cases		214			

Source: authors' calculations in IBM SPSS Statistics 28.0.

In contrast, in the second group, the V4 countries, no statistically significant correlation between the ROS and ESG score was found (p-value = 0,451). The hypothesis H1 cannot be rejected for this group of countries. Detailed statistical testing information is provided in Table 2.

Tab. 2: Spearman's Rank Order Correlation Coefficient: Visegrad countries

		Value	Asymptotic Standard Error	Approximate T	Approximate Significance
Interval by Interval	Pearson´s R	-0.065	0.114	-0.552	0.583
Ordinal by ordinal	Spearman Correlation	-0.089	0.125	-0.757	0.451
N of Valid Cases		74			

Source: authors' calculations in IBM SPSS Statistics 28.0.

Hypothesis H2 assumed no difference in the level of the ESG scores of companies from the V4 group and the Germany+Austria group. Therefore, the normal distribution of the data was tested. Since the p-values for both groups of countries are higher than α, the assumption of a normal distribution of ESG data was not rejected at the 5% significance level (Table 3).

Tab. 3: Normality Tests

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ESG_G+A	0.061	213	0.052	0.988	213	0.063
ESG_V	0.102	73	0.057	0.967	73	0.055

Source: authors' calculations in IBM SPSS Statistics 28.0.

Based on Levene's F-test results, the ESG values variances are statistically significantly different between the two groups of countries. The p-value is 0.019, and Levene's F-test is 5,612. Therefore, the two-sample t-test assuming not equal variances had to be used. As the t-test is 4,001 with a p-value lower than 0.001, we reject hypothesis H3 at the 5% significance level. The mean ESG score is higher by 4.71 points in favour of the group of companies from Visegrad countries. Detailed statistical information is presented in Table 4.

Tab. 4: Independent Samples Tests

	Levene´s Test for Equality of Varinaces		t-test for Equality of Means							
			t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
	F	Sig.			One-Sided p	Two-sided p			Lower	Upper
Equal variances not assumed	5.612	0.019	4.001	104.017	<0,001	<0,001	4.71289	1.17803	2.37681	7.04896

Source: authors' calculations in IBM SPSS Statistics 28.0.

Discussion and Conclusion

Based on the data obtained from the Sustainalytics database for companies residing in Central European Countries, a significant relationship between the traditional financial performance measure (ROS) and one selected measure of sustainability (ESG score) couldn't be statistically confirmed (hypothesis H1). Although the relationship can be considered statistically significant by German and Austrian companies, this extremely weak inverse relation is not very meaningful. No statistically significant correlation between the ROS and ESG score was found in Visegrad countries. Nevertheless, this result can shortly change when introducing sustainability measures becomes more common and subsequently compulsory for specific companies. When those measures become crucial for evaluating company performance, company managers will probably be more willing to reflect sustainability measures in their decisions.

Focusing on the ESG score itself, considering the difference between the average value of the ESG score, the ESG values variances were statistically significantly different between the two groups of countries (hypothesis H2). It can be seen that the Visegrad group achieved better results than the group consisting of German and Austrian companies. This result may be influenced by the limited number of companies residing in Visegrad countries for which the ESG score was available. Furthermore, if we focus on the structure of the amount of the ESG score achieved by companies in the two selected groups, the German and Austrian companies achieved lower scores than can be theoretically expected. On the other hand, the companies from Visegrad countries

obtained higher results than anticipated. The situation can change as more data will be available for the Visegrad countries (ASR, 2022).

Further research in this area should focus on the data from more companies, from more European countries, or use other metrics measuring a business's sustainability to finetune the study, eliminate potential shortcomings of such investigation and obtain more representative results.

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Perception and Identification of the General Public with Sustainable Finance Issues

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Abstract

The perception and identification of the general public regarding sustainable finance issues have become a crucial consideration in implementing sustainable financial policies. Sustainable finance addresses contemporary global financial challenges by harmonising economic, social, and environmental (ESG) interests. This paper reviews various perspectives on sustainable finance, focusing on its importance for the general public. The paper aims to examine the perceptions and identification of the general public regarding sustainable finance issues. The empirical investigation is based on the questionnaire survey and its statistical evaluation. The research results indicate that the significance of carbon footprint as a metric for gauging environmental sustainability is relatively moderate by the general public. The respondents indicated the following financial products as the most environmentally unfriendly: debit cards, electronic banking on PC, and investment funds. As financial products with the lowest emissions and environmental impact, the respondents stated: smart-banking apps in the mobile phone, current accounts, and banking identity. At the same time, the general public is not very familiar with specified concepts related to sustainable finance (open banking, impact investing), and the differences between generations are insignificant. The paper uses a questionnaire survey on the Google Forms platform. The questionnaire included multiple-choice questions, Likert scale items, and participant demographic data.

Key Words

corporate social responsibility, ESG factors, green finance, impact investing, open banking

JEL Classification: G29, Q56, Q01

Introduction

Traditional finance is centred on financial return and risk trade-off in the financial sector, while sustainable finance integrates environmental, social, and governance (ESG) considerations in financial decision-making processes. It includes several strategies and financial instruments, such as green bonds, screening, impact investing, socially responsible investing, etc. (Archer, 2019). Other terms used instead of sustainable finance are sustainable financing, environmental finance or green financing. Migliorelli (2021) suggests that sustainable finance should now be more appropriately recognised as "finance for sustainability," serving as a synonymous term. It should be acknowledged as an independent and essential element in pursuing a sustainable society, aligning specifically with the Sustainable Development Goals (SDGs) and the Paris Agreement.

According to Kirschenmann (2022), sustainable finance promotes better economic growth and development by channelling private investments towards projects supporting the transition to a climate-neutral economy. The field of sustainable finance has seen a significant increase in research publications over the years (Luo et al., 2022). Still, is a sustainable topic also an issue for the general public? Public perception and

support are crucial for successfully implementing sustainable finance initiatives. Various studies highlight the importance of public engagement in sustainable finance, such as public perceptions of innovative financing for infrastructure and analysis of sustainable finance disclosure at commercial banks. The limited literature on sustainable finance from the Czech Republic highlights a research gap in this particular area, indicating a scarcity of research and scholarly publications.

This article aims to examine the perceptions and identification of the general public regarding sustainable finance issues. It seeks understanding how the general public views and engages with sustainable finance practices and initiatives. Historically, the primary motive of all company's activities used to be financial, where the ESG information was only for better valuation and investment decisions. Under the sustainability motive, we may recognise primary and secondary motives. The primary reason for using ESG information became to generate an effect/impact through sustainable and responsible investing practices, e. g. health improvement, sustainable land use, poverty reduction and social preference. To earn at least market conform returns with sustainable and responsible investing solutions where risk and return are balanced became the secondary motive.

1. Methods of Research

This paper uses a questionnaire survey to provide insights into how individuals understand and engage with sustainable finance practices. The questionnaire was designed based on relevant literature and research objectives to assess awareness, knowledge, attitudes, and behaviours related to various sustainable finance terms and issues. For the development of the questionnaire, the Google Forms platform was used. The questionnaire included multiple-choice questions, Likert scale items, and participant demographic data. Some terms referred to sustainable finance were continuously explained for the possibility of continuing with the questionnaire.

Using an online questionnaire via Google Forms offers several advantages, such as increased accessibility, participant anonymity, and efficient data collection and analysis. However, considering potential limitations, including sample representativeness or response bias, is crucial. For the questionnaire distribution, various methods were used to reach the general public. These methods included sharing the survey link with diverse communities by email invitations and social networks. Participants were provided clear instructions and informed consent before the survey. The survey was anonymous. A questionnaire contained two basic types of questions, depending on the research objectives and the information needed: multiple-choice questions and Likert scale questions. Answers were obtained from 138 respondents, and all questionnaires were properly filled in.

The data collected through the survey were analysed using statistical methods, such as descriptive statistics. The general public was divided into social generations according to sociological criteria. Social generations are typically categorised based on a combination of significant social events and changes in social conditions that create a distinct generational social climate (Voľanská et al., 2019).

Sustainable development refers to social development that meets the present generation's needs without compromising the ability to meet future generations' needs

(Das & Chatterjee, 2017), so it is essential to focus on the perception of sustainable finance from this perspective. Chaney et al. (2017), just like other sources, divide generations into Generation Alpha (born after 2012), Generation Z (born between 1997 – 2012), Generation Y (1981 – 1996), Generation X (1965 – 1980) and Baby Boomers and Silent Generation (born before 1965). This approach is used in this article.

Through the questionnaire survey, the study aims to provide valuable insights into the general public's level of understanding, support, and involvement in sustainable finance. This can inform policymakers, financial institutions, and other stakeholders in promoting sustainable finance practices and initiatives.

Based on the literature and empirical studies, the following research questions were formulated for this study:

RQ1: To what extent is sustainable finance important for the general public?

RQ2: To what extent is the general public familiar with sustainable finance issues?

Table 1 shows the demographic specification of the respondents.

Tab. 1: Demographic specification of the respondents. N = 138.

		Total	
		N	**%**
Gender	Female	80	*57.97*
	Male	58	*42.03*
Generation (years of birth)	Generation Alpha (born after 2012)	0	*0.00*
	Generation Z (1997 – 2012)	103	*74.64*
	Generation Y (1981 – 1996),	15	*10.87*
	Generation X (1965 – 1980)	18	*13.04*
	Baby Boomers and Silent Generation (born before 1965)	0	*0.00*
Country of origin	Czech Republic	101	*73.19*
	Other countries	37	*26.81*
	(Portugal	22	*15.94)*
	(India	11	*7.97)*
	(Poland	1	*0.72)*
	(Brazil	1	*0.72)*
	(Nigeria	1	*0.72)*
	(Lithuania	1	*0.72)*

Source: authors' research

In the research sample, the more frequently represented gender was female (57.97% of respondents), born between 1997 and 2012 (Generation Z; 74.64% of respondents), from the Czech Republic (73.19% of respondents). As other countries were represented only by a few respondents, all responses other than Czech were merged into the group Other countries).

2. Literature Review

The literature on sustainable finance encompasses various research areas, including sustainable corporate finance, theories of sustainable finance, green finance and

sustainability disclosure, the role of banks in sustainable development, green financing for sustainable development, and the European Union's approach to sustainable finance.

Claringbould et al. (2019) discuss sustainable finance from a theoretical perspective and examine the European Union's approach to increasing sustainable investments and growth. The authors provide an overview of the most important work the EU currently does: developing a classification system for environmentally sustainable economic activities, the EU Emissions Trading System and providing financial support to projects that align with sustainability objectives. They emphasise the importance of sustainable finance in achieving policy goals.

Klein and Wilkens (2020) discussed the shifting paradigm from traditional to sustainable finance. The authors argue that sustainable finance has become a mainstream concept, and its importance is acknowledged globally. They highlight its impact on the real economy, the role of financial regulations, and the need for sustainable practices within the banking sector and broader financial system.

Ozili (2022) notes the growth of sustainable finance literature within the broader finance field, reflecting the increasing attention and importance of sustainable finance as a research topic. The article proposes six theories of sustainable finance: the priority theory, the resource theory, the peer emulation theory, the life span theory, the positive signalling theory, and the system disruption theory. These theories provide practical explanations for the actions and behaviour of economic agents in relation to sustainable finance.

Liu and Wu (2023) conducted a systematic literature review in which they provided an important review of the current state of green finance, sustainability disclosure, and their impact on financial performance, capital markets, and economic development. They demonstrated significant growth in sustainability reporting globally but raised concerns regarding consistency, comparability, and assurance. Despite some challenges, the authors noted that the literature generally supports the positive association between a firm's green practices and financial performance and the negative correlation with the cost of capital.

Jovanovič and Jovanović (2023) point out that the concept has progressed from Corporate Social Responsibility (CSR) to ESG Reporting, encompassing environmental, social, and governance factors. This evolution aligns with the current emphasis on green transition. This shift has been reflected in corporate practices and legal frameworks at the European and national levels. As a result, ESG and Green Transition guidelines have become integral to the responsibilities and obligations of management and supervisory bodies within companies.

There is no extensive literature on sustainable finance from the Czech Republic. Several articles have examined sustainability-related issues within the country, including the corporate perception of sustainability (Petera et al., 2016) or environmental data facilities and services (Soukopová et al., 2015). However, these references do not directly focus on the in-depth exploration of sustainable finance practices or the specific challenges and developments in the Czech Republic. The limited literature on sustainable finance from the Czech Republic suggests a gap in research and scholarly publications in this particular area.

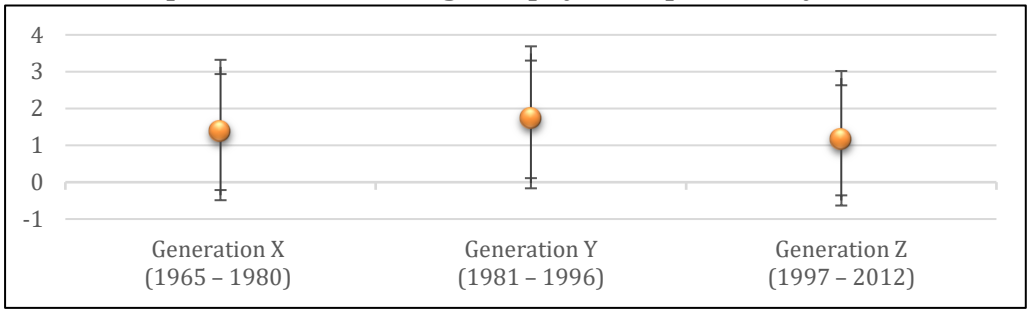
Collectively, all studies support the thesis that sustainable finance has emerged as a significant aspect of finance worldwide.

3. Research Results

Research question RQ1 aimed to capture the extent of the importance of sustainable finance issues for the general public. Three questionnaire questions were dedicated to respondents' relationship to sustainable banking and financial products. The answers to those questions are evaluated from the perspective of the most numerous generations (Figures 1, 2 and 3). The respondents rated the importance of the specific problem in question on a scale from 0 = factor is not important to 4 = factor is very important.

The structure of responses to the question "*Are you interested in the carbon footprint of the banking and payment products you use?*" is illustrated in Figure 1.

Fig. 1: Survey responses to the question: "Are you interested in the carbon footprint of the banking and payment products you use?"

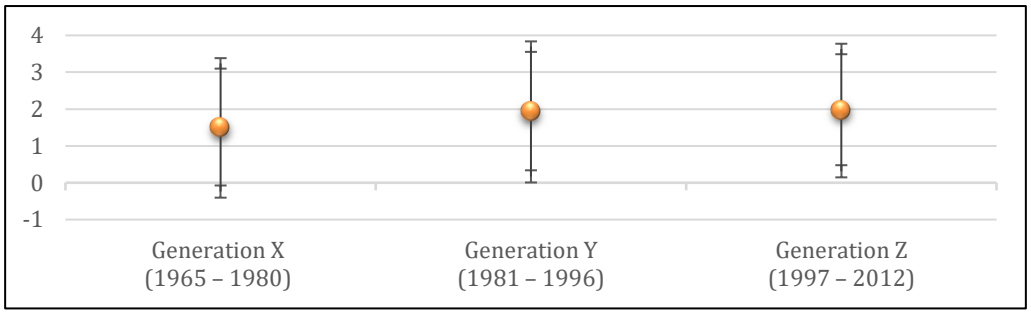


Note: *Responses on Likert Scale 0 – 4 (0 = not at all/definitely no, 4 = definitely yes).*

Source: authors' calculations

Figure 2 presents the structure of answers to the question "*Would you be willing to change your banking house if you believed it would benefit environmental sustainability*?".

Fig. 2: Survey responses to the question: "Would you be willing to change your banking house if you believed it would benefit environmental sustainability?"

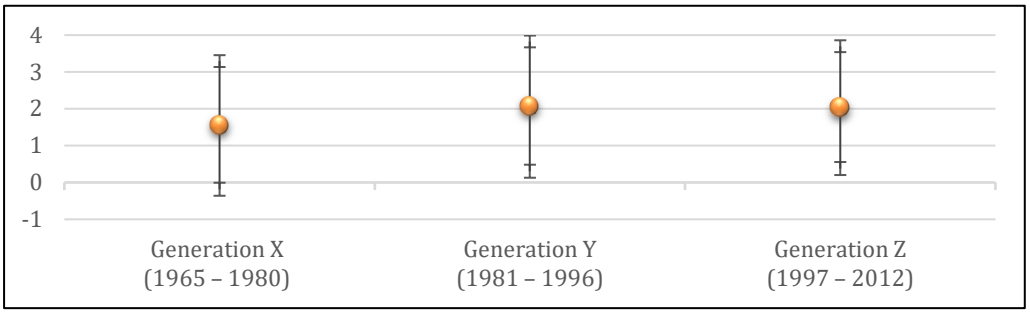


Note: *Responses on Likert Scale 0 – 4 (0 = not at all/definitely no, 4 = definitely yes).*

Source: authors' calculations

The structure of responses to the question "*Would you be interested in information on the carbon footprint of each of your financial transactions directly in your electronic or smart banking?*" is provided in Figure 3.

Fig. 3: Survey responses to the question: "Would you be interested in information on the carbon footprint of each of your financial transactions directly in your electronic or smart banking?"



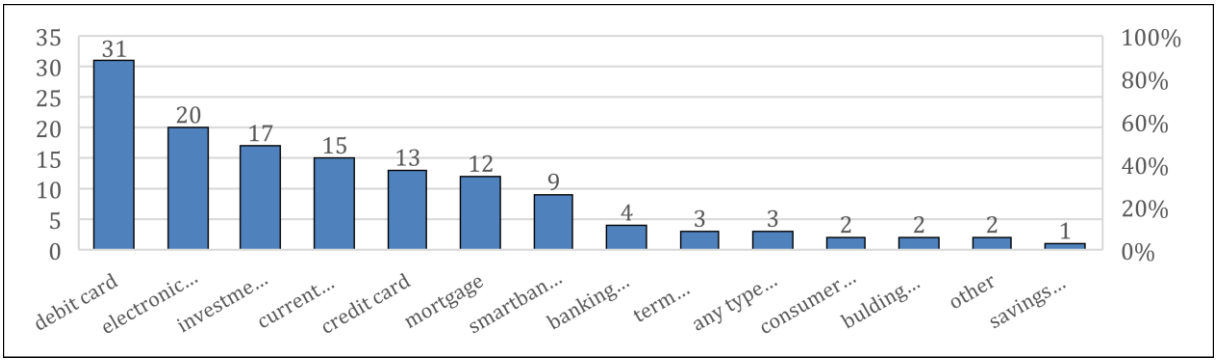
Note: *Responses on Likert Scale 0 – 4 (0 = not at all/definitely no, 4 = definitely yes).*

Source: authors' calculations

The research results show that the importance of carbon footprint as a measure of environmental sustainability is mild. The results barely cross the middle value of significance in all questions. The differences between generations are not very distinct. In general, generation X is the least inclined to a possible change of their banking houses in favour of a carbon footprint decrease. At the same time, it is the least interested in the carbon footprint information of each financial transaction. Surprisingly, generation Z is the least interested in the carbon footprint of their banking and payment products. It is probably because they don't yet use many financial products, or the connection between banking or payment products and carbon footprint is unclear and unrealistic for them.

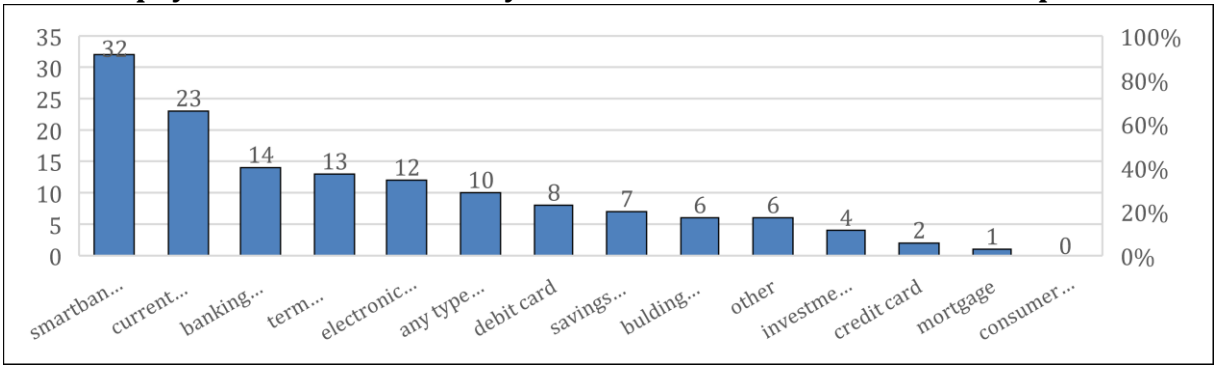
Figures 4 and 5 present the ranking of banking products and payment instruments respondents consider having the highest and the lowest carbon footprint. Respondents could choose only one of the options.

Fig. 4: Survey responses to the question: "Which of the listed banking products and payment instruments do you think has the highest carbon footprint?"



Source: authors' calculations

Fig. 5: Survey responses to the question: "Which of the listed banking products and payment instruments do you think has the lowest carbon footprint?"



Source: authors' calculations

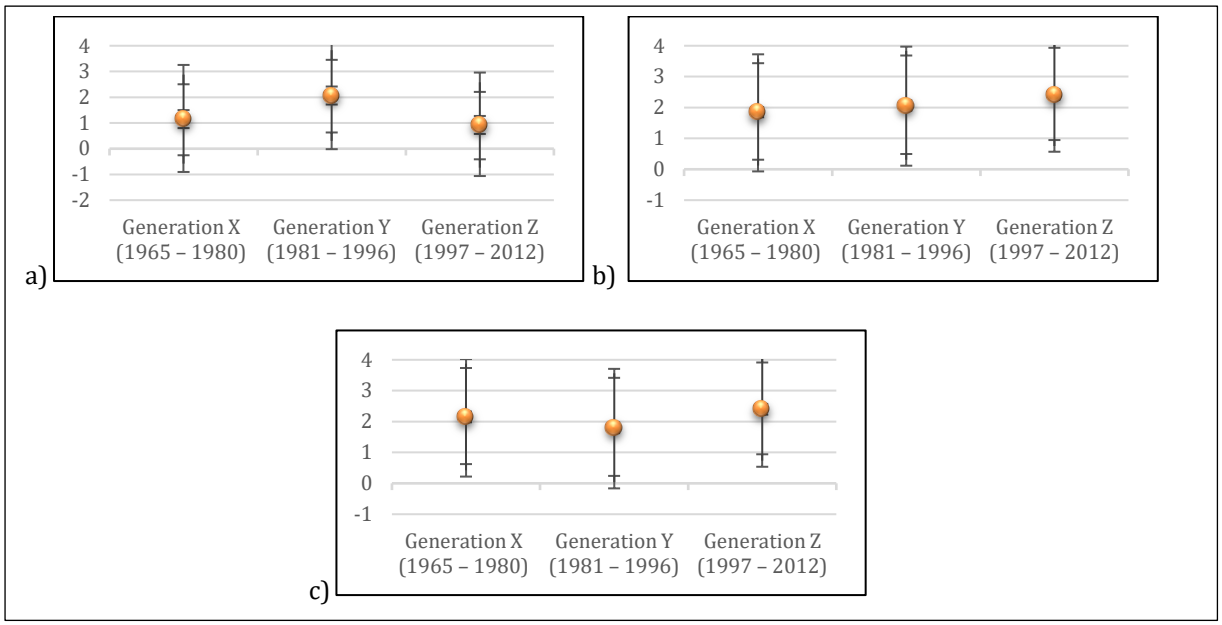
The specialised approach of carbon footprinting in banking and payment transactions recognises the significant influence of consumption habits on an individual's environmental impact. The respondents of our questionnaire (consumers) perceive the following financial products as the most environmentally unfriendly: debit cards (23% of respondents), electronic banking in PC (15%), and investment funds (13%). As financial products with the lowest emissions and impact on the environment were considered to be: smart-banking apps in the mobile phone (23%), current accounts (17%), and banking identity (10%). There is no exact ranking or specification of the carbon footprint of financial products from the questionnaire list in the literature. Respondents' answers cannot be therefore confronted with the reality.

Research question RQ2 was focused on the extent to which the general public is familiar with sustainable finance issues. The questionnaire contained questions testing respondents' knowledge of two specific terms, open banking and impact investing, which play crucial roles in advancing sustainable finance by promoting transparency, accessibility, and responsible investment practices. The terms were explained before answering the following related questions.

Open Banking allows consumers to take advantage of data-driven financial services by sharing data held at one organisation with another organisation, typically between financial institutions and trusted third parties (Babin and Smith, 2022). Open Banking can benefit environmental sustainability by enabling the development and introduction of new financial products and services that support sustainable investment and the development of renewable energy sources.

Figure 6 illustrates survey responses to questionnaire questions testing how respondents are familiar with the concept of Open Banking. After an explanation of the term, respondents' attitudes to the topic were investigated. Figure 6a clearly shows that the general public is not very familiar with the Open Banking concept; slightly higher values can be seen in Generation Y, and the lowest knowledge is in Generation Z. Although Generation Z's respondents are unfamiliar with the term, they believe that this concept can benefit the environment (Figure 6b) and are most willing to adopt this new concept as their own (Figure 6c). But the differences between individual generations are not very significant.

Fig. 6: Survey responses to the questions related to Open Banking



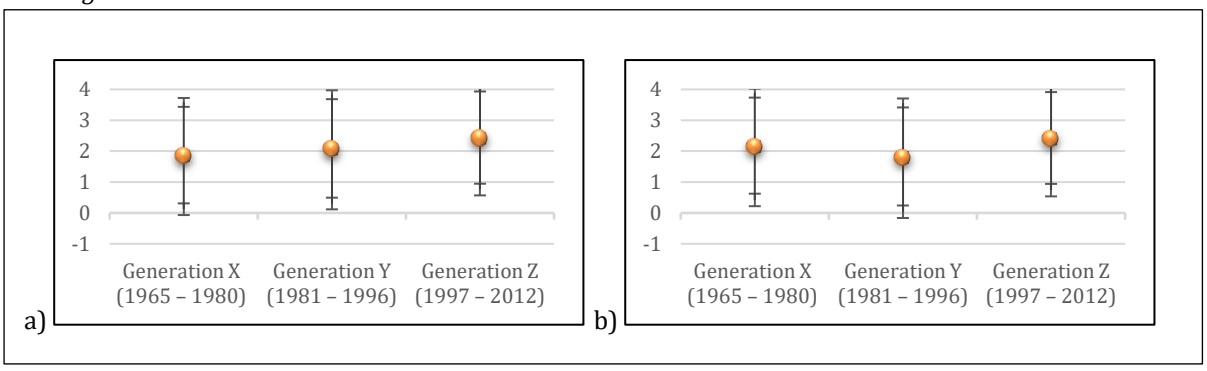
Notes: *Responses on Likert Scale 0 – 4 (0 = not at all/definitely no, 4 = yes, I know exactly/definitely yes). Questions: a) Do you know what "Open Banking" means?; b) Do you think that "open banking" could be beneficial for environmental sustainability?; c) Would you be willing to start using Open Banking if you were convinced of the positive effects on sustainability?*

Source: authors' calculations

Impact investing is the practice of allocating capital to businesses, organisations, and projects with the intention of generating positive social and environmental impact alongside financial returns. Impact Investing and ESG (Environmental, Social and Economic) investing are related but not identical concepts. While Impact Investing focuses directly on generating a positive impact, ESG investing tries to consider these factors as part of the overall assessment of the investment. Both concepts relate to sustainability and can benefit the environment and society, but they differ in their goals and methods of use (Foroughi, 2022).

Fig. 7: Survey responses to the questions related to Impact Investing

Notes: *Responses on Likert Scale 0 – 4 (0 = not at all/definitely no, 4 = yes, I know exactly/definitely yes). Questions: a) Do you know what "Impact Investing" is?; b) Do you believe "Impact Investing" is the same as ESG investing?*



Source: authors' calculations

Figure 7 evaluates questionnaire responses to questions related to Impact Investing. Figure 7a suggests that the general public is more familiar with Impact Investing than Open Banking as the mean values are higher. Especially findings by Generation Z implies better knowledge. Generation Z also has the strongest belief that concepts of Impact

Investing and ESG Investing are identical (Figure 7b), but this is not entirely true. Impact Investing and ESG Investing are related but not identical; both concepts relate to sustainability and can be beneficial to the environment and society, but they differ in their goals and methods of use.

Conclusion

The essence of this conference paper lies in the concept of sustainable finance, which integrates environmental, social, and governance (ESG) factors into financial decision-making processes to support long-term economic growth while addressing sustainability challenges—the paper aimed to examine the general public's attitudes, perceptions and identification with sustainable finance issues. The general public plays a significant role in driving the demand for sustainable finance products and services, influencing the behaviour of financial institutions, and shaping policy agendas towards sustainability. Therefore, sustainable finance is an issue that resonates with and affects the general public's interests and concerns. Even though the perception and identification of the general public with sustainable finance issues is an important aspect of promoting sustainable development, only limited research in this particular field can be found in the literature.

This study followed two main research questions, and appropriate answers were found to all of them. Research question RQ1 aimed to capture the extent of the importance of sustainable finance issues for the general public. The research results show that the importance of carbon footprint as a measure of environmental sustainability is mild, and the differences between generations are not very distinct. The respondents indicated the following financial products as the most environmentally unfriendly: debit cards, electronic banking on PC, and investment funds. As financial products with the lowest emissions and environmental impact, the respondents stated: smart-banking apps in the mobile phone, current accounts, and banking identity. Research question RQ2 was focused on the extent to which the general public is familiar with selected sustainable finance terms, open banking and impact investing, which play crucial roles in advancing sustainable finance by promoting transparency, accessibility, and responsible investment practices. Overall, the general public is not very familiar with the concepts mentioned, and the differences between generations are insignificant.

The study was based on a questionnaire survey, implying certain limitations of results interpretation of personal opinions. Future research still has the potential to explore other aspects of sustainable finance. However, addressing a more significant number of respondents would be necessary to ensure a sufficient frequency in all analysed groups for statistical testing.

The scientific novelty of this study mainly lies in the empirical results gathered through a questionnaire survey. By shedding light on the general public's understanding and attitudes towards sustainable finance, the article contributes to the broader discourse on sustainable finance. Further research in this area can contribute to a better understanding of how to promote sustainable finance practices among the general public.

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Dual Focus on Systemic Risk in Portfolio Management

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Abstract
In this paper, we examine a complex portfolio selection strategy with a dual emphasis on systemic risk. This strategy or only its elements are advisable for both portfolio managers as well as macroprudential regulators. In particular, first, we present the concept of an early warning system (alarm) employing selected entropy measures, which allow us to detect systemic risk in financial markets. Secondly, we apply the two-phase optimization framework to determine the optimal composition of the portfolio. Essentially, the first phase of this strategy includes the reward−risk ratio maximization part and the following phase aims at systematic risk minimization. Furthermore, we approximate the returns using a dynamic set of components obtained from the principal component analysis and the classical ordinary least squares regression. In the empirical analysis using US market data, the wealth paths and statistics of different portfolio strategies are compared with each other. Ex-post results confirm higher profitability of the early warning system with double optimization, even if the transaction costs are taken into account. However, the main benefit lies in the significantly better risk properties of the proposed strategy.

Key Words
early warning system, entropy, systemic risk, portfolio optimization

JEL Classification: G11, G21

Introduction

Since the beginning of financial markets, the prediction and modelling of stock price behaviour have been significant challenges that are examined by both financial analysts and researchers, respectively, see Ahn et al. (2019) and Kouaissah and Hocine (2021). With the increasing fluctuation and volatility of prices in global markets during crisis periods, systemic risk warning is becoming more relevant. According to the general definition, systemic risk has an impact on each institution located on the market and affects the market price of stocks. In other words, systemic risk and the following systemic crisis are related to a common fluctuation that affects the entire economy, while the connection between institutions contributes to an undesirable "domino" effect. Due to the general definition of systemic risk, its measurement is not clearly and uniformly defined, but financial, macroeconomic, and statistical issues are usually used. After several successive crises, e.g., the global financial crisis (2007−2009), the COVID-19 pandemic crisis (2019−2021), or the beginning of the war in Ukraine (2022), the measurement systemic risk often received attention in the literature, see Ahn et al. (2019), Billio et al. (2016), Gradojevic and Caric (2016), Torri et al. (2022), and references therein.

The objective of this work is to study a complex portfolio selection strategy with a dual emphasis on the reduction of systemic risk. This contribution also extends the previous work of Neděla (2022). In particular, we consider the early warning system (hereinafter also referred to as alarm) employing selected entropy measures included in the portfolio selection strategy. This entropy-based alarm should detect systemic risk on the market. For the purposes of this analysis, we use select Shannon and Tsallis entropies (Shannon, 1948; Tsallis, 1988). Furthermore, we apply the two-phase optimization framework, where the first phase is important for obtaining a market benchmark (mean expected return) and the second phase minimizes the systemic risk. The market benchmark is achieved from the reward–risk ratio maximization model, where various reward–risk measures are included. For systemic risk minimization, we use Marginal Expected Shortfall (MES), Value-at-Risk (VaR), and Conditional Value-at-Risk (CoVaR). In addition, we consider optimization based on the approximated return series. Specifically, returns are approximated using a multifactor model with main components obtained by principal component analysis (PCA), see Ortobelli and Tichý (2015). In general, the approximation part is a useful tool for a precise estimation of the expected returns, which improves the decision-making process about the portfolio.

The inclusion of a simple type of alarm in the portfolio selection process was originally proposed by Kouaissah and Hocine (2021). However, the authors used different indicators from technical analysis and their generally applied rules. Thus, contrary to this approach, we decided to replace technical indicators with entropy indicators. In particular, our concept of systemic risk detection is derived from k-day percentage changes of entropy measures. In recent years, the popularity of entropy in the financial and economic areas has increased considerably. In the financial literature, we can find many ways to use this technique. Recently, for example, Billio et al. (2016) introduced an approach to detect systemic risk based on cross-sectional entropy. Later, Post and Potì (2017) introduced a method of stochastic efficiency based on relative entropy. Quantitative analysis of the behavioural characteristics of systemic risks through an entropy-based approach during the financial crisis (2007–2009) was done by Gradojevic and Caric (2016). Regarding the area of portfolio optimization, this issue was examined by Pola (2016), Mercurio et al. (2020), and the literature therein.

The remainder of this paper is structured as follows. This section provides an introduction to the topic. In Section 1, a methodological description of the selected entropy measures and systemic risk indicators used is provided. Section 2 consists of an ex-post empirical analysis using the US market data with a discussion of the results. Finally, the paper is concluded and summarized in the section Conclusion.

1. Methodology of Entropy and Portfolio Selection

This section contains the characterization and formulation of selected entropy indicators, reward–risk measures, and general portfolio optimization frameworks.

Assume a matrix with z risky assets and T observations. We denote a vector of returns $r = [r_1, \dots, r_z]$, where the t-th observation of the i-th return $r_{i,t}$ is calculated as $r_{i,t} = \ln \frac{P_{i,t}}{P_{i,t-1}}$, where $P_{i,t}$ is the price of asset i in time $t = 1, 2, \dots, T$ for $i = 1, \dots, z$. Thus, the portfolio return vector is denoted as $x'r$ while $x = [x_i, \dots, x_z]$ represents a vector of assets

weights. If short sales are not considered, the portfolio weights x are from the simplex $S = \{x \in \mathbb{R}^z | x_i = 1; \sum x_i \geq 0; \forall i = 1, \dots, z\}$.

1.1 Entropy and Systemic Risk Indicators

According to Neděla (2022), in this paper, we consider two types of entropy measures: Shannon's entropy and Tsallis's entropy. In addition, systemic risk indicators CoVaR, VaR, and MES are used for optimization and risk analysis.

Assume a given discrete probability distribution $P = \{p_i, i = 1, \dots, z\}$, Shannon entropy is defined as a measure of disorder or randomness (Shannon, 1948). Therefore, the Shannon entropy E_S is mathematically formulated as:

$$E_S = -\sum_{i=1}^{z} p_i \log(p_i)\,. \tag{1}$$

We achieve a maximum of E_S when the underlying probability p_i is equal for each i (uniform probability). In the opposite situation, the minimum value of E_S is reached if only one $p_i = 1$ and the rest is equal to zero.

The second widely used entropy measure is the Tsallis entropy E_T (Tsallis, 1988; Billio et al., 2016). The difference from the Shannon entropy in Equation (1) lies in the extension index of the parameter α, which helps us to better identify the relevance rate for the prediction of the crisis by the distribution tails. Thus, E_T is defined as:

$$E_T = -\sum_{i=1}^{z} p_i^{\alpha} \log_{\alpha}(p_i) = \frac{1}{\alpha - 1}\left(1 - \sum_{i=1}^{z} p_i^{\alpha}\right). \tag{2}$$

In relation to the value of α, we take into account more or less tails of the distribution. If the index $\alpha = 1$, the Tsallis entropy is identical to E_S. However, when $\alpha > 1$ ($\alpha < 1$) means that the system is more dominated by usual (unusual) situations.

Alternatively, for systemic risk detection, CoVaR presented by Adrian and Brunnermeier (2016) is possible to use. It is calculated as the VaR of the financial market conditional on a company (stock) being in distress (Billio et al., 2016). First, let us define VaR as follows:

$$Pr\left(r_i \leq VaR_{i,\kappa}\right) = \kappa, \tag{3}$$

where κ is a significant value. $F_X^{-1}(y)$ means the inverse distribution function of the variable X. After that, the CoVaR conditional on the i-th asset return is formulated as:

$$Pr\left(r_b \leq CoVaR_{b,\kappa} \middle| r_i \leq VaR_{i,\kappa}\right) = \kappa, \tag{4}$$

where κ is a significant value. For example, if $\kappa = 0.5$ then $CoVaR_{b,\kappa}$ is the market VaR when the i-th asset returns are below the mean value.

The last measure of systemic risk is the Marginal Expected Shortfall (MES) presented by Acharya et al. (2017). The broad definition of MES represents the expected value of r_i in

the case of a market decline detected found when a benchmark return r_b is lower than a predefined quantile q_κ. It is formulated as follows:

$$MES_i = E\left(r_i \middle| r_b < q_\kappa\right), \tag{5}$$

where κ is a value from the interval [0,1]. A market index that replicates the whole market or a particular reference asset might serve as the benchmark.

1.2 Reward-Risk Measures and Portfolio Selection Frameworks

In this subsection, several well-known reward-risk (performance) ratios and portfolio models are presented. The most applied one is the Sharpe ratio (SR) involving the portfolio excess return and the standard deviation (Sharpe, 1994), defined as follows:

$$SR = \frac{E\left(x'r - r_f\right)}{(x'Qx)^{\frac{1}{2}}}, \tag{6}$$

where r_f is a risk-free rate (or a benchmark return) and Q represents the covariance matrix. The SR value expresses the return for the unit of risk.

Additionally, the Rachev ratio measures the ratio between the Conditional Value-at-Risk (CVaR) of earnings and the mean of losses beyond Value-at-Risk (VaR), see Rachev et al. (2008). The equation is as follows:

$$RR = \frac{CVaR_\beta\left(r_f - x'r\right)}{CVaR_\alpha\left(x'r - r_f\right)}, \tag{7}$$

where $CVaR_\alpha(x'r) = \frac{1}{\alpha}\int_0^\alpha VaR_y(x'r)dy$.

The next performance measure selected is the STARR, where, in contrast to SR, CVaR with a significance value α replaces the standard deviation. STARR is defined as follows:

$$STARR = \frac{E\left(x'r - r_f\right)}{CVaR_\alpha(x'r)}. \tag{8}$$

The use of CVaR in the denominator captures the downside risk of the portfolio compared to the standard deviation contained in the SR.

According to Ruttiens (2013), an alternative time-dependent risk measurement technique is calculated based on cumulative returns or wealth path $W = \{W_t\}, t \in \{1,2,\dots,T\}$. The Ruttiens´ risk indicator is defined as the standard deviation of the spreads between wealth and its linear alternative leading to the same final W. Vector of spreads is computed as $Y_t = W_t - W_0 - \left(\frac{t}{T}\right)(W_T - W_0)$. The risk measure is formulated as $Ruttiens\ risk = \left(\sum_{t=1}^{T}\frac{1}{T}(Y_t - \bar{Y})^2\right)^{1/2}$, where $\bar{Y}$ is the mean value of vector Y. As defined by Ortobelli et al. (2017), the dynamic performance ratio RuttR can be mathematically formulated as follows:

$$RuttR = \frac{W_T - 1}{1 + s \cdot Ruttiens\ risk} \tag{9}$$

where s represents the proportional coefficient. If the initial wealth $W_0 \neq 1$, then the numerator of the ratio contains $W_T - W_0$, which represents excess profit of an investment.

In this case, the investor aims to find an optimal portfolio that generates the maximum excess return per unit of expected risk; we can maximize these ratios above in the quadratic optimization framework (Rachev et al., 2008). Generally, the maximization model can be denoted by the following formulation:

$$\begin{gathered} \max_x \rho(x'r) \\ x'e = 1 \\ 0 \leq x_i \leq\ 0.2\ ;\ i = 1, \dots, z \end{gathered} \tag{10}$$

where $\rho(x'r)$ represents one of the selected performance measures (SR, RR, STARR, or RuttR) and e is a z-column unit vector with all values being equal to 1.

The second rational option is to minimize the risk of the portfolio, as provided in modern portfolio theory (Markowitz, 1952) built on variance minimization. With respect to this theory, the model can be formulated as follows:

$$\begin{gathered} \min_x \omega(x'r) \\ x'e = 1 \\ E(x'r) = M \\ 0 \leq x_i \leq 0.2\ ;\ i = 1, \dots, z \end{gathered} \tag{11}$$

where $\omega(x'r)$ is (systemic) risk measure and M is the required value of the expected return.

2. Empirical Analysis with Results

In this section, we apply the methodology from section above to the US maket data to verify the expected characteristics of our portfolio strategy. In particular, we use daily close prices of stocks, which were active in the S&P 100 index as of 4 November 2021. We chose the length of the time period from 1 January 2006 to 30 June 2021 (approximately 3,900 daily observations), during which two major crisis periods occurred. Because some of the price series have incomplete data for selected periods, these stocks are not further considered. Furthermore, as the risk-free rate, we use the return of the 3-month US Treasury bill, which is included in the computation of performance indicators, as well as an alternative investment when the early warning system is triggered. The data was downloaded from the Bloomberg database and the Investing.com website.

2.1 Ex-post portfolio analysis with results

To perform the analysis, the entire computational algorithm, including the portfolio optimization process, can be divided into several steps, similar to Neděla (2022):

Step 1: Compute the entropy measures based on historical return data of one year (252 days) of the S&P 500 index using Equations (1) and (2). The parameter α for the Tsallis entropy is set as 0.6. According to these daily values, the 1-day and 5-days differences vectors are computed given by $\phi = \frac{(E_t - E_{t-k})}{E_{t-k}}$ for Shannon entropy and Tsallis entropy as well. If the 1-day decline is greater than 0.03 (i.e., 3%), the alarm is triggered, indicating a shift of investment to a risk-free asset until the 5-days differences of entropy increase more than 0.01 (i.e., 1%). If the alarm rule is not considered, skip to Step 2.

Step 2: Apply the PCA approach to the Pearson correlation matrix of the returns to obtain the main s factors (components) explaining at least 85% of the total portfolio variability. Then use a common OLS estimator for the approximation of returns assuming that r_i is a linear function of factors f_j formulated as $r_i = a_i + \sum_{j=1}^{s} b_{i,j} f_j + \varepsilon_i$, where a_i is constant of the i-th return, $b_{i,j}$ is coefficient for factor f_j and ε_i is residual part of the i-th return (Ortobelli and Tichý, 2015; Kouaissah and Hocine, 2021).

Step 3: Apply the two-phase optimization framework to find the asset's weights. In the first phase, the maximization performance ratio model (10) is applied to obtain the market potential (the expected portfolio return M). Then, we proceed with the minimization model formulated in Equation (11) using systemic risk measures (3), (4), or (5). The model has the condition that the expected portfolio return is identical to M acquired from the first optimization. In both cases, the upper limit of the portfolio weight is set at 0.2 to better diversify the portfolio.

Step 4: Compute portfolio statistics and the final wealth W_T while taking into account transaction costs tc_{t_d} set as 20 basis points. W_t is calculated by the following formulation:

$$W_{t_{d+1}} = \begin{cases} \left(W_{t_d} - tc_{t_d}\right)(1 + r_{b,d+1}) & if\ alarm\ is\ performed \\ \left(W_{t_d} - tc_{t_d}\right)(x_M)' r_{t_{d+1}}^{ex-post} & otherwise, \end{cases} \tag{13}$$

where $r_{t_{d+1}}^{ex-post}$ is the return between the period t_d and $t_{(d+1)}$. The time $t_{(d+1)} = t_d + \tau$, where $\tau = 21$.

The whole algorithm (steps 1 to 4) is applied again until daily observations are available. For an easier comparison of strategies, we consider that the initial investment W_0 is set to 1 (unit). All results of this ex-post analysis are presented in Tab. 1-4 and Fig. 1-2. The comparison of compiled portfolios is made according to daily statistics, i.e., mean (%), standard deviation (%), VaR5% (%), CVaR5% (%), MES (%), SR (%), RR and final wealth.

Tab. 1 shows the statistics of the max SR portfolio strategies with the statistics of the S&P 100 index selected as a benchmark (buy & hold principle). First, if portfolios without the alarm are compared, we can see that the two-phase optimization strategy with CoVaR minimization generates the best performance. In more detail, SR-CoVaR strategy has higher profitability than the simple one-phase, but surprisingly slightly higher risk. However, by incorporating alarm into the portfolio strategy, we are able to rapidly reduce the risk and increase the overall performance. In particular, MES decreases significantly, which confirms the success of limiting exposure to systemic risk. It is also evident that the Tsalis entropy with A-SR-MES strategy generates the best results.

Tab. 1: Ex-post portfolio statistics of different strategies with max SR model

Strategy	*mean*	*SD*	*VaR5%*	*CVaR5%*	*MES*	*SR*	*RR*	*final W*
SR	0.0299	1.3475	2.1705	3.4286	-0.3422	2.1624	0.8602	2.9743
SR-CoVaR	0.0358	1.5309	2.5003	3.8791	-0.4899	2.2911	0.8404	3.6931
SR-MES	0.0276	1.6142	2.5890	4.0514	-0.4084	1.6637	0.8642	2.7368
SR-VaR	0.0287	1.3632	2.2127	3.4838	-0.3384	2.0508	0.8473	2.8490
Shannon entropy								
A-SR	0.0336	1.1461	1.9240	2.9652	-0.2744	2.8641	0.8699	3.4024
A-SR-CoVaR	0.0320	1.3207	2.3774	3.3772	-0.2922	2.3677	0.8545	3.2147
A-SR-MES	0.0348	1.3815	2.3889	3.5098	-0.2676	2.4663	0.8599	3.5606
A-SR-VaR	0.0347	1.1631	1.9977	2.9933	-0.3050	2.9214	0.8842	3.5483
Tsallis entropy								
A-SR	0.0382	1.1918	1.9498	3.0308	-0.2718	3.1431	0.8665	4.0286
A-SR-CoVaR	0.0447	1.3593	2.4524	3.4121	-0.2897	3.2311	0.8576	5.0984
A-SR-MES	0.0535	1.4414	2.4402	3.5643	-0.2690	3.6588	0.8742	7.0317
A-SR-VaR	0.0344	1.2103	2.0488	3.0747	-0.2816	2.7778	0.8743	3.5021
S&P 100	0.0299	1.2726	1.9284	3.2268	3.2296	2.3354	0.8836	2.2112

Source: authors' calculations in Matlab

Tab. 2: Ex-post portfolio statistics of different strategies with max RR model

Strategy	*mean*	*SD*	*VaR5%*	*CVaR5%*	*MES*	*SR*	*RR*	*final W*
RR	0.0071	1.3473	2.0627	3.3891	-0.3639	0.4730	0.8702	1.2969
RR-CoVaR	0.0173	1.5708	2.5645	3.9880	-0.5085	1.0533	0.8462	1.8792
RR-MES	0.0190	1.5856	2.5393	3.9152	-0.3740	1.1506	0.8910	1.9993
RR-VaR	0.0209	1.1654	1.7967	2.9457	-0.2296	1.7296	0.8583	2.1437
Shannon entropy								
A-RR	0.0036	1.1739	1.8843	3.0355	-0.1956	0.2409	0.8613	1.1397
A-RR-CoVaR	0.0109	1.4138	2.4426	3.6708	-0.2551	0.7221	0.8243	1.4916
A-RR-MES	0.0231	1.3906	2.4047	3.5810	-0.2526	1.6074	0.8495	2.3224
A-RR-VaR	0.0257	0.9923	1.6155	2.5369	-0.1700	2.5220	0.8730	2.5600
Tsallis entropy								
A-RR	0.0082	1.2374	1.9657	3.1216	-0.1643	0.6009	0.8671	1.3481
A-RR-CoVaR	0.0217	1.4604	2.4580	3.7336	-0.2641	1.4351	0.8271	2.2073
A-RR-MES	0.0464	1.4627	2.4091	3.6292	-0.2524	3.1181	0.8814	5.4225
A-RR-VaR	0.0298	1.0416	1.6940	2.6032	-0.1666	2.7850	0.8819	2.9603

Source: authors' calculations in Matlab

Tab. 3: Ex-post portfolio statistics of different strategies with max STARR model

Strategy	*mean*	*SD*	*VaR5%*	*CVaR5%*	*MES*	*SR*	*RR*	*final W*
STARR	0.0255	1.3466	2.1353	3.4288	-0.3723	1.8341	0.8618	2.5298
STARR- CoVaR	0.0438	1.5446	2.4927	3.8947	-0.5397	2.7867	0.8553	4.9385
STARR-MES	0.0243	1.6074	2.6021	4.0321	-0.4069	1.4670	0.8636	2.4288
STARR-VaR	0.0255	1.3638	2.1746	3.4855	-0.3817	1.8153	0.8519	2.5352
Shannon entropy								
A-STARR	0.0347	1.1391	1.9588	2.9429	-0.2908	2.9808	0.8578	3.5451
A-STARR-CoVaR	0.0365	1.3193	2.2780	3.3762	-0.2581	2.7127	0.8522	3.7906
A-STARR-MES	0.0304	1.3655	2.4312	3.4796	-0.2898	2.1730	0.8441	3.0329
A-STARR-VaR	0.0386	1.1578	1.9385	2.9609	-0.2735	3.2701	0.8765	4.0881
Tsallis entropy								
A-STARR	0.0401	1.1774	1.9631	2.9573	-0.2879	3.3423	0.8752	4.3161
A-STARR- CoVaR	0.0411	1.3649	2.3778	3.4388	-0.2685	2.9579	0.8551	4.4797
A-STARR-MES	0.0498	1.4183	2.4817	3.4920	-0.3036	3.4586	0.8827	6.1479
A-STARR-VaR	0.0394	1.1966	1.9850	3.0093	-0.2543	3.2283	0.8773	4.2039

Source: authors' calculations in Matlab

Tab. 4: Ex-post portfolio statistics of different strategies with max RuttR model

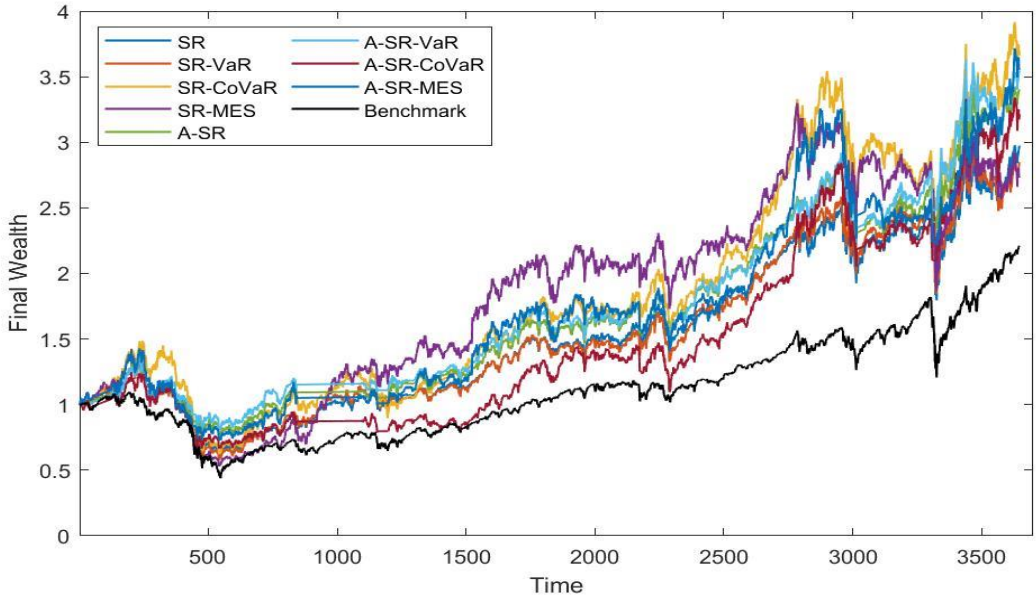
Strategy	*mean*	*SD*	*VaR5%*	*CVaR5%*	*MES*	*SR*	*RR*	*final W*
RuttR	0.0446	1.6580	2.8057	4.1833	-0.5274	2.6436	0.8367	5.0822
RuttR-CoVaR	0.0437	1.6692	2.8376	4.2236	-0.5130	2.5729	0.8361	4.9206
RuttR-MES	0.0429	1.6738	2.8526	4.2323	-0.5027	2.5178	0.8354	4.7788
RuttR-VaR	0.0462	1.6556	2.8375	4.1773	-0.5287	2.7442	0.8364	5.3876
Shannon entropy								
A-RuttR	0.0350	1.4377	2.5477	3.7336	-0.3052	2.3831	0.8356	3.5850
A-RuttR-CoVaR	0.0395	1.4476	2.6302	3.7404	-0.3370	2.6796	0.8455	4.2286
A-RuttR-MES	0.0385	1.4353	2.5711	3.7041	-0.2929	2.6271	0.8447	4.0651
A-RuttR-VaR	0.0368	1.4326	2.5961	3.7156	-0.3027	2.5133	0.8398	3.8204
Tsallis entropy								
A-RuttR	0.0498	1.4498	2.4527	3.6392	-0.3477	3.3798	0.8576	6.1361
A-RuttR-CoVaR	0.0501	1.4887	2.6467	3.7459	-0.3507	3.3174	0.8477	6.2231
A-RuttR-MES	0.0435	1.4962	2.6319	3.7777	-0.3005	2.8546	0.8514	4.8784
A-RuttR-VaR	0.0468	1.4479	2.4447	3.6421	-0.3428	3.1802	0.8564	5.5096

Source: authors' calculations in Matlab

In Tabs. 2–4, the results of the strategies using the other performance measures are shown. Generally, they basically confirm the findings obtained for the strategies with the SR. It is obvious that the profitability of portfolio strategies with the alarm is in most cases higher than the strategies without it. Note that complex strategies reduce even classical risk measures as well as systemic risk measure (MES), due to the involvement of the alarm. Obviously, the highest profitability is achieved by maximizing the RuttR in Table 4. Finally, it is evident that only a few strategies maximizing RR do not outperform the benchmark (S&P 100 index) in the sense of final W and some strategies have lower risk than the benchmark.

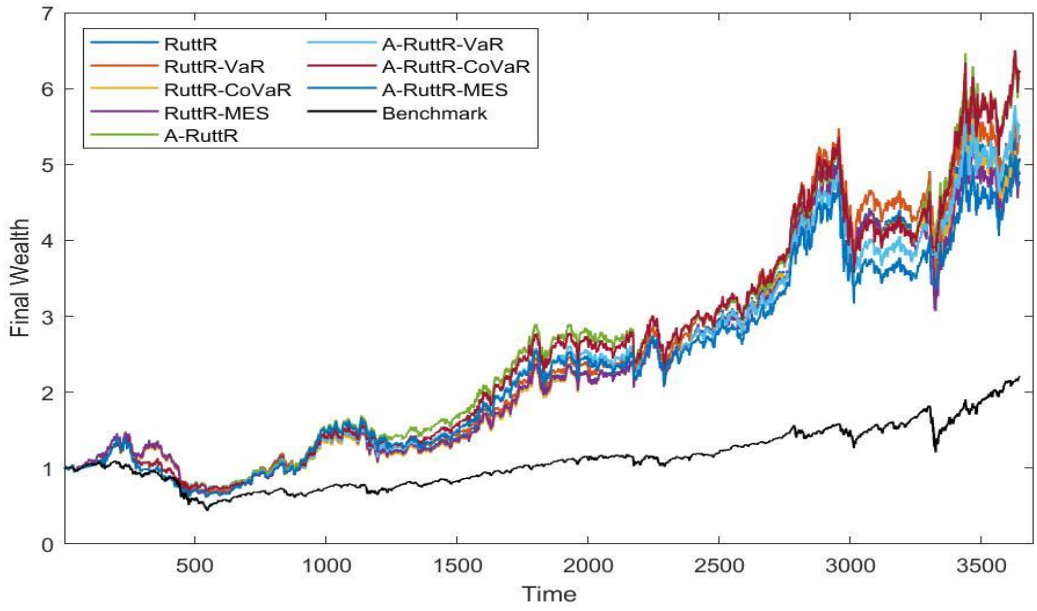
To better capture the evolution of wealth paths for various portfolio strategies and the effect of the alarm, we show Figs. 1 and 2. We select only the comparison based on two performance measures (SR and RuttR) because of the saving of space. Note that for both entropy measures, the alarm was triggered 12 times with a different durations.

Fig. 1: Ex-post wealth paths for max SR portfolio strategies with and without the Shannon entropy alarm compared to a benchmark S&P 100



Source: authors' own calculations in Matlab

Fig. 2: Ex-post wealth paths for max RuttR portfolio strategies with and without the Tsallis entropy alarm compared to a benchmark S&P 100



Source: authors' own calculations in Matlab

The benefit of the alarm tool was already noticeable during the financial crisis that was portrayed at the start of the selected period. Additionally, it effectively illustrates how a portfolio behaves during an economic expansion when a partial market shock causes investment to be interrupted for longer. An upward tendency is clearly visible before the interruption and is linked to earlier growth following the transition to risky assets. However, all strategies still experience significant drawdowns during the COVID-19 crisis period, when daily declines in financial markets were more pronounced.

Conclusions

This paper examined a complex portfolio selection strategy focused on the minimization of systemic risk from two perspectives. First, we use the early warning system using Shannon and Tsallis entropy measures to detect the threat of systemic risk. Furthermore, we applied the two-phase optimization portfolio selection approach on approximated returns. This strategy consisted of maximizing reward-risk ratios in the first phase and minimizing systemic risk in the second phase while maintaining the expected return obtained from the first phase. In the empirical part, we analyzed the portfolio statistics and wealth paths for different portfolio strategies with and without alarm. By comparing obtained results based on the US market data, we confirmed better properties of alarm strategies with two-phase optimization provided even the transaction costs are incorporated in the wealth computation. To sum it up, the two-phase optimization helped us to improve the performance of portfolios compared to the simple strategy while the alarm reduced the total risk of generated portfolios. In further research, we can compare the effectiveness of the entropy early warning system with the technical analysis one.

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Recommendations for Strengthening the Critical Factors of Utilizing the Public Procurement for Innovative Solutions

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Abstract
The presented article presents recommendations for strengthening the critical factors of utilizing the Public Procurement for Innovative solutions (PPI) concept. The utilization of the PPI concept is the author's research topic, and the author has already published several articles on this subject. As part of the author's research, critical success factors of the PPI concept were identified in the Januska & Palacka (2023) article. This article presents research conducted within autor habilitation thesis and describes proposals for eliminating or mitigating the identified barriers based on structured interviews with industry experts and a literature review. The aim of this article is to disseminate the results of the conducted research among the scientific community. Martin Januska has also been a co-researcher on two international projects, PPI2Innovate and RI2Integrate, focusing on supporting the PPI concept in the Interreg Central and Interreg Danube programs. Expert groups have been established within these project structures and are utilized in the development of the proposals.

Key Words
public procurement for innovative solutions, PPI, PPI critical sucess facotrs

JEL Classification: H0, M0

Introduction

The PPI concept is a strong tool for supporting innovation from a theoretical perspective. However, its practical utilization is nearly non-existent in the Czech Republic. In their article, the authors present proposals for strengthening the implementation of this concept. The goal of the article is to introduce partial research results in the field of PPI to the scientific community.

In the Januska & Palacka (2023) article, the authors describe the method they used to identify the critical success factors of the PPI concept through a systematic literature review and empirically verify them using the Delphi method. The results are compared in the following table.

This article builds upon the content of the article by Januska and Palacka (2023) and presents proposals for reinforcing the identified critical success factors.

1. Methods of Research

The method used to develop proposals for strengthening the critical success factors is a synthesis of information gathered from literature and structured interviews with experts. Martin Januska has been a co-researcher on two international projects, PPI2Innovate and RI2Integrate, focused on supporting the PPI concept in the Interreg Central and Interreg Danube programs. Within these project structures, expert groups were also formed and utilized in the development of the proposals as respondents in Delphi method.

Therefore, the following proposals are a combination of the authors' recommendations, information from the literature, and the results of discussions with experts from the mentioned projects. The presented article presents the research outputs conducted as part of the habilitation thesis of one of the authors.

2. Results of the Research

In the following table, you can see the identified critical success factors (CSFs). The CSFs labeled with the combination CSFxx are the critical factors identified through the Delphi method, while the factors labeled with the combination KFxx are the critical factors identified through the systematic literature review. In terms of recommendations for strengthening the critical success factors, it is necessary to categorize these factors into groups based on the possibility of influencing them. Highlighted factors were identified only by one of the used methods.

The categorization based on the potential for influence will be as follows:

a) Policy makers
b) Institutions
c) Specific procurement team
d) Suppliers

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Tab. 1: Comparison of critical success factors identified through expert teams and the systematic literature review (SLR) – Part 1

Group	Description of PPI's critical success factor in empirical Delphi research		Description of PPI's critical success factor in SLR	
Needs, requirements, goals	CSF1	Use of key policy objectives, strategic documents and priority tasks in determining needs	KF2	Objectives
	CSF2	Proper identification of the needs for PPI implementation and a clear description of the subject of the contract. Consultation and open dialogue with potential suppliers	KF1	Requirements specification
	CSF3	Involvement of stakeholders (trade associations, experts, economic entities, academia) in designing the best procurement strategy (e.g. preliminary market consultation / technical dialogue)	KF4	Application of procurement procedures and practices
	CSF4	When describing a need, it is necessary to confront expectations and capabilities in order to avoid unrealistic requirements for technical, financial or logistical reasons (request what is achievable)	KF3	Coherence in the perception of needs
Personnel requirements	CSF5	Supporting the decision-making body and the various relevant departments	KF6	Skills of PPI participants
		within the contracting authority in the implementation of the PPI		
	CSF6	A project team composed of people with relevant competencies, including external experts in all relevant areas (legal, procurement, technical, financial, health, etc.)	KF5	Skills and capacities
Legislation and the implementation environment of PPI	CSF7	Long-term innovation support policy (at European and/or national level) providing monitoring mechanisms and incentives to achieve innovation targets	KF7, KF8, KF9, KF11, KF20	Long-term orientation and flexible legislation, Sufficient legislation - definition of terms, Support of international legislation, Motivation and support of innovation policy, Environment supporting R&D - requirements for innovativeness

Tab. 1: Comparison of critical success factors identified through expert teams and the systematic literature review (SLR) – Part 2

Group	Description of PPI's critical success factor in empirical Delphi research		Description of PPI's critical success factor in SLR	
	CSF8	Support of decision-makers and internal units responsible for public procurement. The need to invest more time and resources in the preparation stage of proceedings to achieve better results	KF14, KF16	Institutional setting of the procurement process focused on innovation, Professional procurers and procurement expertise
	CSF9	Plenty of resources	KF10, KF12, KF13	Processing time and effective management, Budget and transparency, Time perspective
			KF15	Adequate private sector demand
			KF17	United Public Markets
			KF18	An interactive environment for acquiring knowledge
			KF19	Information symmetry
			KF21	Regional specificities must be taken into account
Procurement process	CSF10	Detailed planning and continuous monitoring of the project	KF22	Communication and strong coordination + feedback
	CSF11	The criteria for selection and award must be clearly defined and must be based on the subject of the contract	KF1	Requirements specification
	CSF12	Anticipating and assessing risks. Proposals must include risk analysis and mitigation proposals	KF24	Risk management
	CSF13	Focus on total cost of ownership, including operational costs		
			KF23	Flexibility
Others	CSF14	Sharing best practices and exemplary projects within the country		

Source: authors' previous article (Januska & Palacka, 2023)

3. Policymakers

The first group that can influence the selected critical success factors are policymakers. Regarding legislation, long-term support at all levels is crucial. Given the higher risks and financial requirements, public procurers need to be motivated or compelled to choose PPI projects. There are various tools available to policymakers, ranging from grant programs (conditional upon utilizing the PPI concept) to directive requirements that mandate a certain percentage of PPI contracts for each public procurer, depending on their type.

If there is significant motivation from policymakers to adopt the PPI concept, it would be advisable for public procurers to initially seek external expert support until they gain sufficient experience in this area. Moreover, the funding and availability of this support should be considered. For instance, the establishment of national competency centers tasked with providing methodological and technical support to public procurers can be considered. These competency centers have been created in the Czech Republic as part of projects such as PPI2Innovate (see https://dex-ic.com/kompetencni-centrum-pro-ppi) and RI2Integrate (see https://s-ic.cz/cs/mesta-mohou-usetrit-diky-chytremu-zadavaniverejnych-zakazek/).

The authors fully agree with the view that the most significant element for supporting the PPI concept is policy change and motivation at all levels (Caloghirou et al., 2016; Hommen, 2008; Lember et al., 2015; Rolfstam, 2012). Once PPI projects are required of public procurers and become more common, both the public and private sectors will quickly adapt to this situation. Experiences from countries like Austria and Croatia, where the PPI concept is already more frequently utilized, show that it leads to more efficient use of public finances and better quality for end users.

CSF9 Adequate resources can be influenced by both policymakers and institutions. This factor has received the most attention in the literature. The authors agree with the experts that it is necessary to consider from the policy development stage and project selection phase that the PPI concept significantly demands the utilization of all resources, especially requiring significantly higher time commitments compared to traditional projects (Lember, 2015; Torvinen and Ulkuniemi, 2016; Valovirta and Edler, 2015).

CSF14 Sharing best practices and showcasing projects in the country is best centralized at a suitable national level, as also mentioned by Edler and Georghiou (2007). In the Czech Republic, besides the aforementioned competency centers, the Technology Agency of the Czech Republic (TAČR) can serve as a central information hub. Currently, TAČR issues methodological procedures and recommendations in this area, as exemplified by Slipkova (2021). According to their website, TAČR also has ambitions to serve as an intermediary for sharing experiences, as seen at https://www.tacr.cz/inovace-v-zadavani-verejnychzakazek/.

The expert groups also agreed that it is necessary to support both public procurers and private suppliers through the sharing of information on successful projects and best practices. It is particularly important to inform suppliers that their participation in preliminary market consultations does not jeopardize their subsequent participation in the project. As stated by Podolova (2019), according to the constant decision-making practice at the national and European levels, it is clear that it is not prohibited for a

supplier to participate in the preparation of tender conditions and subsequently compete for the same public contract in a tender, and their bid may be selected as the most suitable.

On the contrary, the opposite approach would be in violation of the principles of equal treatment and the prohibition of discrimination according to § 6 paragraph 1 of the Public Procurement Act. It should be emphasized that having sufficient experience and the ability to share it is important, as well as motivating procurers or directly requesting them to create records of lessons learned (Lessons Log), as required, for example, by the PRINCE2 methodology.

4. Institutions

The second group that can influence the selected critical success factors operates at the level of institutions as a whole. This group encompasses critical success factors listed in the previous table.

At the institutional level, it is possible to influence critical factors related to Personnel Requirements and Legislation and the PPI Implementation Environment. In terms of personnel, CSF5 focuses on supporting decision-making bodies and relevant departments within the public procurer in implementing PPI. This involves utilizing the expertise available at the institutional level. Centralizing specialized capacities within the institution is a common practice for cost optimization, encompassing areas such as legal support, HR, and others. These experts cannot be fully engaged at the project level, often resulting in a lack of their presence in project teams. Organizations that possess such specialized support significantly facilitate the work of project managers. Similarly, CSF8 emphasizes the importance of supporting individuals with decision-making authority and internal units responsible for public procurement. Investing more time and resources in the preparation phase is necessary to achieve better results. This factor is categorized within Legislation and the PPI Implementation Environment. Within this critical factor, there is a particular emphasis on the need to invest more resources in PPI project preparation (Bloch and Bugge, 2013).

Furthermore, within this group, experts agree on the necessity of motivating employees to engage in project preparation using the PPI approach rather than the conventional method, which is simpler and less risky for them. This is an internal decision of each public procurer, but policymakers should exert pressure on public procurers to encourage the utilization of PPI (Lember, 2015).

5. Specific procurement team

The most significant group that can influence the selected critical success factors operates at the level of the specific procurement team. This group encompasses the largest set of critical success factors listed in the previous table.

Regarding factors within the Needs group, it can be summarized in one sentence that proper identification of PPI project needs (CSF2) is essential, taking into account public

policy goals (CSF1) and considering what is realistically feasible and achievable (CSF4), while involving relevant stakeholders (CSF3).

However, both the authors cited in the SLR and the authors of this text believe that a critical success factor for projects in general, including PPI projects, is the proper definition of scope (Mirza et al., 2013). In line with the PRINCE2 methodology, the author recommends detailed definition of needs based on consensus among the entire project board. It is necessary to confront the so-called Lead Supplier and Lead Customer during the needs definition process, representing the users and the suppliers. Their needs and requirements must intersect to some extent, as this is where the final solution will lie. The procurer cannot demand a solution that is insufficiently innovative according to the suppliers' requirements (to minimize their effort), but at the same time, unrealistic and unattainable outputs cannot be demanded based on the users' requirements (no one would participate in the process). In the process of creating specifications, it is recommended to involve additional stakeholders in line with CSF3 and CSF4. The resulting requirements should be slightly adjusted in favor of the user, who generally has a weaker negotiation position. Additionally, it is important to create sufficient innovation pressure on the supplier. In simple terms, a compromise must be found between what is required and what is realistically achievable (Ajmal et al., 2020).

In terms of personnel requirements, it is crucial to assemble a project team with sufficient capacities in line with CSF6, composed of individuals with relevant competencies, including external experts in all relevant areas (legal, procurement, technical, financial, healthcare, etc.). PPI projects require more expertise from personnel compared to conventional public procurement. It mainly involves gaining initial experience, where the author recommends leveraging knowledge transfer from more experienced procurers..

In the actual process of awarding the public contract, the most significant success factor is CSF11, where the criteria for selection and awarding must be clearly defined and based on the subject matter of the contract. The significant challenge here lies in making the individual bids easily comparable. Unlike conventional procurement procedures, the evaluation criteria should primarily focus on the desired outcome and life-cycle costs rather than the approach to achieving the result and investment costs.

The effective management of risks throughout the project is another important success factor (CSF12), as PPI projects are inherently more risky than traditional projects. It is crucial for the public sector to guarantee the assumption of a portion of the risks while being aware of the risks associated with innovative solutions and clearly defining specific requirements for the operational parameters of the delivered solution in collaboration with the supplier. This can be achieved through Service Level Agreements (SLAs) or long-term testing of outputs after implementation (Caloghirou et al., 2016;).

Another success factor within the procurement process group is the need for detailed planning and control not only during the planning phase but also throughout the subsequent implementation phases. This is again related to the significant risks involved in innovative solutions, as the actual outcomes may differ considerably from the initially proclaimed outcomes (Caloghirou et al., 2016).

The last important factor in this section is financial evaluation, where PPI projects should emphasize the overall financial efficiency of the solution (MEAT), considering not only the procurement cost but also the sum of investment and operational costs over the solution's

lifetime, as well as other parameters such as innovation, environmental impacts, social impacts, and so on.

6. Suppliers

Critical Success Factor KF15: Adequate demand from the private sector was not identified through the Delphi method. However, it has been identified in the literature (Kalvet, 2010; Uyarra et al., 2014) and during the surveys conducted in the RI2Integrate project and the Water Saving Solution project at the High Polytechnical School in Brno.

Suppliers have been consistently put in a position where they must offer exactly what is demanded at the lowest possible price. As a result, they have refrained from showing any initiative, as it often leads to failure in the tendering process. It is therefore crucial to focus on raising awareness and conducting informative activities that target suppliers and aim to change this established standard. Experiences from the pilot run of PPI2Innovate and the questionnaire survey among suppliers in the Water Saving Solution project at the High Polytechnical School in Brno have shown that some suppliers are not interested in participating in PPI tenders due to a lack of experience with similar types of contracts and being unprepared for them. However, experiences from abroad demonstrate that this concept is viable and can be effectively supported through training for potential procurers in the areas of preliminary market consultations and PPI. The aforementioned supplier questionnaire also indicates that half of the procurers were willing to participate in public procurement through PPI. The same applies to the companies approached during the pilot run of RI2Integrate. The willingness to engage is present, but there is a lack of opportunities and experience.

Conclusion

The presented article summarizes proposals for strengthening the critical success factors of the PPI concept. The identified critical success factors have been divided into four groups based on who can influence them or who they primarily concern. The target groups according to which the critical success factors are divided into individual areas are: Policymakers, Institutions, Specific procurement teams, and Suppliers. The presented article presents the research outputs conducted as part of the habilitation thesis of one of the authors.

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Analysis of Key Macroeconomic Indicators and Their Relationship to Unemployment in the Czech Republic

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Abstract
The Czech Republic boasts one of the lowest unemployment rates in the European Union, indicating a demand-supply imbalance in the labour market. This situation has implications for other labour market-related variables, such as nominal wages and labour productivity. In 2021, there was a significant increase in the inflation rate, reaching 15.1%. This development also impacted the trajectory of real wages.
This article uses statistical analysis to predict the future economic trends of essential macroeconomic indicators related to the labour market. The dependence of individual variables on the unemployment rate will be determined through correlation analysis. Additionally, the study aims to assess the degree of independence between the unemployment rate and selected economic indicators, including nominal wages, labour productivity, real wages, and inflation.
Future developments will be forecasted based on linear time series regression models for each examined variable. The statistical results will be economically interpreted in light of the current economic situation.
Overall, the results of the correlation analysis indicate a significant statistical relationship between unemployment and nominal wages, suggesting a strong negative correlation between these variables. This finding aligns with macroeconomic expectations that an increase in unemployment leads to a decrease in the rate of nominal wage growth. The correlation analysis between unemployment and inflation reveals a moderate indication of a negative relationship between the two variables. However, the correlation analysis between unemployment and labour productivity and between unemployment and real wages indicates weak and insufficient evidence of any significant relationship between these variables. Therefore, further analyses and consideration of additional factors are necessary to obtain a more comprehensive and reliable understanding of these relationships.

Key Words
unemployment, correlation analysis, Spearman correlation coefficient, prognosis, wage

JEL Classification: E24, C02

Introduction

Economic performance, unemployment rate, and GDP are crucial macroeconomic factors influencing regional development (Mura et al., 2020; Vigliarolo, 2020). The study (Wang & Le, 2018) emphasizes the significant influence of unemployment as a leading macroeconomic indicator of economic growth.

The results of other studies (Mura et al., 2020; Pawęta, 2018) indicate a weak relationship between unemployment and real GDP in the Visegrad Group (V4) countries. Pawęta (2018) highlights that the crisis had a delayed impact on the V4 economies. Their research findings suggest that the post-crisis period influenced the economies and labour markets

of the V4 countries. Research from Nigeria (Adelowokan et al., 2019) demonstrates that poverty resulting from unemployment has a significant short-term impact on economic growth while showing a positive relationship. The unemployment rate and GDP have also been affected by the Covid-19 pandemic. The results of the study by Su et al., (2022) emphasize that the pandemic significantly increases the unemployment rate in predominantly European economies. Furthermore, they found that employment trends in European countries are almost similar to those observed in the United States.

The reviewed empirical studies provide insights into the intricate relationship between economic performance, unemployment rate, GDP, and regional development. They reveal varying degrees of association, with some indicating a weak connection while others highlight more significant effects. The Covid-19 pandemic has introduced additional dynamics, significantly impacting the unemployment rate and employment trends. Understanding these relationships and their implications is vital for formulating effective economic policies and promoting sustainable regional development. Further research is needed to explore the underlying mechanisms and identify strategies to mitigate the adverse effects of unemployment on economic growth.

1. Methods of Research

Data for the analysis of fundamental macroeconomic indicators were obtained from identified primary and secondary sources. Publicly available databases, such as the Czech Statistical Office and Czech National Bank, provided relevant quantitative information. Additionally, information from conferences, professional literature, trade journals, and workshops related to the topic was utilized. The data will be analyzed for the years 2008 to 2022, which were available at the time of publication.

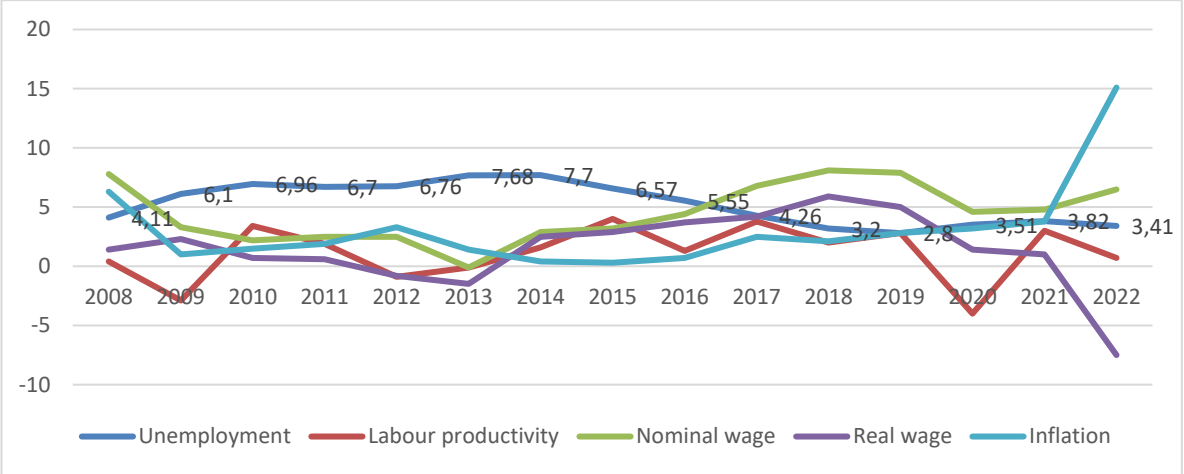
Correlation analysis allows for assessing the extent to which the change in one variable is associated with the change in another variable. A positive correlation indicates that an increase in the value of one variable is associated with an increase in the value of the other variable. In contrast, a negative correlation indicates that an increase in the value of one variable is associated with a decrease in the value of the other variable. To quantify the degree of correlation between variables, Spearman's correlation coefficient will be used, which is suitable for evaluating relationships between variables that may not be linear (Hedvičáková & Pozdílková, 2023). This coefficient is used to assess relationships between variables that are not necessarily continuous or exhibit a non-linear relationship. The values of Spearman's correlation coefficient range between -1 and 1. Values close to 1 indicate a strong positive correlation, while values close to -1 indicate a strong negative correlation.

The paper aims to evaluate the situation in the labour market and its future development, as well as to demonstrate the degree of independence among economic indicators. Four variables will be examined in the article: nominal wages, labour productivity, real wages, and inflation. The correlations between these variables will be evaluated using correlation analysis and Spearman's correlation coefficient, thereby demonstrating which variables are dependent on the unemployment rate. Values approximately between -0.5 and 0.5 indicate uncorrelated (independent) variables. The objective is to demonstrate the degree of independence between the unemployment rate and selected economic indicators such as nominal wages, labour productivity, real wages, and inflation. The graphical representation of the correlations will be conducted using Matlab.

2. Results of the Research

The last examined years have brought significant changes that have had an impact on the analyzed economic variables. In 2019, the world was hit by the Covid-19 pandemic. Subsequently, there was a war conflict in Ukraine and a massive increase in energy and food prices. These aspects have had impacts on the inflation rate, which reached 15.1% in the Czech Republic in 2022 (see Fig. 1). Because there is a labour demand surplus in the Czech labour market compared to labour supply, there has not been a significant increase in the unemployment rate. Therefore, the Czech Republic has one of the lowest unemployment rates among EU countries.

Fig. 1: Development of economic variables in percentages



Source: authors' calculations, data from (Czech Statistical Office, 2023)

In this chapter, a correlation analysis of unemployment and selected indicators will be conducted: nominal and real wages, labour productivity, and inflation. Other variables will not be extensively discussed in this paper due to its scope.

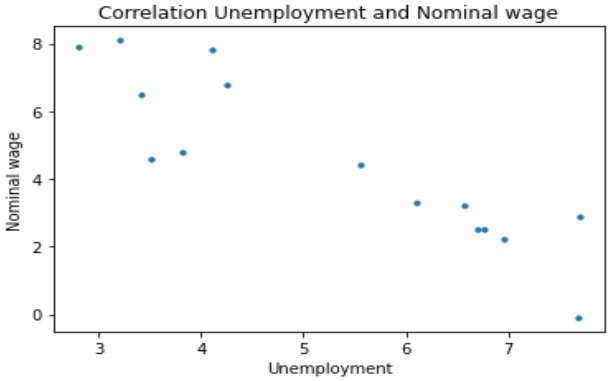
Tab. 1: Correlation analysis

	Unemployment	Nominal wage	Labour productivity	Real wage	Inflation
Unemployment	1.000000	-0.892370	-0.002344	-0.133566	-0.497666
Nominal wage	-0.892370	1.000000	0.185378	0.297095	0.418914
Labour productivity	-0.002344	0.185378	1.000000	0.264067	-0.114283
Real wage	-0.133566	0.297095	0.264067	1.000000	-0.741902
Inflation	-0.497666	0.418914	-0.114283	-0.741902	1.000000

Source: authors' calculations in Matlab, data from (Czech Statistical Office, 2023)

The result of the correlation analysis between unemployment and nominal wage (-0.892370) indicates a strong negative relationship between unemployment and nominal wage (see Tab. 1 and Fig. 2). This means that as unemployment increases, the nominal wage decreases, and vice versa. This negative correlation may be a result of economic factors such as supply and demand in the labour market.

Fig. 2: Correlation of unemployment and nominal wage

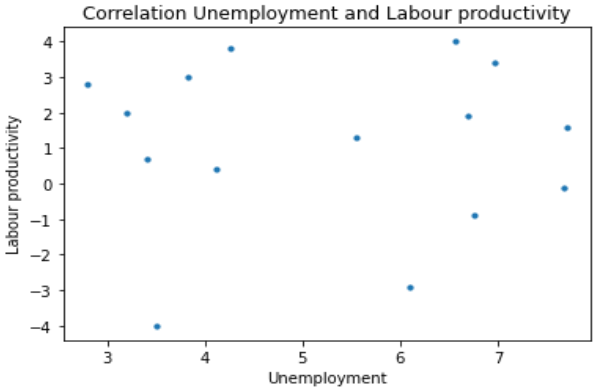


Source: authors' own calculations in Matlab, data from (Czech Statistical Office, 2023)

The result of the correlation analysis between unemployment and labour productivity (-0.002344) suggests independence between these two variables. A correlation value close to zero indicates no significant statistically detectable relationship between unemployment and labour productivity (see Tab.1 and Fig. 3).

However, many other factors can influence the relationship between unemployment and labour productivity, such as economic conditions, political measures, technological advancements, etc.

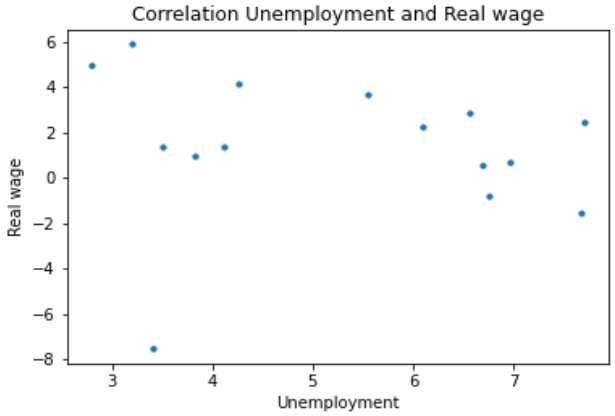
Fig. 3: Correlation of unemployment and labour productivity



Source: authors' own calculations in Matlab, data from (Czech Statistical Office, 2023)

The value of -0.133566 suggests a slight tendency that as unemployment increases, real wages might slightly decrease, and conversely, as unemployment decreases, real wages might slightly increase (see Tab. 1 and Fig. 4). However, this correlation is very low and can be influenced by many other factors that were not considered in this analysis. Among the main factors influencing the relationship between unemployment and real wages are factors such as inflation, economic growth, the labour market, political measures, etc.

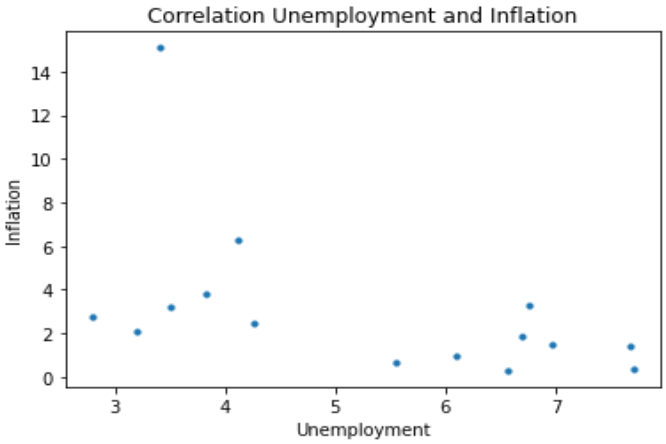
Fig. 4: Correlation of unemployment and real wage



Source: authors' own calculations in Matlab, data from (Czech Statistical Office, 2023)

The result of the correlation analysis between unemployment and inflation (-0.497666) indicates a moderately strong negative correlation between these two variables (see Tab. 1 and Fig. 5). The value of -0.497666 suggests that as unemployment decreases, inflation might slightly increase, and vice versa. This relationship is consistent with expectations according to economic theory, which suggests an inverse relationship between unemployment and inflation, known as the Phillips curve.

Fig. 5: Correlation of unemployment and inflation



Source: authors' own calculations in Matlab, data from (Czech Statistical Office, 2023)

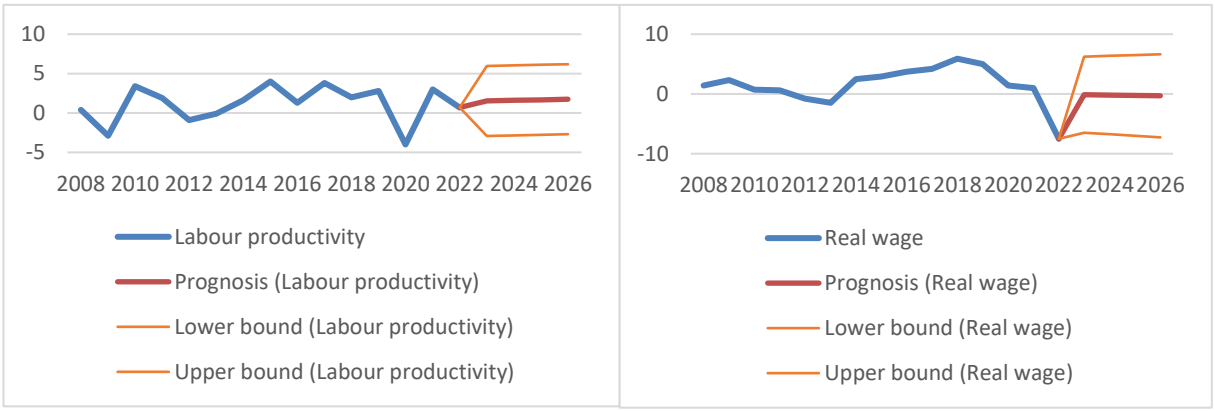
Further analyses and consideration of additional factors can help to understand better these relationships and dynamics between unemployment and the selected variables.

The following graphs show the projected future development of the examined economic indicators. A linear regression model was used for prediction (see Fig. 6 – 8). In this model also lower bound and upper bound were computed using MATLAB software. The lower bound and upper bound of the beta estimate in the regression model is negative or positive for each predictor. The model results show some significant estimates of the beta parameter, but the upper and lower bounds for the beta estimates tend to be in opposite directions for almost all variables. For details see (Montgomery, 2006).

Fig. 6: Forecast of the unemployment rate anad nominal wages in percentage

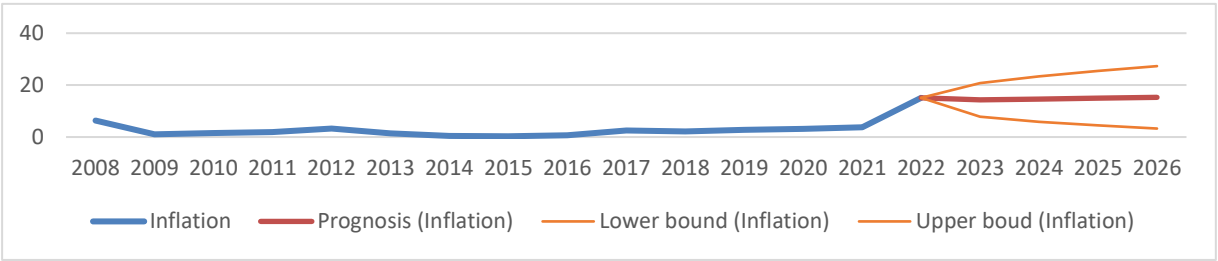
Source: authors' own calculations, data from (Czech Statistical Office, 2023)

Fig. 7: Forecast of labour productivity and real wage in percentage



Source: authors' own calculations, data from (Czech Statistical Office, 2023)

Fig. 8: Forecast of inflation in percentage



Source: authors' own calculations, data from (Czech Statistical Office, 2023)

The previous figures show an expected slight decrease in the unemployment rate (see Fig. 6), roughly stagnant nominal wages (see Fig. 6), labour productivity (see Fig. 7), and real wages (see Fig. 7). The model also predicts stagnation in the inflation rate (see Fig. 8). However, this is a highly inaccurate prediction due to the outlier inflation value in 2022 compared to previous years. According to the forecast of the Czech National Bank, the inflation rate is expected to decrease to 11.2% in 2023 and 2.1% in 2024 (CNB, 2023). The development of unemployment will influence the level of nominal and real wages.

When comparing the forecast figure of unemployment and nominal wages, a negative correlation, as calculated above, is evident. An increase in one variable corresponds to a decrease in the other variable.

3. Discussion

The results of the analysis of the relationship between the unemployment rate and labour productivity in the Czech Republic may vary depending on specific periods, available data, and analysis methods. When interpreting the results, it is also essential to consider whether the correlation was calculated based on long-term or short-term data (Mačí, 2020). Short-term fluctuations in the labour market and wage changes can influence the correlation results, while a long-term analysis would provide a clearer picture of the relationship between these variables.

The results of the correlation analysis suggest a strong negative correlation between the unemployment rate and nominal wages and a moderately strong negative correlation between the unemployment rate and inflation. This result supports the theory of the Phillips curve, which is an economic model relating to unemployment and inflation. In 1958, A.W. Phillips published an article analyzing the relationship between the unemployment rate and the rate of change in nominal wage rates based on empirical data. His results showed a negative relationship between the rate of wage inflation and the unemployment rate - a lower unemployment rate is associated with a higher inflation rate and vice versa. This relationship later became known as the original wage version of the Phillips curve.

In the 1960s, P.A. Samuelson and R.M. Solow expanded on this theory and focused on the growth rate of nominal wages and price inflation. They demonstrated that a high unemployment rate is associated with a decrease in the inflation rate. However, in the late 1960s and early 1970s, there was a significant change in the economic situation, where factors other than unemployment (such as oil shocks) began to affect the movement of price levels and wage levels. These oil shocks increased both the price level and unemployment, along with a decline in output. These new factors contradicted the expectations based on the classical Phillips curve. As a result, the empirical mismatch between inflation and various measures of slack was interpreted by some researchers as evidence that the Phillips curve weakened or even disappeared (Blanchard et al., 2015; McLeay & Tenreyro, 2020; Vigliarolo, 2020). Although a slightly strong negative correlation between the unemployment rate and inflation has been shown, the authors agree that the Phillips curve has weakened. In the Czech Republic, there is a long-term shortage of labor force that does not respond to the market situation. This area will be further analyzed. On the contrary, some studies state that the Phillips curve always applies, even today (McLeay & Tenreyro, 2020).

Further research needs to be expanded to include additional variables and potentially involve the analysis of multiple countries. It is also necessary to examine the impacts of the current economic situation on the development of unemployment and other macroeconomic indicators. Due to the time lag emphasized by researchers such as (CNB, 2023), Mura et al. (2020) and Pawęta (2018), it is essential to reanalyze this period with a time interval in mind.

Conclusion

The overall result of the correlation analysis between unemployment and nominal wages (-0.892370) can be considered a significant statistical indicator, indicating a strong negative relationship between these two variables. This situation aligns with

macroeconomic assumptions that an increase in unemployment leads to a reduction in the pace of nominal wage growth.

The result of the correlation analysis between unemployment and labour productivity (-0.002344) can be regarded as very weak and insufficient evidence of any significant relationship between these two variables. Similarly, the result of the correlation analysis between unemployment and real wages (-0.133566) can be considered a very weak indication of a relationship between these two variables. It is advisable to conduct further analyses and consider additional factors to achieve a more comprehensive and reliable understanding of this relationship.

The result of the correlation analysis between unemployment and inflation (-0.497666) can be considered a moderately strong indication of a negative relationship between these two variables. However, this relationship is not absolute and may be influenced by other factors such as changes in labour productivity, international trade, wage expectations, and central bank policies. Additionally, the identified correlation alone does not provide information about the causal relationship between unemployment and inflation.

The analysis results are also influenced by other variables, such as the macroeconomic situation. In 2019, the examined variables were primarily affected by the Covid-19 pandemic, the conflict in Ukraine, and a sharp increase in energy and food prices. All these factors contributed to significant inflation growth. Due to a shortage of workers in the labour market and the resulting imbalance of labour demand and supply, the unemployment rate increased gradually. According to macroeconomic predictions, the unemployment rate should not significantly increase unless a recession occurs.

Acknowledgement

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Plastic Reduction as Part of Sustainable Golf Tourism in Slovakia

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Abstract

Sustainable tourism in golf is playing an increasingly important role in efforts to minimise the negative social and environmental impacts of the sport. Golf resorts typically partner with local suppliers, creating jobs for local residents, providing opportunities for local communities and investing in local education and infrastructure. In economic terms, golf tourism contributes to destination development. Tourists coming to a golf resort contribute to the local economy through accommodation, dining, and leisure activities. The increased flow of tourists creates new opportunities for business development. All of these factors contribute to the economic growth and prosperity of the destination. The aim of the paper is to define the concept of sustainability in golf tourism and its impact on the environment. The sustainability aspect in golf tourism seeks to reduce its environmental footprint through various measures including water management, energy, waste minimization and biodiversity conservation. Golf resorts are implementing eco-friendly practices such as irrigation systems using rainwater, limiting the use of pesticides and especially reducing plastic. In this way, they seek to minimize the impact on the environment and ensure its long-term sustainability. In this paper we have chosen the methodology of bibliometric analysis of scientific production on the topic of sustainable tourism in the Golf Web of Science database. Since 1996, we identified 50 articles published in scientific journals. Environmental impact is the most numerous content. Therefore, we further address the environemntal issue in the Slovak Republic environment. Based on empirical research, we have found that the most successful project in the field of environmental measures is the introduction of a mandatory deposit system, which has contributed most significantly to reducing the amount of plastic on golf courses in Slovakia.

Key Words

golf, sustainable tourism, waste management

JEL Classification: Q01, Q26, Q51, Q56, L83

Introduction

Sustainable tourism is now a key aspect of global efforts to protect the environment and promote sustainable development (Go, 2023). This concept has significant implications for various sectors, including golf resorts and tourism associated with this sporting activity, such as air travel. Golf tourism is a popular form of recreation and has a significant economic impact almost worldwide (Haldane, et al., 2023). The current wave of interest in sustainability brings new challenges and opportunities for the golf industry. Sustainable tourism in the industry aims to minimize the negative impact of golf activities on the environment and local communities, while at the same time reinforcing the positive social and economic aspects. In this paper, we outline best practices and strategies that can be implemented to achieve sustainable development in the tourism industry. The last decade has witnessed a growing awareness of environmental issues and

the need to protect biodiversity (Thu & Đinh, 2022). In this context, it is imperative that the golf industry takes responsibility and implements measures that minimise environmental impact and contribute to sustainable tourism.

Plastics are the ecological nightmare of modern civilisation. We consider plastics reduction to be a necessary and topical issue that also applies to golf. Plastics, especially single-use plastic products, have become a significant environmental problem and threaten our environment, health and biodiversity (Dhiman, Pant, 2022). Plastic reduction is thus essential to preserve our planet and ensure not only sustainable tourism but also the overall future of humanity (Tahiri, Kovaçi, & Trajkovska, 2022). There are many reasons why it is necessary to reduce the use of plastics. The first, is their long degradability. Plastics take hundreds of years to decompose, leading to their accumulation in landfills and pollution of the natural environment, especially groundwater. In addition, the production of plastics requires large quantities of fossil fuels, which contribute to greenhouse gas emissions and climate change.

We also see plastic waste in places where we would not expect to see it, such as beautiful beaches. We don't just find plastic in the oceans. Predictions for 2050 say there will be more plastic in the seas than fish (Rakhmayanti, 2022). Microplastics have also been discovered for the first time in freshly fallen snow in Antarctica (Aves, et al., 2022). This has drawn attention to the global scale of plastic pollution, with scientists reporting that on average up to 29 microplastic particles are found in one litre of melted snow. Their concentrations in Antarctic snow samples were three times higher than average. The snow samples collected were from a remote area of the Ross Sea where microplastics in snow were not expected. More than a dozen different types of microplastics were found in the Antarctic snow. The most prevalent were particles of polyethylene terephthalate (PET), which is used to make plastic bottles.

Even more alarming was the news that microplates have also been discovered in human blood and thus can travel throughout the human body and lodge in individual organs (Leslie, et al., 2022). Previous research has confirmed that humans consume microplastics in food such as fish, but they also enter our bodies from water or air. Microplastic particles have also been found in human excreta. Recent research has shown that up to half of blood samples contained polyethylene terephthalate plastic.

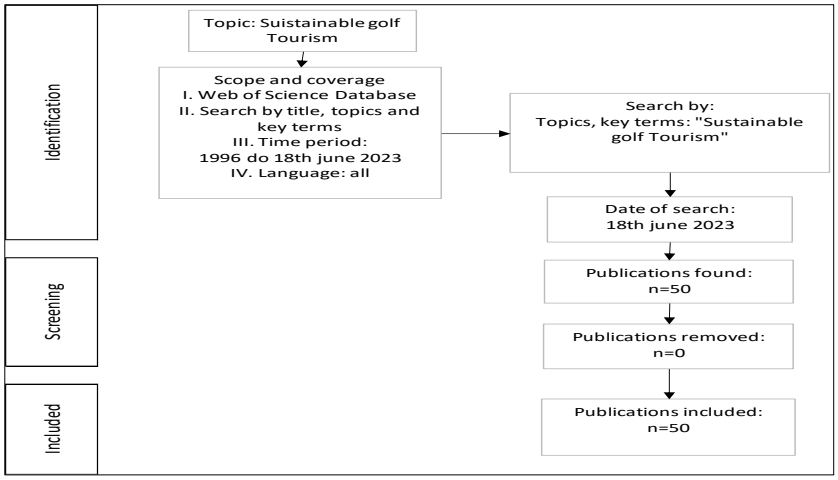
However, it is impossible to live without plastics as they are part of our lives. Plastics are not only destroying our lives, they are also saving them, as plastic components are used in medicine. Plastic waste makes up all areas of our existence. Every minute, 1 million plastic bottles are bought worldwide (Pomponi, et al., 2022). The sports industry is no exception and thus of course the golf tourism industry.

1. Methods of Research

Bibliometric analysis is a useful tool for evaluating and quantitatively examining scientific literature (Donthu, et al., 2022). The aim of this scientific paper is primarily to analyse publication trends on a compilation of publications related to sustainable tourism in golf in the Web of Science database. In this database, we analyzed papers whose title includes the keywords "suistainable golf tourist", retrieved on June 18, 2023. The Web of Science database was selected because it has large sets of documents. We identify relevant articles, books, and conference papers that touch on this topic from 1996 to 2023. This

bibliometric review is based on the selection strategy, the PRISMA research protocol, and the flow chart (Page et al., 2021) (see Fig. 1). We present the bibliographic overview in pictorial form, using the Visualization of Scientific Outputs program of the Netherlands University of Leiden, VOSviewer version 1.6.18. After the bibliometric analysis, we proceed to the secondary objective, which is to identify, through empirical research, the possibilities of plastic reduction in the golf reserves of Hruba Borsa and Penati.

Fig. 1: Selection strategy and research protocol for the bibliography "Sustainable Tourism in Golf"



Source: authors' own calculations

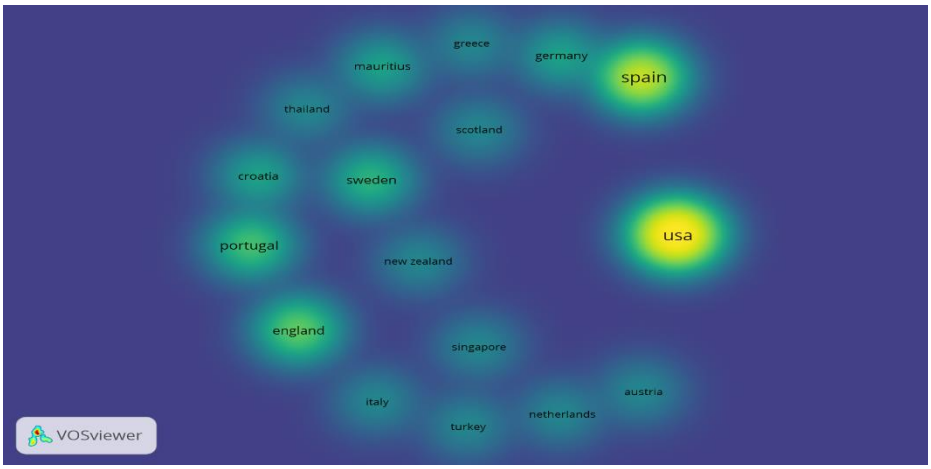
2. Results of the Research

A bibliometric search on golf tourism and sustainability revealed 50 articles published in journals indexed in the Web of Science journal database shows the articles published each year, observing an upward trend in scientific production. The first study published in Elsevier Science Ltd. entitled "Management of Mediterranean coastal dunes" focused on dune management. It discusses measures aimed at preserving and restoring the natural values of coastal sand dunes. It aimed at nature conservation and the wise use of coastal resources and land to be ecologically sustainable. Nature management, coastal protection and erosion, reforestation, agriculture, as well as golf tourism. Their management approach takes into account sustainable use and environmental impact.

2.1 Analysis of publications on sustainable tourism in golf

The articles on the topic come from 24 countries, which can be seen in Fig. 2 displayed by the Vosviewer software. The largest number of articles was published by American authors, reaching 24% of all publications (12 articles). Other authors who contributed to the topic are from Spain with ten articles, representing 20%, Portugal (8%), England (6%), and Sweden (6%).

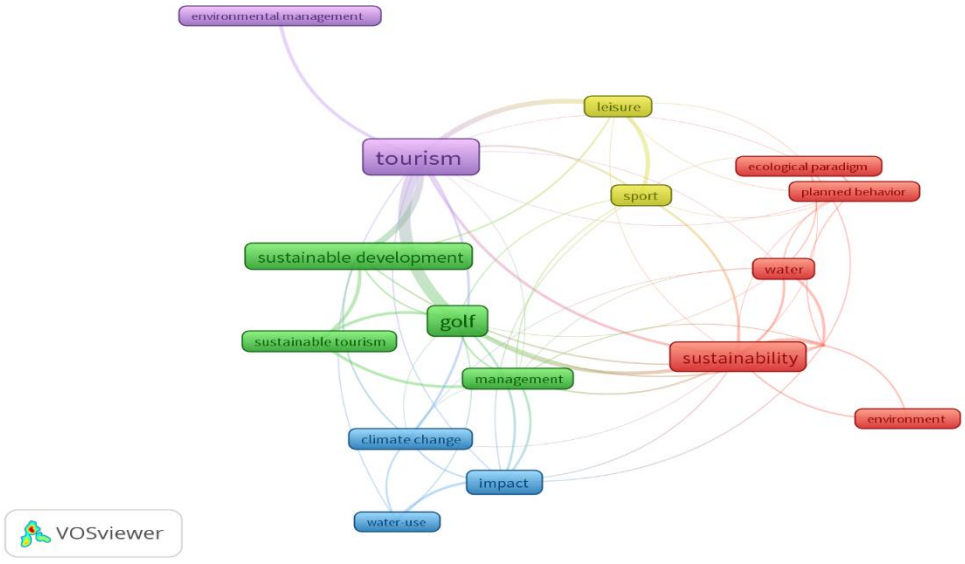
Fig. 2: Expert articles on the topic by country of authors



Source: authors' own calculations by VOSviewer

Next, we analyze the content that was processed in the articles. For this purpose, we examine the relationships between all 254 keywords. The minimum number of occurrences of each keyword has been set to three, thus reducing the number of keywords to 16. Fig. 3 contains the correlations between the selected keywords and a series of thematic clusters are formed. In the middle of the graph is a set of main concepts such as: golf, tourism and sustainability.

Fig. 3: Keyword analysis on the topic of sustainable golf tourism



Source: authors' own calculations by VOSviewer

The visual analysis presented by Vosviewer distinguishes six clusters:

1. The red colour is mainly presented by the concept of environmental impact,
2. In the green cluster, the terms golf course and golf tourism are found, but in particular the term sustainable golf tourism and its management appears,
3. The blue cluster contains concepts related to environmental attitudes and behaviour,
4. Yellow is a cluster that perceives the theme in terms of leisure sports activities,

5. The purple cluster contains the concepts of tourism and environmental management.

2.2 Plastics on golf courses in Slovakia

At sporting events around the world, plastic waste fills the bins. In the golf industry, the biggest polluter is the golfer himself (Fig. 4), who generates the largest proportion of the total plastic waste. The golfer uses golf tees during play to position the ball for the tee shot, but they make up only a fraction of the plastic waste. Plastic bottles accumulate in the garbage bins on a daily basis.

Fig. 4: Top polluters on golf courses

Source: authors' own calculations

The ways in which Slovak golf courses reduce plastic waste are as follows: eco-friendly forms of utensils and cups, wooden signs on the golf course, fertilizers in industrial packaging, eco-friendly cleaning products, soap dispensers, wooden tees, but especially water dispensers with refillable bottles.

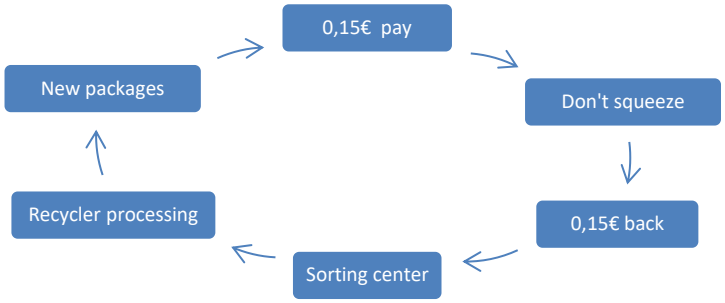
PET bottles carry important fluids that are essential for sports performance. The bottles are also taken by golfers in their bags during practice rounds. The Hrubá Borša Golf Club reports that it dispenses an average of 70 plastic bottles of soft drinks during the week. The change occurs when the tournament is busy. Commercial tournaments, where the number of golfers often exceeds 100 players, the promoter will issue 300 to 400 bottles, depending on the temperature. The Penati Golf Club found that they are able to save over 25,000 plastic bottles per year which means 750,000 kg less plastic waste and this is only due to the introduction of water dispenser stations (Willis, et al., 2019) shown in Fig. 5, where we can also see the freestanding trash bins specifically for returnable bottles.

Fig. 5: Water dispensers and waste bins in Penati Golf Resort

Source: authors' own photo

A mandatory beverage container deposit system is in place in 8 counties of the European Union (Agnusdei, Gnoni & Sgarbossa, 2022). The first country in 1991 was Germany. The deposit system not only reduced the carbon footprint but also reduced the cost of disposal of these plastics. In Norway, this system has been in place since 2000, and the disposal of total waste has been halved. In Slovakia, the deposit system (Fig. 6) was launched on 1 January 2022. In the implementation year, 75% of the deposit packaging was collected.

Fig. 6: Beverage packaging stockpiling system in Slovakia



Source: authors' own calculations

3. Discussion

Tourism is one of the main economic pillars contributing to economic growth and employment worldwide. The number of international travellers has increased more than 50-fold in over 70 years (Obersteiner, Gollnow & Eriksson, 2021). Tourism's contribution to waste generation is steadily increasing, which is accompanied by an increase in negative environmental impact. In a study by Obersteiner et al. (2021), it is reported that one tourist produces an average of 1.67 kg of waste. Based on our knowledge, I confirm the authors' claims that tourism can have a negative environmental impact.

According to Suter (2019), PET bottle and can deposit promotes recycling through a discontinuity effect that turns reluctant recyclers into diligent recyclers. The impact of the warming feeling of being an environmentalist and a member of an environmental group is about the same as the impact of a 15 cent deposit on bottles. Citizens of states with strict recycling laws and bottle deposits have higher recycling rates. The effectiveness of such policy interventions is greater for those who do not yet recycle, have lower incomes, and do not consider themselves environmentalists.

Waste prevention and recycling should therefore be one of the main goals of sustainable tourism in golf, not only in Slovakia (Chaabane et al., 2019). Therefore, we agree with the authors' assertions that sustainability on golf courses starts with the separation of PET bottles and cans, or the complete removal and replacement with glass bottles and spring water dispensers, as the Penati Šajdíkové Humence Golf Resort has done.

Conclusion

Through bibliometric analysis, we show that interest in plastics reduction in the golf industry is not a popular topic, as the number of scientific articles is low. Practically, we are convinced that environmental measures in golf resorts in Slovakia are only in their infancy. However, plastic reduction in golf tourism is an important issue in current global sustainability efforts. Plastics pose serious threats to the environment. Golf resorts are

places where large amounts of plastic materials are consumed and it is therefore crucial to implement measures to reduce their use. Implementing recycling containers and ensuring that plastic waste is properly sorted can lead to more efficient recycling and a reduction in the volume of waste that ends up in landfills. Part of reducing plastics in golf tourism should include education and outreach to players, staff and visitors. Communicating the importance of environmental protection, proper management of plastic waste and encouraging sustainable practices can lead to behavioural changes and the creation of a more sustainable golf community.

Overall, the reduction of plastics throughout the golf tournament industry is a complex and multi-dimensional problem that requires comprehensive measures. A combination of plastic substitution, the introduction of recycling systems and awareness raising activities can lead to a significant reduction in the negative impact of plastics on golf resorts and their surroundings. It is essential that golf clubs, players, managers and stakeholders work together and take responsibility for the environmental sustainability of the golf industry. They must actively participate in efforts to reduce the use of plastics and create a better environment for current and future generations. We encourage further research on the possibility of plastic reduction in the Slovak Republic after the introduction of the plastic bottle deposit system. We propose a quantitative analysis of the impact of this system in the conditions of golf resorts after 5 years of operation.

Acknowledgment

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The Impact of Educational Attainment on Gross Wages: A Comparative Analysis of the Public and Private Sectors in Czechia

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Abstract

This research paper examines the impact of educational attainment on gross wages in the public and private sectors in Czechia, focusing on potential disparities in wage outcomes. Using a comprehensive dataset from the Average Earnings Information System (ISPV) for 2022, we employ regression analysis, while controlling for factors such as age and gender. Our empirical analysis uncovers a positive relationship between educational attainment and wages in both the public and private sectors. However, it is noteworthy that the private sector demonstrates a slightly lower return to education compared to the public sector, as indicated by one specific regression technique employed in our study. However, the second estimation technique does not confirm this result. Additionally, we estimate a stronger negative impact of gender (female) on wage levels in the private sector than in the public sector. Analyzing wage differentials among young workers (aged 24-30) compared to the overall workforce, we observe that the disparities in average earnings are mostly less pronounced at the early stages of their careers. This research deepens our understanding of the relationship between educational attainment, wages, and sectoral differences, providing a foundation for evidence-based decision-making and policy formulation in the context of the Czech labor market.

Key Words

impact of educational attainment on wages, public sector, private sector, wage differentials, Czech Republic

JEL Classification: I26, J31, J45

Introduction

Education is widely recognized as a main determinant of individual economic outcomes, with educational attainment often being linked to higher wages and improved employment prospects. However, the relationship between educational attainment and wages can vary across different sectors of the economy. In this research paper, we aim to explore the impact of educational attainment on gross wages in both the public and private sectors. The central research question guiding this study is: What is the impact of educational attainment on gross wages in the public and private sectors in the Czech Republic? Based on existing literature and theoretical foundations, we posit the following hypothesis: Employees with higher levels of education will have higher gross wages compared to those with lower levels of education, and this effect will differ between the public and private sectors.

A number of studies examining the returns to education and wage differentials between the public and private sectors have been published. Research in this field has been ongoing for several decades (*e.g.* Bender 1998; Borjas 2002; Gittleman and Brooks 2012;

Keefe 2012; Sławińska 2021). One of the most recent studies utilizing the Mincerian function, Montenegro and Patrinos (2022), indicates that, on average, the public sector offers higher wages than the private sector; however, the impact of education on earnings is more significant in the private sector. The topic of the public-private pay gap has been addressed in the Czech Republic by researchers such as Picka (2014) and Picka and Klazar (2016). According to Picka (2014), at the lower decile level, there is a positive discrimination in favor of employees in the public sector, and as the quantile increases, the coefficient becomes negative, penalizing public sector affiliation, especially among men. Utilizing quantile regression, the study Picka and Klazar (2016) examines the wage disparity between the public and private sectors in the Czech Republic. The impact of higher education on the earnings of Czech employees, distinguishing between the public and private sectors and estimating the Mincerian function, was examined by Finardi and Fischer (2017). Their result indicates that obtaining a higher education degree in the private sector leads to a higher wage premium compared to the public sector, based on data from 2009.

Furthermore, we examine the differences in employee remuneration at the beginning of their careers (age 24-30) in the public and private sectors. As young individuals embark on their professional journeys, they often ponder where their education can be best monetized. The text is organized as follows. The first chapter contains a description of the research methodology, chapter 2 presents the results of the analysis, chapter 3 discusses the results, and the final section concludes.

1. Methods of Research

To investigate our research question, we employ a quantitative research approach utilizing a large-scale dataset of individuals' educational attainment and corresponding gross wages in both the public and private sectors. We specifically conduct the analysis using micro-level data from the Average Earnings Information System (ISPV) for the year 2022.. The ISPV is administered by a specific unit within the state statistical service at the Ministry of Labour and Social Affairs of the Czech Republic and it serves as the exclusive provider of structural wage statistics in the Czech Republic. The ISPV data was extrapolated to the entire population using the methodology developed by Červenka, Beran, and Bílková (2022).

For our initial step, we begin by examining the descriptive statistics of the variables. We notice differences in education, age, and wages in the public and private sectors. In our subsequent analysis, we employ regression analysis to assess the impact of educational attainment on wages while controlling for other relevant factors, such as age and gender. This allows us to further explore the observed differences in education, age, and wages between the public and private sectors. Our aim is to explore the impact of educational attainment, distinguishing five levels of education, on gross wages. The analysis proceeds in three steps. First, we examine the impact of education on gross wages regardless of the private or public sector. Subsequently, we analyze the sectors separately. In the third step, we include gender as an additional control variable.

The equations for the multiple regression models are as follows:

$$\log(gross\ wage)^j = \beta_0 + \beta_1\ education^j + \beta_2\ age^j + u^j \quad (1)$$

$$\log(gross\ wage)_G^j = \beta_0 + \beta_1\ education_G^j + \beta_2\ age_G^j + u_G^j \quad (2)$$

$$\log(gross\ wage)_P^j = \beta_0 + \beta_1\ education_P^j + \beta_2\ age_P^j + u_P^j \quad (3)$$

$$\log(gross\ wage)_G^j = \beta_0 + \beta_1\ education_G^j + \beta_2\ age_G^j + \beta_3\ sex_G^j + u_G^j \quad (4)$$

$$\log(gross\ wage)_P^j = \beta_0 + \beta_1\ education_P^j + \beta_2\ age_P^j + \beta_3\ sex_P^j + u_P^j \quad (5)$$

where *gross wage* is the gross monthly wage, *education* is the highest level of education achieved on a scale from 1 to 5, and *age* stands for the age calculated as 2022 minus year of birth. The variable *sex* is dichotomous, with categories representing male and female. The superscripts j represent individual employees, while G and P denote the public (government) and private sectors, respectively. The error term in the regression equations is denoted as u. For young workers (aged 24-30), we specifically examine the differences in average and median wages between the public and private sectors based on educational attainment and compared these differences to the wage differentials observed among all employees in the dataset. To determine the statistical significance of the observed differences in wages, we employ a t-test.

2. Results of the Research

Descriptive statistics are presented in Table 1. Overall, we work with nearly 4.5 million observations. 80% of the observations are from the private sector, and 20% are from the public sector. The average age of employees is 43.5 years and the most common level of education is secondary education with a school-leaving examination (with *„maturita"*). The difference in average gross earnings between men and women exceeds 10,000 CZK, while the difference in medians is 6,500 CZK. When separating the public and private sectors, the average wage for men in public sector exceeds the average wage for women by 7,000 CZK, and the median exceeds by 6,000 CZK (see Tab. 2). In the private sector, the average wage for men is higher by 11,000 CZK than for women, with the median exceeding 7,500 CZK (see Tab. 3).

Tab. 1: Descriptive Statistics – Both sectors

Variable	Obs.	Standard deviation	Mean			Median		
		Total	Total	Male	Female	Total	Male	Female
Education	4 470 448	1,24	2,99	2,90	3,09	3	3	3
Age	4 470 448	11,94	43,50	43,00	44,00	44	43	45
Gross wage / Gross salary	4 470 448	34 775	43 613	48 686	38 491	37 087	40 494	33 900

Note: In education, we distinguish between 5 levels: (1) elementary and incomplete education; (2) secondary education without a school-leaving examination (i.e. without *„maturita"*); (3) secondary education with a school-leaving examination; (4) higher vocational education, and bachelor's or (5) university education. Men account for 50.24% of the observations. The private sector accounts for 3,575,960 observations. Earnings are reported in CZK.
Source: authors' calculations in STATA 16.1 based on ISPV data 2022

Tab. 2: Descriptive Statistics – Public sector

Variable	Obs.	Mean			Median		
		Total	Male	Female	Total	Male	Female
Education	894 488	3,56	3,61	3,54	3	3	3
Age	894 488	46,16	45,44	46,48	47	46	47
Gross wage / Gross salary	894 488	42 413	47 529	40 230	39 024	43 087	37 396

Source: authors' calculations in STATA 16.1 based on ISPV data 2022

Tab. 3: Descriptive Statistics – Private sector

Variable	Obs.	Mean			Median		
		Total	Male	Female	Total	Male	Female
Education	3 575 960	2,85	2,80	2,91	3	3	3
Age	3 575 960	42,84	42,68	43,03	43	43	44
Gross wage / Gross salary	3 575 960	43 913	48 843	37 808	36 570	40 107	32 598

Source: authors' calculations in STATA 16.1 based on ISPV data 2022

As we are interested in the impact of education on gross wages, the following table (see Tab. 4) presents the differences in average gross wages between the public and private sectors for employees categorized by educational attainment. Across all levels of educational attainment, it is evident that the private sector consistently exhibits higher average and median gross wages in comparison to the public sector. The largest wage differential between the public and private sectors is observed among employees with a university education, reaching 30%. Their median wage in private sector is higher by just under 13%. The highest difference in median wages is among employees with secondary education without a school-leaving examination, reaching nearly 20%.

Tab. 4: Average and Median Wages in the Public and Private Sectors in 2022, Categorized by Education Levels (in CZK)

Education	Mean			Median		
	Public sector (G)	Private sector (P)	Difference	Public sector (G)	Private sector (P)	Difference
Elementary and incomplete education	27 037	30 485	12.75%	24 442	28 676	17.32%
Secondary education without a school-leaving examination (i.e. without *„maturita"*)	28 665	34 425	20.09%	27 081	32 451	19.83%
Secondary education with a school-leaving examination	38 855	43 066	10.84%	36 905	37 984	2.92%
Higher vocational education, and bachelor's	43 706	50 602	15.78%	41 138	42 161	2.49%
University	53 836	70 343	30.66%	48 469	54 644	12.74%

Source: authors' calculations in STATA 16.1 based on ISPV data 2022

Before conducting the regression analysis, we tested the fulfillment of four regression assumptions: normality of residuals, heteroscedasticity, multicollinearity, and autocorrelation. After testing the normality of residuals, we have found that the variable is not normally distributed. Moreover, the Breusch-Pagan test revealed the presence of heteroscedasticity. Since the VIF (Variance Inflation Factor) test yielded a value of 1, we can conclude that multicollinearity is not a concern. The Durbin Watson test value is 1.18 which is lower than 2, thus indicating that positive autocorrelation exists in data. We

addressed autocorrelation by applying the Cochrane–Orcutt transformation, resulting in a transformed Durbin-Watson statistic. The results are displayed in Table 5. The first column represents the number of the estimated regression equation.

Tab. 5: Cochrane-Orcutt AR(1) Regression Results

Eq.	Log (gross wage)	Coef.	Std. Err.	t	P>|t|	DW statistic (transformed)	Adj. R-squared
(1)	Education	0.1572578	0.0001474	1066.62	0.000	2.200	0.2052
	Age	0.0022434	0.0000145	154.77	0.000		
	Cons.	9.994552	0.0008297	1.2e+04	0.000		
(2)	Education	0.1762297	0.0002854	617.45	0.000	2.165	0.3045
	Age	0.0045341	0.0000301	150.82	0.000		
	Cons.	9.736174	0.0018491	5265.33	0.000		
(3)	Education	0.1570573	0.0001715	915.67	0.000	2.197	0.1918
	Age	0.002015	0.0000164	122.95	0.000		
	Cons.	10.0262	0.000927	1.1e+04	0.000		
(4)	Education	0.1757642	0.0002823	622.61	0.000	2.147	0.3217
	Age	0.0046087	0.0000296	155.71	0.000		
	Sex	-0.1169347	0.0007812	-149.69	0.000		
	Cons.	9.933274	0.0022558	4403.52	0.000		
(5)	Education	0.160297	0.0001653	969.76	0.000	2.189	0.2517
	Age	0.0023062	0.0000158	145.78	0.000		
	Sex	-0.2026138	0.0003816	-530.96	0.000		
	Cons.	10.29762	0.0010293	1.0e+04	0.000		

Source: authors' calculations in STATA 16.1 based on ISPV data 2022

As we can observe from Table 5, all of the variables are statistically significant at 1% significance level. The estimated coefficient of education is consistently positive, indicating that wages increase with educational attainment. The return to an additional level of education is slightly lower in the private sector than in the public sector. Achieving one level higher of education is accompanied by a 17.6% increase in wages in the public sector and a 15.7% increase in the private sector. Similarly, the positive relationship between age and wage levels holds true. An additional year of age increases wages by 0.4% in the public sector and by 0.2% in the private sector. When we added a dummy variable for gender to the model, the estimated coefficient is negative. The coefficient is -0.12 in the public sector and -0.20 in the private sector, indicating a stronger negative impact of gender (female) on wage levels in the private sector than in the public sector.

Considering the departure from normality in the residuals observed in a simple ordinary OLS regression, we also adopt robust estimation techniques to obtain unbiased standard errors. The results are displayed in Table 6. The first column represents the number of the estimated regression equation.

Tab. 6: Regression Results with Robust Standard Errors

Eq.	Log (gross wage)	Coef.	Robust Std. Err.	t	P>|t|	R-squared
(1)	Education	0.1730295	0.0001635	1058.5	0.000	0.2334
	Age	0.001946	0.0000144	134.8	0.000	
	Cons.	9.960274	0.0007912	1.3e+04	0.000	
(2)	Education	0.1803097	0.0002973	606.49	0.000	0.3086
	Age	0.0050246	0.0000287	175.26	0.000	
	Cons.	9.699015	0.0017567	5521.11	0.000	
(3)	Education	0.1830362	0.0002006	912.31	0.000	0.2353
	Age	0.0017716	0.0000168	105.47	0.000	
	Cons.	9.962518	0.0009255	1.1e+04	0.000	
(4)	Education	0.1789434	0.0002905	615.89	0.000	0.3373
	Age	0.0052347	0.0000287	182.14	0.000	
	Sex	-0.1425731	0.0007499	-190.11	0.000	
	Cons.	9.936672	0.0020247	4907.68	0.000	
(5)	Education	0.187445	0.0001954	959.36	0.000	0.2997
	Age	0.0019289	0.0000164	117.41	0.000	
	Sex	-0.2347815	0.0004045	-580.46	0.000	
	Cons.	10.28287	0.0010214	1.0e+04	0.000	

Source: authors' calculations in STATA 16.1 based on ISPV data 2022

Even when using an alternative estimation technique, all variables in all models are statistically significant. The differences in returns to an additional level of education are nearly indistinguishable in the public and private sectors, unlike the estimates from the previous technique. The positive association between age and wage levels persists. Employing this alternative estimation technique, we find that age exerts a stronger influence on wage growth in the public sector compared to the private sector. Specifically, each additional year of age is associated with a 0.5% increase in wages in the public sector, while the effect is slightly lower at 0.17% in the private sector. When including the gender variable, the results indicate a consistent gender disparity. In both sectors, the coefficient is negative, with the private sector exhibiting a higher magnitude.

Subsequently, we examined the remuneration of young employees (aged 24-30) in the public and private sectors. Both average and median values increase with higher levels of education, and across all categories, we observe higher earnings in the private sector (see Tab. 7).

Tab. 7: Average Gross Earnings in the Public and Private Sectors for Individuals Aged 24-30 in 2022, Categorized by Education Levels (in CZK)

Gross wage/ Gross salary	Public sector (G)	Private sector (P)	Difference	Public sector (G)	Private sector (P)	Difference
	Mean	Mean	Mean	Median	Median	Median
(1) elementary and incomplete education	28 246	31 209	10,49 %	26 101	29 787	14,12 %
(2) secondary education without a school-leaving examination (i.e. without *„maturita"*)	28 846	34 519	19,67 %	28 013	33 063	18,03 %
(3) secondary education with a school-leaving examination	34 787	39 144	12,52 %	34 131	36 394	6,63 %
(4) higher vocational education, and bachelor's	38 539	43 056	11,72 %	36 871	39 045	5,90 %
(5) university education	43 861	48 386	10,32 %	40 315	43 170	7,08 %

Source: authors' calculations in STATA 16.1 based on ISPV data 2022

Both for average gross wages and median gross wages, we observe the highest difference in earnings between employees in the private and public sectors with a secondary education without a school-leaving examination. The t-test revealed that the differences in average wages for individuals aged 24-30 between the public and private sectors are statistically significant for all levels of education. When examining wage differentials between young workers and the overall workforce, we find that disparities in average earnings are mostly less pronounced at the early stages of their careers (cf. the fourth and the last columns of Tab. 4 and Tab. 7).

3. Discussion

In our research, we discovered that the effect of educational attainment on gross wage was statistically significant at all levels. In both the public and private sectors, wages increase with higher levels of education. The control variables of age and gender also emerged as statistically significant. Our primary result indicates that raising the educational level yields an almost equivalent percentage increase in gross wages for both the public and private sectors. The initial observed phenomenon of a slightly lower return to an additional level of education in the private sector compared to the public sector can be attributed to several plausible explanations. One possible explanation lies in the unique skill demands of the private sector, which may prioritize specific qualifications or expertise that are not solely dependent on higher educational attainment. Additionally, it is crucial to consider that the composition of industries and job profiles within the private sector may differ significantly from the public sector, introducing further variations in wage differentials.

We also estimated a larger negative coefficient for gender in the private sector compared to the public sector. We can offer potential explanation for this finding. The public sector often has more standardized pay structures and transparent salary scales. This can help mitigate gender bias by ensuring that pay is determined based on objective criteria rather than subjective negotiations or individual bargaining power. Lastly, we find that wage disparities in average and median wages between the private and public sectors are mostly lower among young workers compared to the disparities we identified among all employees. Young workers may have similar educational backgrounds and qualifications,

especially among recent graduates. This can contribute to smaller wage disparities as their skills and knowledge are more comparable, regardless of the sector they work in.

Conclusion

Through this research, we aimed to contribute to the understanding of the impact of educational attainment on gross wages, taking into account the variations between the public and private sectors. Our analysis yielded three main results. Firstly, we have found that the return on an additional level of education is nearly equivalent in the private sector compared to the public sector. Secondly, we observed a negative relationship between gender (female) and wage levels in both sectors, with a stronger negative relationship in the private sector. Age also has a positive influence on wage levels, with a stronger effect in the public sector. Lastly, when examining wage disparities among young workers, we discovered that the differences in average and median wages between the private and public sectors were mostly smaller compared to the overall employee dataset.

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Sharing Economy in the Accommodation Services – Example of Prague During the Years 2017–2022

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Abstract

The submitted contribution focuses on the issue of the shared economy in Prague in the period from 2017 to 2022. The main goal is to estimate the daily values of realized offers within the framework of the shared economy and to make a comparison with the traditional accommodation market. The presented analysis of the sharing economy market works with data that are modified by the authors of the contribution so that the desired comparison can be made. These data are based on the number of written user reviews (using Airdna, Airbnb, Insiderairbnb and other sources). Output from this analysis is then converted using an algorithm into the number of realized offers on a daily basis. For the market working with traditional accommodation, data from STR Global was used, which represents the market for accommodation services in Prague based on daily data. The work with daily data is one of the key uniqueness of this contribution, as common studies work only with average data, usually over a longer period of time (a month or a quarter). However, such data are inappropriate for the market of accommodation services. Based on the estimates and analyses, it appears that during the period of the covid-19 pandemic, shared accommodation has become more used than traditional accommodation. This conclusion can be attributed to the situation where many tourists preferred private accommodation over regular accommodation facilities.

Key Words

Sharing economy, accommodation service, covid-19

JEL Classification: L83, Z30

Introduction

This paper is focusing on the issue of sharing economy in Prague between the years 2017 and 2022. The main aim of the paper is to estimate the daily values of a number of offers booked via sharing economy and to compare the situation in the sharing economy to the traditional market of accommodation services in Prague during the mentioned period.

According to Richet et al. (2015), the sharing economy is based on the effective distribution of precious resources. Botsman and Rogers (2011), on the other hand, define the sharing economy as a system for sharing underutilized assets for both financial and non-financial reasons. Schor and Fitzmaurice (2015) highlight the digitization of the entire sharing economy ecosystem as a prerequisite for its use. According to Stephany (2015), the sharing economy is an activity that provides free assets in an online environment to reduce the need to own such assets. Agarwal et al. (2019) include distinctions regarding the actual proprietorship of the asset or its further sharing without reference to ownership rights. The texts do not, however, provide a precise and uniform definition. The definition of the sharing economy is not precisely defined. The original

concept is associated with sharing currently available capacities or assets that can be of use to another individual. Sharing these assets may or may not be contingent upon monetary compensation. There are numerous possible motivations for this sharing. There are a variety of perspectives on the sharing economy in terms of the factors that may have contributed to its implementation. Some view it as a form of investment (Cheng, 2016; Richter et al., 2015). Agarwal et al. (2019) mention the significance of the sharing economy in relation to the sustainability and efficient utilization of available accommodation capacities. Botsman and Rogers (2011) describe the original concepts, which will be referred to in this text as collaborative consumption.

From the initial, we can outline the fundamental perspectives on the sharing economy issue from the following points of view:

- The original concept of collaborative consumption
- Investment activity
- Emphasis on sustainability

However, for the objectives of this publication, the emphasis on the sharing economy is predominantly motivated by investment considerations. Nevertheless, it cannot be completely isolated from the original concept, which is understood in this text to be collaborative consumption. The original concept of collaborative consumption is motivated primarily by the sharing of presently available accommodation capacities, as opposed to profit. On the other hand, investment activity is intrinsically associated with profit-seeking from the outset. Other motives are absent or are not the driving force behind such actions.

1. Methods of Research

To estimate the share of the offer of shared accommodation in Prague within the framework of this paper, paid data sources from STR Global Inc. were available and Airdna data too. In combination with publicly available data sources (CzechTourism, CZSO, Airdna, Tomslee, Insiderairbnb and Airbnb) it was then possible to realize the given estimate. Mainly monthly or quarterly data were available, however, some data were available on a daily basis. The daily basis is much more suitable for detailed analysis and especially for comparing the seasonality of the shared economy and traditional accommodation. Data from STR and Airdna reports were used for these detailed analyses.

First, it was necessary to transfer monthly data on realized offers of shared accommodation on a daily basis. This step was carried out using the knowledge of the number of written references of guests using shared accommodation as follows.

$$X_d = number\ of\ references_{d+LoS} \times \frac{1}{\left(\frac{average\ number\ of\ ref.per\ day}{average\ number\ of\ offers}\right)} \quad (1)$$

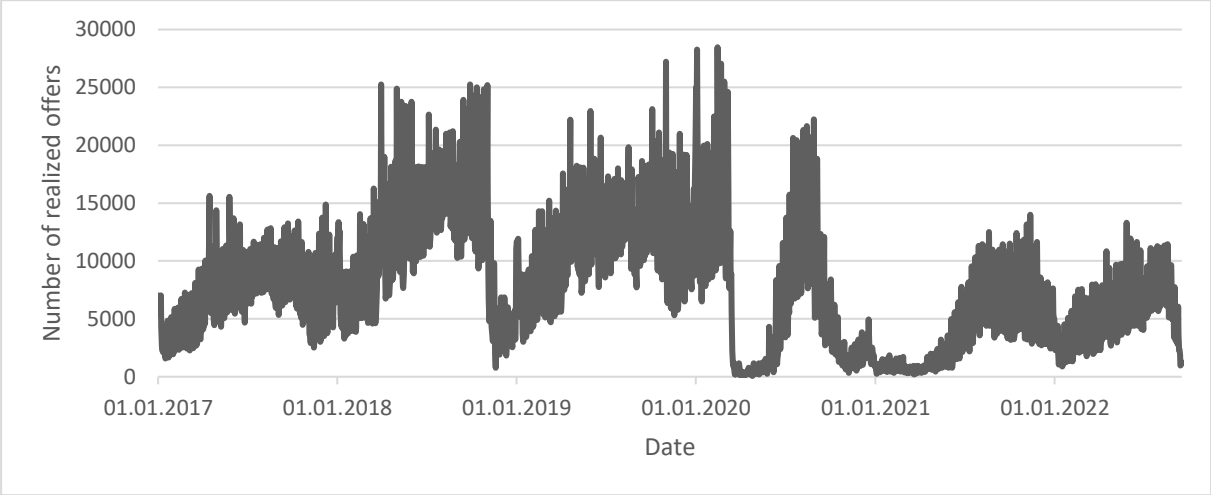
It is evident from the calculation that it is necessary to estimate the share of the number of guests who will write a reference after their stay (the denominator of the fraction under one). At the same time, the calculation works with the fact that the guest writes a

reference only after the accommodation has been implemented, and therefore for estimating the number of realized offers for day d, it is based on the number of references on the day, increased by the average length of stay.

2. Results of the Research

Over two thousand values were estimated, and their determination required calculations using an algorithm that computed the values at various average lengths of stay (LoS) because this data fluctuates over time and affects the final output of estimated values. The script was written in the programming language R. The final representation of these daily values between 2017 and 2022 is shown in the figure below.

Fig. 1: The number of realized offers in the sharing economy (daily basis).



Source: own processing based on data from Airdna, Airbnb, STR, InsiderAirbnb, Tomslee, and Czech Statistical Office (ČSÚ).

The image provided depicts the daily values from January 2017 to September 2022. The exhibited values disclose several intriguing discoveries. Compared to outputs typically presented as average monthly or quarterly values, these daily data are more pertinent for practical purposes, price management, and gaining an understanding of consumer behaviour. The following table contains some annual summary statistics.

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Tab. 1: Selected values of the number of offers (sharing economy)

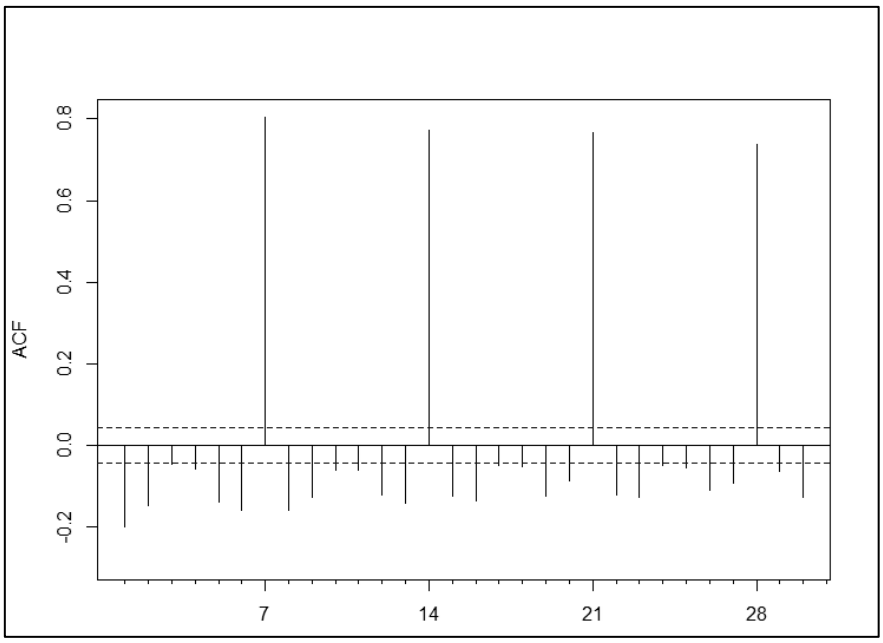
Year	Maximum	Minimum	Median
2017	15626	1579	6378
2018	25231	765	11123
2019	27207	3009	10429
2020	28467	64	3599
2021	13997	191	2909
2022 (until September)	13315	884	4593

Source: own processing based on data from Airdna, Airbnb, STR, InsiderAirbnb, Tomslee, and Czech Statistical Office (ČSÚ).

Based on the data presented in the table above, 2019 was the most successful year in terms of the number of offers, while the maximal value of 28,467 offers per day was attained in 2020. The minimal value of 64 offers was recorded in the same year, indicating the impact of the pandemic situation. The median value attained its lowest point in 2021, a year in which values were generally reduced. The median number of realized offers began to rise in 2022. Despite the fact that 2022 is an incomplete year, it is notable that its utmost value was lower than that of 2021. The market's recovery after the covid-19 pandemic is evident, but it has not yet returned to pre-pandemic levels. Uncertainty exists as to whether the market will revert to its initial values. Inflation and rising housing costs contribute to this situation. According to data from the Czech Statistical Office, the monthly increase in the consumer price index in 2022 ranged between 10% and 18%. In contrast, the range of index growth in 2018 and 2017 was 1.7% to 2.9%.

To better analyze and utilize the output, an ARIMA or SARIMA model-based time series analysis was conducted, taking seasonality into account. The seasonality of the time series was determined to be seven, which corresponds to the autocorrelation function shown in the figure below. This is the autocorrelation function with no modifications.

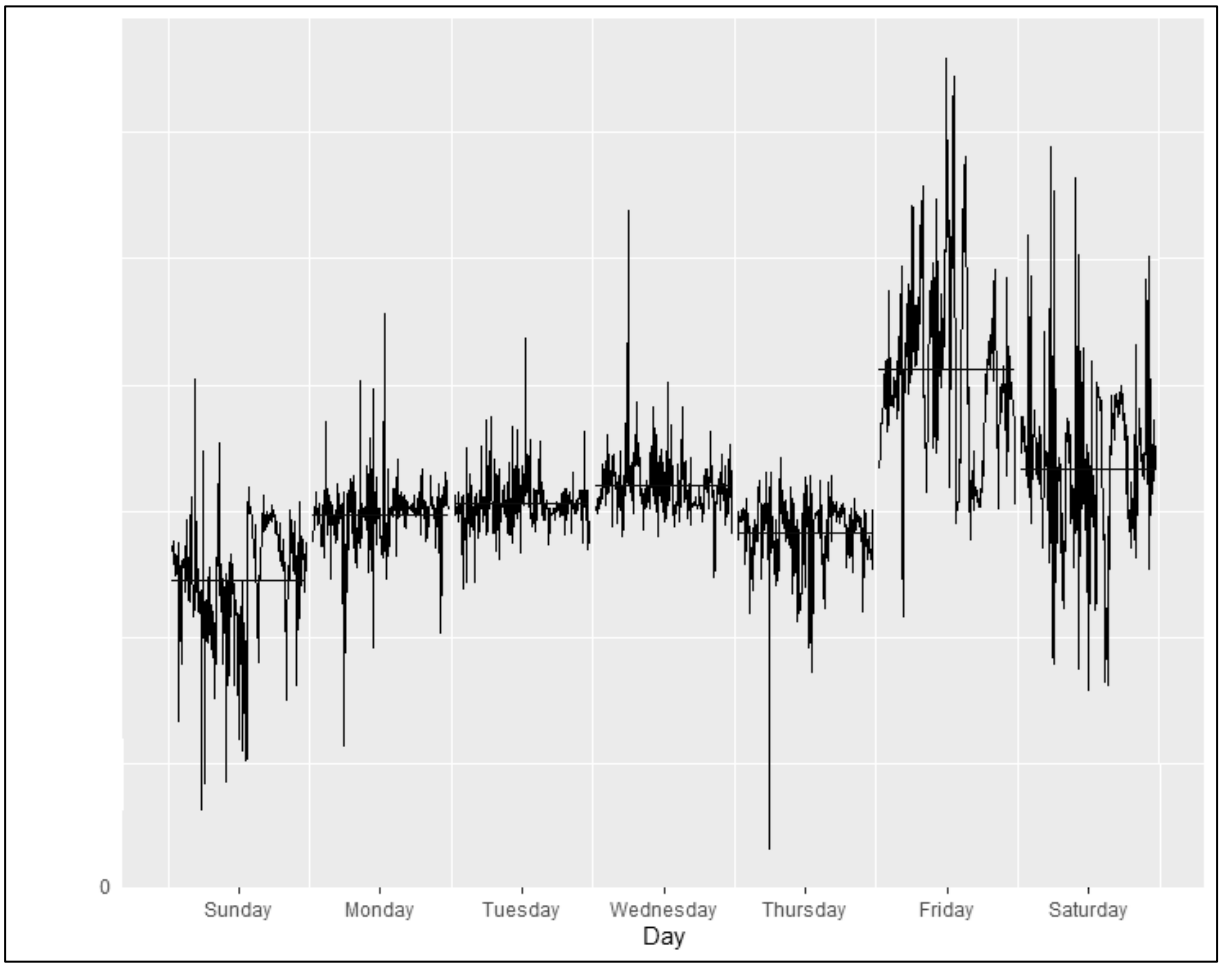
Fig. 2: Autocorrelation function of the shared economy time series



Source: own processing based on data from Airdna, Airbnb, STR, InsiderAirbnb, Tomslee, and Czech Statistical Office.

The above autocorrelation function plot indicates the identification of a seasonality pattern at a level of seven, which suggests a strong weekly seasonality in the data. In addition to this identified seasonality, it is also possible to focus on the output of the number of realized offers by individual days of the week. Such an output is illustrated in the following figure.

Fig. 3: Number of realized offers in the shared economy by individual days of the week



Source: own processing based on data from Airdna, Airbnb, STR, InsiderAirbnb, Tomslee, and Czech Statistical Office (ČSÚ).

The preceding graph indicates that Fridays and Saturdays are the busiest days in the entire time series. Sundays, on the other hand, are the least utilized days. Notably, the calculation was carried out using the R programming language, and the graph is displayed according to the Western convention, where the week begins on Sunday.

Using the R programming language and its libraries forecast, fpp2, and readxl, the comprehensive analysis of the time series was performed. The auto.arima function, which recommends the most appropriate parameters for the ARIMA or SARIMA model based on the AIC evaluation criterion, was utilized extensively. The subsequent SARIMA parameters were suggested for the entire underlying time series: SARIMA(1,0,2)(0,1,2)(7) indicates no discernible trend in the time series and seasonality of 7 (weekly seasonality). This is primarily due to the significant alterations brought about by the covid-19 pandemic, which resulted in a deviation from the long-term trend. In addition, partial differencing was used.

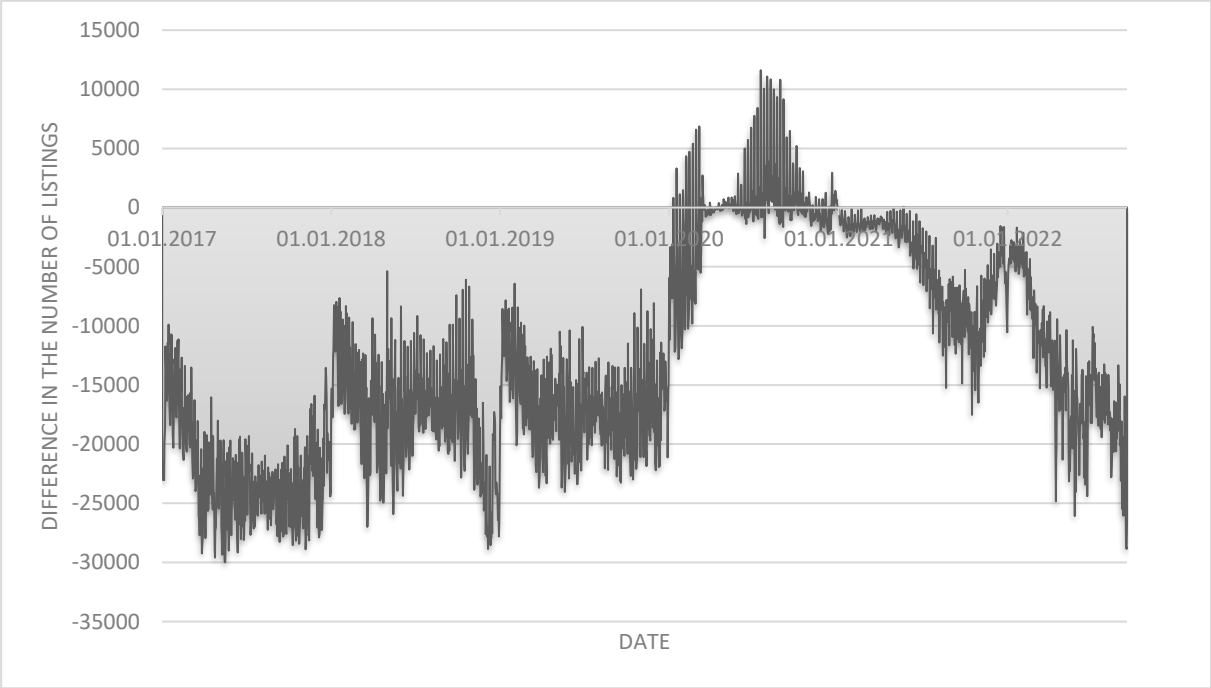
As a final observation regarding the established time series, its primary benefit is its daily basis. Many available statistical datasets utilize monthly or even quarterly mean values. These data may be appropriate for long-term statistics, but they are insufficient for comprehensive analyses that require more intricate information. The time series contains a weekly trend that naturally diminishes in monthly and quarterly data. In the following

segment, this estimation will also be contrasted with data from STR, which is also updated daily and provides information about the conventional accommodation market. Prior to describing these comparisons, it is necessary to validate the estimated data by contrasting them with market data from the Airdna portal. This verification is explained in the text below.

Conclusion

The following figure could be improved by comparing the number of listings in the sharing economy and the traditional accommodation market. The difference, indicated by negative values, indicates that there are fewer listings by that value in the sharing economy. Positive values, on the other hand, imply that there are more listings by that value in the sharing economy.

Fig. 4: Development of the difference in listings between shared and traditional accommodation



Source: Own processing based on data from Airdna, Airbnb, STR, InsiderAirbnb, Tomslee, and ČSÚ.

From Figure 4, it is evident that the situation in 2020 is more of an outlier and a temporary deviation from the otherwise stable values, which hover around -13,000 listings. The sharing economy market has 12,622 fewer listings than the conventional accommodation market, which corresponds to a 45.27 percent market share of the sharing economy in the traditional market.

In conclusion, it can be stated that the sharing economy market showed much faster growth during the pandemic and was also used more often than the traditional accommodation market. The traditional accommodation market is, for understandable reasons, a more rigid market, as evidenced by the above facts. In the future development, it will be appropriate to focus especially on the share of the shared economy market in the traditional accommodation market, as the values shown show that this market appears to be saturated in the longer term.

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Investigating the Perceived Importance and Motivation of the Students of the EUBA Faculty of Commerce Towards the Deposit Refund System

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Abstract

The article deals with ecological awareness and consumer behaviour. The aim of the article is to examine a cohort of students at the University of Economics in Bratislava, specifically students of the Faculty of Commerce, in the context of ecological behaviour. In the article, we focus on (1) identifying the perceived importance and motivation for Deposit Refund System (DRS) in the context of the student's gender and educational level. We also examine the connection between perceived importance and motivation for DRS. In our work, we use primary research, which we evaluate with the help of statistical methods. The results indicate that gender has a significant effect on the perceived importance of the DRS, but a university degree does not. Within the framework of perceived motivation, the investigated factors did not have a significant impact. It can be concluded that there is a link between the importance and motivation for DRS in the studied cohort. The results can be used to raise ecological awareness.

Key Words

the Deposit Refund System, ecology, sustainability, consumers' behaviour

JEL Classification: Q56, Q58, M31

Introduction

Currently, waste management is more intensively addressed not only in Slovakia, but also in the EU and worldwide. Over the past forty years, there has been a dramatic increase in the amount of produced waste, which we consider to be a very important environmental problem for our generation and for all the following ones as well. We all have to solve this problem (Končalová & Dubcová, 2010). In order to ensure sustainable development, it is necessary that all individuals contribute to the protection of the environment through their activities (Wang & Lin, 2017). Each European produce on average around 180 kg of packaging waste per year. Packaging is one of the main users of primary materials. Without measures, the EU would see a 46% increase in plastic packaging by 2030 (Ec.europa.eu, 2022). It is plastic waste and its residues that are considered a threat on a global scale, which requires special attention. For this reason, it is important to find out from the public their opinion on pollution and to find out their knowledge and environmental behavior (Soares et al., 2021). The role of the nation is to promote public awareness and individual participation in environmental protection by making environmental information widely available (McKeown et al., 2002).

Currently, there is still a lack of awareness of one's own responsibility. The Dicio agency conducted a survey in Slovakia, in which it found that among 1,607 respondents, personal comfort, well-being and entertainment are on the highest pedestal for almost three quarters of respondents (77.7%). Slovaks behaved ecologically only if it was not at

the expense of their comfort or money. 17.7% of the respondents answered that they have given up on ecological behaviour because they are convinced that they cannot do anything on their own anyway. Only 4.5% of Slovaks answered that they practice this behaviour despite the fact that ecological behaviour requires effort and may be at the expense of their standard of living. Based on this survey, we can get the feeling that we as a country are irresponsible either due to insufficient awareness of the state of the environment or as a result of resignation (Štefánova, 2011).

It is knowledge and access to it that is a powerful tool for change (Grubor & Milovanov, 2017). Teachers play a key role in education and in the transformation of schools and therefore the entire society (Ferreira et al., 2007). The goal of education for sustainable development is to integrate the principles, values and practices of sustainable development into all aspects of education and learning. These educational efforts will promote behavioural changes that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for current and future generations (Velasco & Harder, 2014). It has been found that individuals tend to behave in the same way as their surroundings and to participate in the same activities (Hu & Jasper, 2006). According to Hormuth (1999), performing certain activities can be motivated by the desire to achieve a certain status, to impress other people or to find one's own identity.

A great way to deal with freely thrown waste is the deposit refund system, which is a fair and transparent system, involving producers, traders, consumers under the supervision of the Ministry of the Environment (slovenskozalohuje.sk, 2022). The DRS was launched in the Slovak Republic from January 1, 2022 after discussing the implementation model. An analysis was created to evaluate the advantages and disadvantages of the system's operation (Malindzakova et al., 2022). Its main goal is to increase the level of recovery of waste from plastic and aluminum packaging. Customers who buy a drink pay a deposit and get their deposit back after returning the empty container for recycling (Du Rietz, 2022). Producers are also part of the system, they have to pay taxes for each package created. This system reduces waste, increases user engagement and increases environmental awareness (Davies, 2017; Fitzsimons et. al., 2010; tomra.com, 2022).

Among the key factors that need to be investigated in connection with consumer behavior and its ecological, environmental and social responsibility are consumer attitudes, readiness to accept/reject an ecological lifestyle (pro-environmental behaviour) and adaptation of the basic principles of socially responsible consumption within consumer behaviour. It is important to realize that these factors are influenced by consumer knowledge and basic demographic factors (Čvirik et al., 2021). Consumer attitudes can be shaped by a combination of cognitive and emotional factors. Attitudes can be seen as beliefs that can lead to certain actions or as beliefs that influence us to not act. Concrete action is considered a conative component that is the result of this process. According to Čvirik & Ölveczká (2020a), a responsible consumer is one who is aware of the social and ecological consequences of his individual consumption and makes efforts to influence it in a positive direction to achieve global prosperity.

Similar research regarding responsible consumer behavior was conducted by Čvirík and Ölveczka (2020a), in which they focused on finding out whether age, income or gender has an effect on the level of responsible consumption. They found that Slovak consumers achieve a slightly above-average level of responsible consumption. Demographic factors such as age, gender, and income have been shown to influence the

rate of conscientious consumption. This research showed that women have a higher interest in ecology and sustainability.

1. Methods of Research

This article aims to investigate the ecological consumer behaviour of students attending the University of Economics in Bratislava. It seeks to explore if those factors play a role in students' engagement with environmentally friendly initiatives, specifically focusing on their participation in the deposit refund system. To gather relevant data, a questionnaire survey was conducted among participants from the Commerce Faculty, allowing for an assessment of their involvement in the deposit refund system and the potential relationship between education, age and green consumer behavior. Statistical analysis, including chi-square tests and directional measures, was used to examine associations between education level, gender, age, and system participation. It is the young generation and especially university students who represent a key segment that needs to be motivated and create awareness among them for the acceptance of ecologically sustainable strategies (Čvirik & Ölveczká, 2020b).

The article is supported by a primary survey in which 149 students of the University of Economics in Bratislava (Faculty of Commerce) participated. It is therefore a deliberate sample. The sample included 41% men, 59% women and 3% other.

The sample error rate was calculated using the formula (Formula 1).

$$n = \frac{\left(z^2 \times p \times (1-p)\right) + e^2}{e^2 + z^2 \times p \times \frac{(1-p)}{N}} \quad (1)$$

Considering the calculation (population size (N) = 1100; Variance in % (p) = 50) it can be concluded that in terms of the sample size (n =149) and the confidence interval (95%) the error rate of the results can be assumed at ±7.5 %.

Research questions formulated by the authors:
R1: How does the gender affect the subjective perception of the importance of participation in the deposit refund system?
R2: How does the education affect the subjective perception of the importance of participation in the deposit refund system?
R3: How does gender influence the motivation to participate in the deposit refund system?
R4: How does the education affect the motivation to participate in the DRS?
R5: How can the connection between perceived importance and perceived level of motivation be understood?

2. Results of the Research

To fulfill the goal, in the following section we focus on answering the research questions (RQ).

RQ1: How does the gender affect the subjective perception of the importance of participation in the deposit refund system?

We recorded the result for investigating the influence of gender on the perceived importance of DRS in a crosstab (Tab.1)

Tab. 1: Impact of the gender on the subjective perception of the importance in participation in the DRS

		Gender		Total
		woman	man	
Do you think that the DRS is important?	Definitely not	1	1	2
	Rather not	1	0	1
	I do not know	3	4	7
	Rather yes	11	20	31
	Certainly yes	67	37	104
Total		83	62	145

Source: authors' own research processed in SPSS

Tab.1 indicatively points to the non-existence of a relationship between the investigated variables. Of course, to support this statement, we subsequently used the Chi-square test. Given that the asymptotic significance is 0.048, we can say that there is a statistically significant relationship between gender and considering the backup concept as important. An Eta value of 0.257 indicates a moderately strong relationship between the variables.

RQ2: How does the education affect the subjective perception of the importance of participation in the deposit refund system?

We recorded the result for investigating the influence of the level of education (degree) on the perceived importance of DRS in a crosstab (Tab.2)

Tab. 2: Impact of the level of education on the the importance in participation in the DRS

		Student of		Total
		the first degree	the second degree	
Do you think that the DRS is important?	Definitely not	1	1	2
	Rather not	2	0	2
	I do not know	4	3	7
	Rather yes	21	10	31
	Certainly yes	78	29	107
Total		106	43	149

Source: authors' own research processed in SPSS

The results from the crosstab (Tab.2) show a high perception of the importance of DRS, but do not indicate the influence of degree. Given that the asymptotic significance is 0.690, we can say that there is no statistically significant relationship between whether the respondent is a bachelor's or master's degree student and considering the concept of backup as important.

RQ3: How does gender influence the motivation to participate in the deposit refund system?

We recorded the results of the frequency analysis in the form of crosstabs (Tab. 3).

Tab. 3: Impact of the the gender on the motivation to participate in the DRS

		Gender		Total
		woman	man	
Are you motivated to participate in the DRS?	Definitely not	2	0	2
	Rather not	4	7	11
	I do not know	6	5	11
	Rather yes	28	27	55
	Certainly yes	43	23	66
Total		83	62	145

Source: authors' own research processed in SPSS

The results again point to a high level of perception of the importance of DRS in both sexes. For a thorough examination of the possible relationship, we used the Chi-square test. Given that the asymptotic significance is 0.194, we can say that there is no statistically significant relationship between gender and the motivation to back up PET bottles and cans.

RQ4: How does the education affect the motivation to participate in the DRS?

We recorded the results of the connection of variables in the form of a crosstab in Tab. 4.

Tab. 4: Impact of the level of education on the motivation to participate in the DRS

		I am student of		Total
		the first university degree	the second university degree	
Are you motivated to participate in the DRS?	Definitely not	1	1	2
	Rather not	10	3	13
	I do not know	8	4	12
	Rather yes	44	11	55
	Certainly yes	43	24	67
Total		106	43	149

Source: authors' own research processed in SPSS

The results indicate a high level of motivation in both groups (Tab.4). Given that the asymptotic significance is 0.349, we can claim that the motivation to reserve PET bottles and cans does not depend on whether the respondent is a bachelor's or master's degree student.

RQ5: How can the connection between perceived importance and perceived level of motivation be understood?

Due to the nature of the variables, we used Spearman's rho as a correlation coefficient for the investigation between the limit and motivation. The results indicate a positive moderately strong dependence (rho = 0.326). We also investigated the possibilities of interpretation on the population. The results of inductive statistics indicate that we can expect dependence also in populations (p value = 4.853^{e-5}; alpha =0.05).

3. Discussion

The results of the article indicate the importance of gender only in the case of the perceived importance of DRS. This phenomenon can be caused by the fact that the female gender often takes on the role of "mother" and is more aware of society's problems (Čvirik, 2021). In the other cases, we did not note the significance of the relationship, which points to a certain universality of this problem in perception within the studied cohort. Identifying the relationship between perceived importance and motivation is also important. In other words, it can be concluded that if students are aware of the importance of DRS, they are more motivated, and vice versa. This effect can be used to increase ecological awareness, while it is appropriate not only to educate students, but also to directly involve them in activities related to awareness. The results can be applied directly in practice.

The work also has certain limits. It is necessary to note that this is a self-reflection of the students, which may indicate a certain distortion in the sense of presenting a higher awareness. In the future, it would be appropriate to study students from other universities and countries, and thus create a comparison. Finding a way to raise awareness in the field of DRS is also important.

Conclusion

We found that there was a statistically significant relationship between gender and considering the backup concept as important, women consider it as more important. Education does not affect a subjective perception about the importance of the DRS. Gender does not affect the motivation to back up PET bottles and cans. The motivation to back up PET bottles and cans also does not depend on whether the respondent is a bachelor's or master's degree student. Our future research will focus on finding out the factors that influence young people's attitude towards participation in the deposit refund system and we will find out whether they encountered a topic related to the importance of the deposit refund system during their studies in an educational institution. To ensure a sustainable future, it is crucial for educational institutions and policymakers to recognize the influence of education on ecological consumer behavior and actively promote environmentally friendly practices among students. By fostering an eco-conscious mindset through education, we can empower the younger generation to become active participants in creating a greener and more sustainable society.

Acknowledgment

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Correlation of Indicators of Development in the Insurance Market in the Czech Republic, Slovak Republic and the EU Average

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Abstract

In 2004 the Czech and Slovak Republics became part of the European Union, which brought many changes influencing the financial markets, including the insurance industry. Czech, Slovak, and European markets are constantly evolving, and they respond to the changes in the environment in which they operate. Given these facts, the paper focuses on analysing the interdependence of the insurance market in the Czech Republic, Slovak Republic, and the EU insurance market (the EU average) and on identifying the conditions of this dependence. The successfully functioning financial sector has a significant positive impact on economic growth; for this reason, the paper will pay attention to the issue of how insurance influences economic growth. To capture the insurance market, many insurance indicators can be used, among which are, in particular, gross premiums written, insurance penetration and density. In comparing the development of the insurance market in the Czech Republic, Slovak Republic and other European countries or the EU average, it is necessary to select the appropriate indicator given. The development of the global insurance market and the individual insurance markets is influenced not only by events in the world economy (economic development, development of the financial markets, the impact of economic or financial crisis), but it is also influenced by many factors that can be divided into two groups according to how on the insurance market act. In our article, we will focus mainly on extrinsic factors. Data for the analyses were drawn from SwissRe (Sigma journal), Eurostat and OECD databases.

Key Words

insurance market, correlation coefficient, correlation of time series, premiums per capita

JEL Classification: C22, C25, G22

Introduction

In connection with the entry of the Czech and Slovak Republic into the European Union, there have been extensive changes affecting the financial market, including the insurance industry. This paper aims to examine whether there is a correlation between the development of the Czech, Slovak and European insurance markets, i.e., the aim is to show the degree of correlation between the Czech and European insurance market and identify the conditions of this dependence. The paper also aims to examine the relationship between insurance and economic growth. Regarding the aim of the paper will be necessary to note which indicators can be used to capture the development of the

insurance market and which of them are suitable for comparison with other countries, respectively with the EU, it will also be necessary to identify factors that affect the insurance market. Currently, none of the research focuses on this very specific area.

1. Methods of Research

Review of Literature

Many specialists from different countries deal with the issue of the influence of macroeconomic indicators on the insurance market and the development of basic indicators of the insurance market. Among the most important studies from recent years, we can mention the study whose results were published in the journal Economic Annals-XXI by the authors Prokpjeva, Kunetsova and Kalayda (2020), which focused mainly on the development of the insurance market and economic growth indicators, relationship in the word. Here they focused on selected countries of Europe, Asia, and former socialist countries, comparing the development of selected indicators (GDP growth rate, insurance premium growth rate and life insurance premiums) of these countries in 2014 and 2018.

The previous research (Haiss, Sümegi, 2007) on the relationship between insurance and economic growth shows differences between less developed countries and countries with developed financial markets, i.e., countries with better-developed financial systems have faster and more stable long-term growth.

In his study, M. Arena (2006) from the World Bank examines the impact of the insurance market (life and non-life insurance) on economic growth through the analysis carried out in 56 countries from 1976–2004. It identified the evidence of a causal relationship between insurance activity on economic growth and the positive influence of life and non-life insurance next evidence that in the case of life insurance is its impact on economic growth driven only by high-income countries.

Ducháčková and Daňhel (2006) also analyse the issue of the level of the insurance market and economic level in the V4 countries, and it can be seen the difference concerning other EU countries, mainly due to the influence of different developments in the past and their position in the overall insurance market in the EU. The position of these countries in the EU market is only 1.47%.

Data and Methods

This paper is focused on assessing the development of dependence on the insurance market in the Czech Republic, Slovak Republic, and the EU. This intent is supported primarily by identifying appropriate indicators to capture the insurance market and suitable for comparison with other insurance markets. To meet the paper's aim, macroeconomic factors affecting the insurance market were also identified, and then statistical analysis was made – correlation of time series. The statistical part of the paper uses data about premiums per capita of Czech, Slovak, and European markets, and for the analysis, used program Statgraphics Centurion XVIII.

The development of the global insurance market and the individual insurance markets is influenced not only by events in the world economy (economic development,

development of the financial markets, the impact of economic or financial crisis), but it is also influenced by many factors, that can be divided into two groups according to how on the insurance market act (internal and external factors).

To the group of internal factors (Daňhel et al, 2006), it can be included, those factors that arise from the behaviour of the insurance market entities, such as:

- insurance,
- reinsurance,
- interest of insurance,
- understanding the importance of insurance, etc.

Selected external factories influencing the insurance market will also be analysed, namely:

- real change of GDP,
- inflation rate,
- unemployment rate.

To fulfil the main objective of the paper, the following elementary insurance indicators (Daňhel et al, 2006) will be analysed:

- gross premium written,
- insurance penetration (premiums of GDP in %),
- insurance density (premiums per capita).

Gross premiums written express premium amounts payable under insurance contracts. Gross premiums written are made firstly of regular premiums and secondly of single premium payments. Using this indicator can be expressed at the level of the country's insurance market, which serves as a measure of the performance of insurance companies in the market.

Given that the size of the country also influences the gross premiums written, it is more appropriate to compare the development of the insurance market among the countries considered indicators – premiums of GDP in % and premiums per capita.

Insurance penetration is based on the ratio of the volume of gross premiums written to GDP and is used to assess the development of the insurance markets.

Insurance density can be defined as the volume of gross written premiums per inhabitant. Using this indicator can also assess the population's interest in insurance protection.

The Correlation coefficient (1) will be used to measures the tightness of dependence, and it can take values from -1 to +1.

$$Cor_{(X,Y)} = \frac{Cov(X,Y)}{\sqrt{s_x^2 s_y^2}} \quad (1)$$

Absolute gain (2) will also be used, which expresses the change in the indicator's value from time t to time $t-1$:

$$\Delta_t^{(1)} = y_t - y_{t-1}. \quad (2)$$

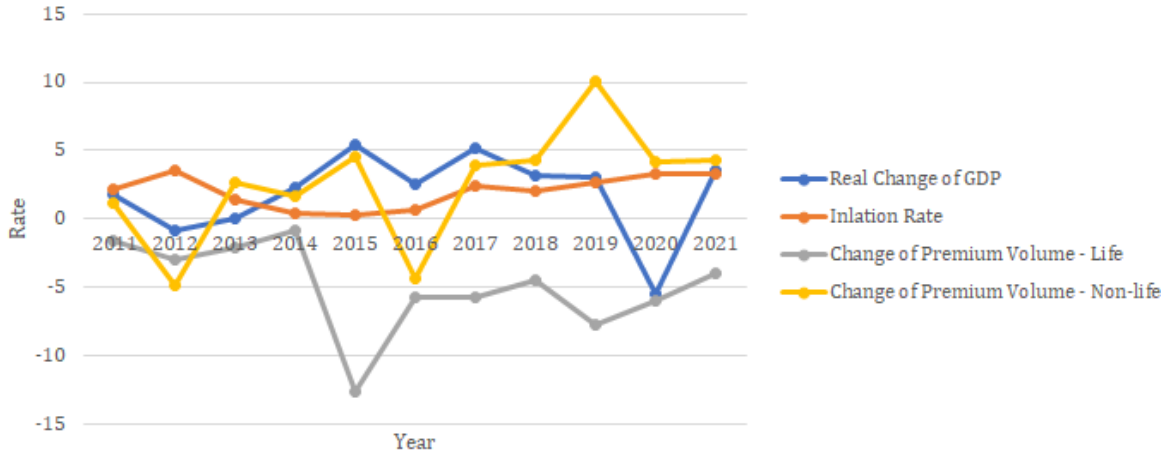
Regarding the availability of data and the consistency of the analyses, the time series from 2011 to 2021 (i.e., 11 years) was selected. The data was drawn from SwissRe (Sigma - Word Insurance journal for 2012–2022), then Eurostat and the OECD database.

2. Results of the Research

Elementary Insurance Indicators and Factors Affecting the Insurance Market

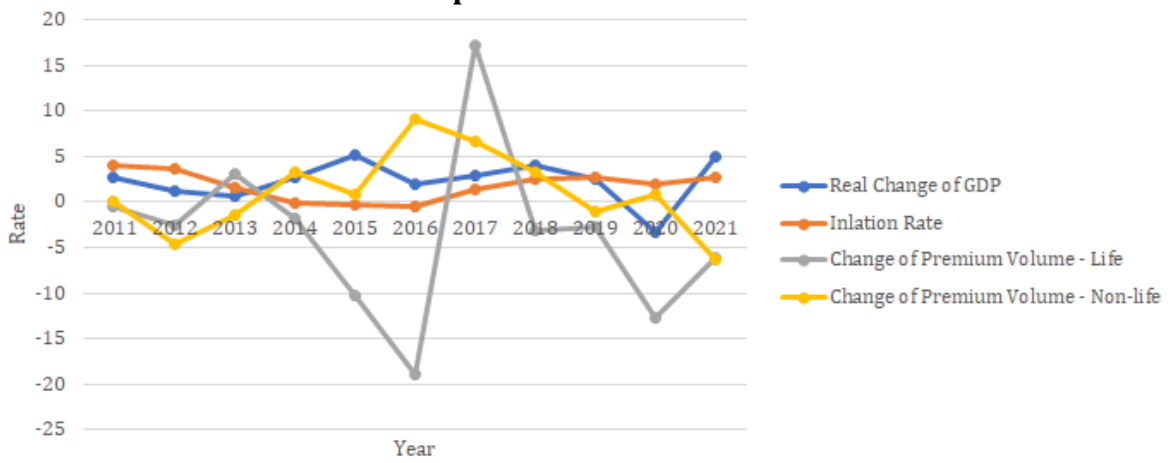
One of the aims is to examine the impact of economic growth on the insurance market in the Czech Republic, Slovak Republic, and EU. The most important macroeconomic factors affecting the insurance market will be considered real GDP changes and the inflation rate compared to the real changes in gross premiums in life and non-life insurance, shown in Fig.1 (Czech Republic), Fig. 2 (Slovak Republic) and Fig. 3 (EU states) below.

Fig. 1: Impact of macroeconomic indicators on the insurance market of the Czech Republic in 2011–2021



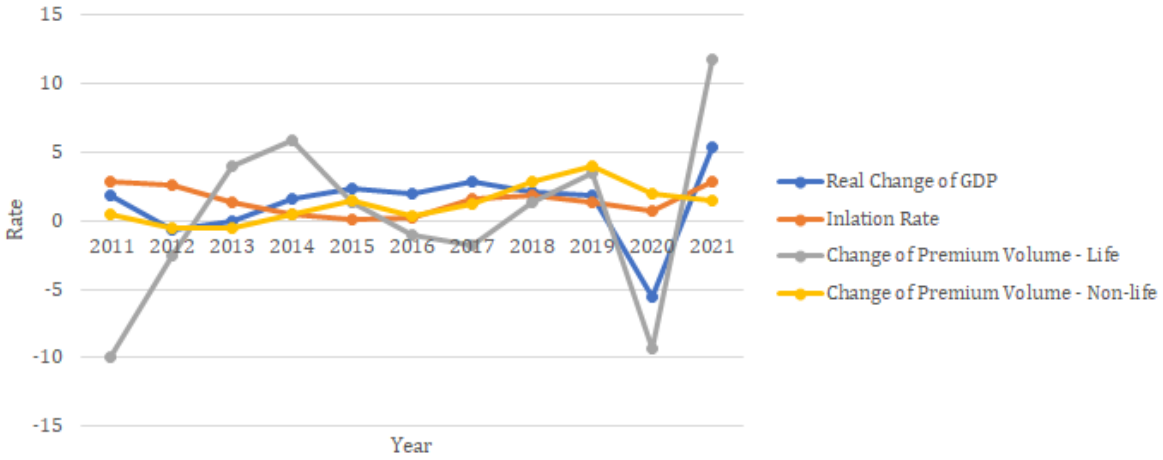
Source: authors' own calculations, data from (SwissRe, 2012–2022), (Eurostat a), 2023), (Eurostat b), 2023)

Fig. 2: Impact of macroeconomic indicators on the insurance market of the Slovak Republic in 2011–2021



Source: authors' own calculations, data from (SwissRe, 2012–2022), (Eurostat a), 2023), (Eurostat b), 2023)

Fig. 3: Impact of macroeconomic indicators on the insurance market of the EU in 2011–2021

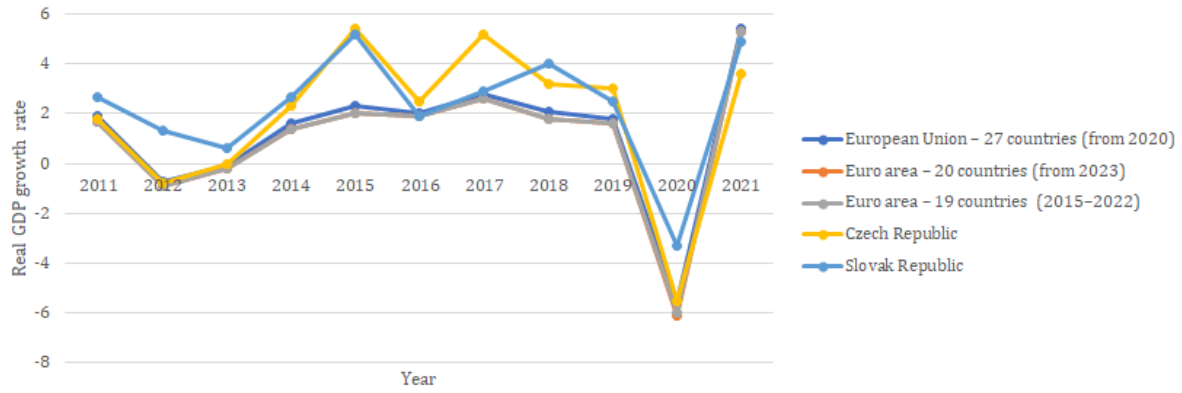


Source: authors' own calculations, data from (SwissRe, 2012–2022), (Eurostat a), 2023), (Eurostat b), 2023)

From the perspective of Fig. 1, 2 and 3, it is impossible to speak of a high degree of alignment of the selected macroeconomic indicators. It can be assumed that the influence of GDP and inflation on the development of the insurance market will become apparent only after a certain period, i.e. after one, two or more periods. The fluctuating trend of this indicator is evident from the development of real changes in the gross prescribed premium. Furthermore, the pictures show fluctuations in the change of premium volume - life insurance, not only in the Czech but also in the Slovak market. The fluctuation in the Czech insurance market in 2015 was caused not only by a legislative change in tax creditability but also by the issue of reinsurance. In addition, the development of this preacher is also marked by the consequences of the Covid-19 crisis in 2020. In the Slovak market, the drastic fluctuation of this indicator in 2016 was also caused by legislative changes, and the increase in 2017 was mainly due to the increase in one-off contracts.

From the figures above, life insurance is an insurance industry that is more dependent on GDP development – for a comparison of the development of real changes in GDP in the Czech Republic, Slovak Republic and EU, see Fig. 4.

Fig. 4: Development of real changes in GDP in the Czech Republic, Slovak Republic, and the EU in 2011–2021



Source: authors' own calculations, data from (Eurostat a), 2023)

Fig. 4 shows an almost identical simultaneous development of real changes in GDP. The main fluctuations in the development of this indicator can be observed in the period from 2014 to 2019, when the development of this indicator was more similar within the Czech and Slovak Republics than in the average of the EU countries, whether it was the EU-27 or the Euro area 20 (or 19) countries. Another significant milestone in developing this indicator was the COVID-19 crisis in 2020.

Correlation Analysis of Czech, Slovak and European Insurance Market

Regarding the accession of the Czech and Slovak Republics to the EU and the fact that the Czech, Slovak and European insurance markets are constantly developing and reacting to changes in the environment in which they operate, the goal was set to analyse the relationship between the Czech and European insurance markets and the Slovak and the European insurance market. For the statistical analysis, time series were used to indicate insurance premiums per inhabitant in the Czech Republic, Slovakia, and the EU. Considering that the country's size influences the indicator of the gross premium written, the number of inhabitants or other external factors, it will therefore be considered a more accurate indicator of the premium per capita. The data were analysed for 2011–2021; results are in Tab.1.

Considering the nature of the data, the Statgraphics Centurion XVIII automatic model selection program was chosen to align the analysed time series. Here the authors were able to choose the following models (Linear Trend, Quadratic Trend, Exponential Trend, S-Curve, Moving Average, Simple Exp. Smoothing, Brown's Linear Exp. Smoothing, Holt's Linear Exp. Smoothing and Quadratic Exp Smoothing). The authors chose Mean Squared Error (MSE) as the Method Selection Criterion.

A quadratic trend was chosen to balance the time series for the premiums per capita in the EU (3), Czech Republic (4) and Slovak Republic (5) indicator.

$$\widehat{T_{y_t}} = 2604.38 - 83.3039t + 7.54942t^2 \quad (3)$$

$$\widehat{T_{x_t}} = 925.93 - 98.5583t + 7.47374t^2 \quad (4)$$

$$\widehat{T_{z_t}} = 490.025 + 20.678t - 1.69992t^2 \quad (5)$$

Obtaining residual values for individual time series was possible considering the selected trends.

Tab. 1 summarises information about the indicator of premiums per capita in the Czech Republic, Slovak Republic, and EU. Therefore, the question arises whether such a connection exists between these time series, which would allow us to explain the changes in one time series in the second time series, i.e., we will deal with the correlation of time series. It is important to note that if we want to determine whether there is a causal relationship between these time series, it is not sufficient to consider the overall trend, but it is necessary to examine whether there is a relationship between irregular components (residues) of the analysed series.

Tab. 1: Correlation of Time Series

Year (t)	**Premiums per capita in the EU in USD (y_t)**	**Premiums per capita in the Czech Republic in USD (x_t)**	**Premiums per capita in the Slovak Republic in USD (z_t)**	***residue* e_y**	***residue* e_x**	***residue* e_z**	**The algebraic sign of 1st difference for y_t**	**The algebraic sign of 1st difference for x_t**	**The algebraic sign of 1st difference for z_t**
2011	2756.7	821.534	551.175	228.077	-13.3114	42.1717	×	×	×
2012	2533.4	732.874	507.802	65.4326	-25.8343	-16.7795	−	−	−
2013	1620.3	746.821	541.741	-802.111	49.3023	4.981	-	+	+
2014	2790.7	711.998	543.637	398.747	60.7215	-1.90144	+	−	+
2015	2411.9	574.04	434.046	35.3066	-45.9419	-116.871	−	−	−
2016	2383.0	554.858	386.59*	6.669	-48.7767	-166.306	−	−	−
2017	2429.1	589.985	926.652	37.9284	-12.25	375.177	+	+	+
2018	2666.0	650.918	477.42*	244.891	35.1352	-69.2341	+	+	−
2019	2374.0	662.696	517.994	-92.1451	18.418	-20.4394	−	+	+
2020	2335.0	660.167	510.202	-191.28	-27.5538	-16.6109	−	−	−
2021	2670.0	756.202	497.605	68.486	10.091	-14.1875	+	+	−

Source: authors' calculations in Statgraphics Centurion XVIII, data from (SwissRe, 2012–2022), (OECD, 2023)

First, we will measure the tightness of the relationship between the time series of premiums per capita. Then we will focus on measuring the tightness of the vicious circle between the residues.

From values of premiums per capita in the Czech Republic and the EU was calculated correlation coefficient (6):

$$Cor_{(X,Y)} = 0.1177 \tag{6}$$

The P-value which tests the statistical significance of the estimated correlations is 0.7303. P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level. None of the following pairs of variables have P-values below 0.05.

From values of premiums per capita in the Czech Republic and the EU was calculated correlation coefficient (7):

$$Cor_{(Z,Y)} = -0.0245 \quad (7)$$

The P-value of the estimated correlations is 0.9430 P-value is higher than 0.05, again this is a statistically insignificant non-zero correlation.

This information shows no connection between the development of insurance premiums per inhabitant in the Czech Republic and the EU and between the development of insurance premiums per inhabitant in the Slovak Republic and the EU. However, in the case of the correlation of two-time series, such a statement cannot be considered relevant, as it may be an apparent no correlation.

A detailed look at the table above, it is evident that between developmental movements of both indicators, there is not too systematic development, as evidenced by the algebraic sign of the first differences of values (absolute gain) for both time series ("+" = year increase, "–" = annual decrease).

Concerning previous results, it is necessary to verify whether it is not the apparent no correlation, i.e., to eliminate the time series systematic components and find the correlation only of residues. To investigate whether the relationship between the variables is casual, it is necessary to use methods of tightness dependence time series of random components, i.e., time series adjusted from the trend.

The results of the dependence analysis of these random components are shown below, (8) shows the result of the dependence between the residuals for the CR and EU time series and (9) shows the result of the dependence between the residuals for the SR and EU time series.

$$Cor_{e_x e_y} = -0.0822 \quad (8)$$

$$Cor_{e_z e_y} = -0.0002 \quad (9)$$

The P-value of the correlation of residuals of CR and EU is 0.8100, and of the residuals of SR and EU is 0.9994.

Such a high P-value (it is higher than 0.05) again indicates that it is a statistically insignificant non-zero correlation (compared with the result (5)).

3. Discussion

The results show no correlation between the analysed time series and the time series of residuals. For further research, I recommend extending the time series. Unfortunately, we were unable to obtain some data for the period 2003 to 2010. Therefore, as mentioned above, we analysed selected indicators' dependence for 2011–2021.

Considering the lack of research on this issue in neighbouring countries, comparing these results with other countries is impossible. However, it would be interesting to direct further research in this direction – whether there is a correlation between the development of premium per capita in the individual EU member states with the average of the EU countries.

Conclusion

This paper aimed to determine whether there is no correlation between the insurance market development in the EU, the Czech Republic, and the Slovak Republic. In the first part were identified factors that affect the insurance market, and the development of macroeconomic indicators (GDP and inflation) and gross premiums written in life and non-life insurance were assessed. It has been shown that there needs to be a high degree of alignment between these indicators in the same years, contrary the influence of GDP and inflation on the insurance market will take effect with time. As a research method for exploring the dependence, statistical analysis was chosen – time series correlation of indicator premiums per capita in the EU, Czech and Slovak Republic.

Although it may seem that this is a no dependence (correlation coefficient for the relationship between the Czech Republic and the EU = 0.1177 (P-value = 0.7303), for the relationship between the Slovak Republic and the EU = –0.0245, (P-value = 0.9430)), the so-called apparent no correlation was proven by using the values of absolute gains pointing to the non-systematic development of both indicators. Concerning these results, a correlation of residuals was carried out, which again showed no dependence between the insurance market of the EU and the Czech Republic (correlation coefficient of residuals = –0.0822, P-value = 0.8100) and even in case of dependence between the insurance market of the EU and the Slovak Republic – again there is no dependence (correlation coefficient of residuals = –0.0002, P-value = 0.9994).

Acknowledgment

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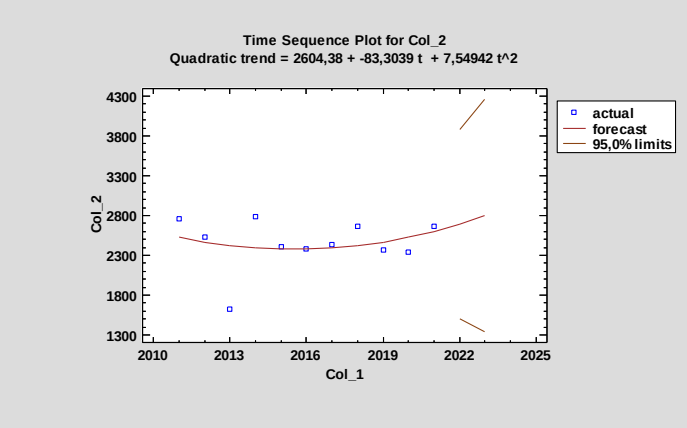
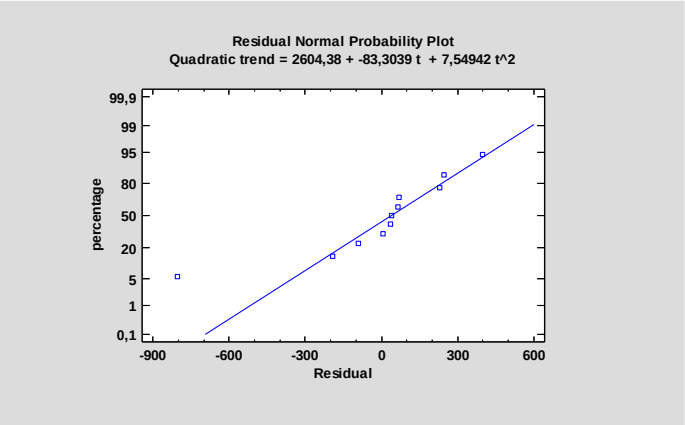
Appendix

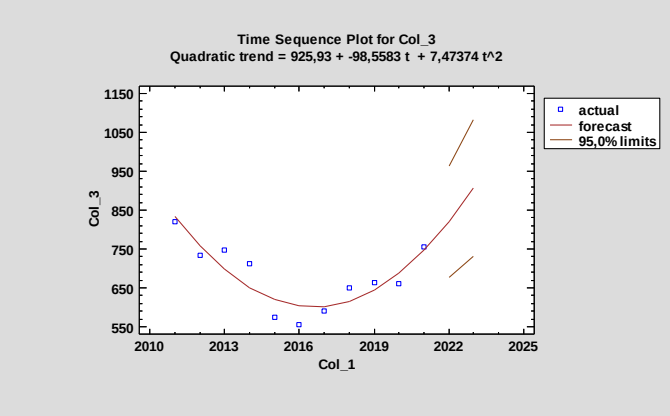
Analysis – Insurance Density

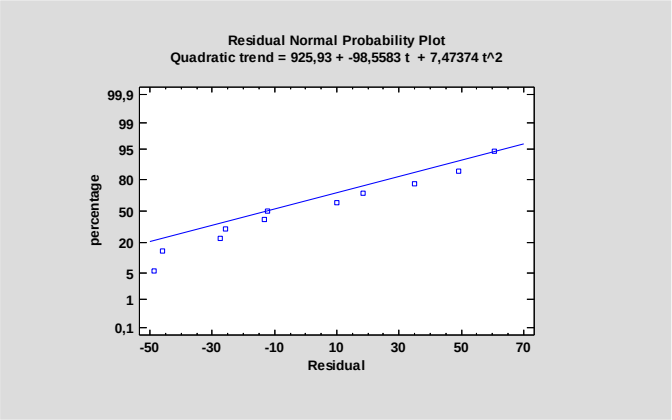
Figures: timeseries EU – left: Time Sequence Plot, right: Residual Normal Probability



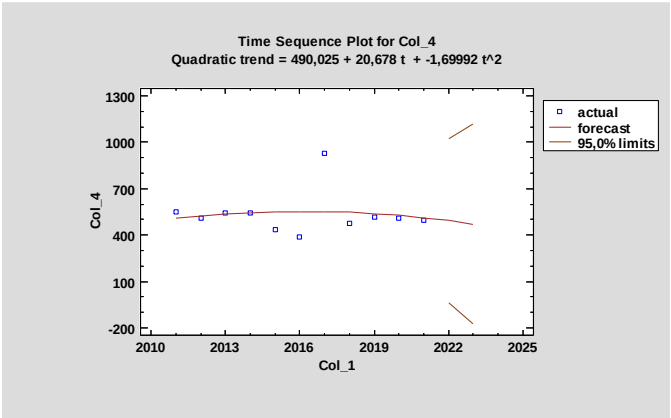


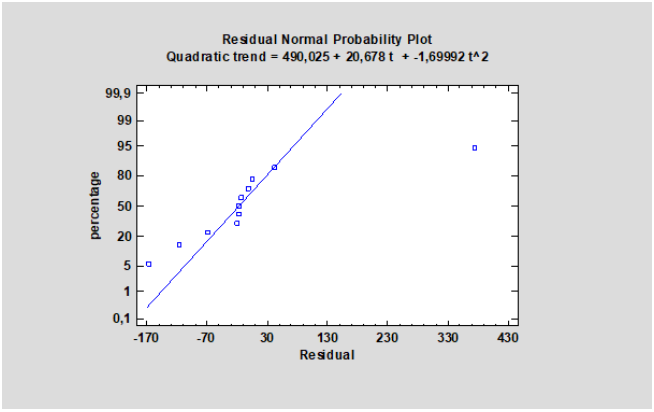
Figures: timeseries CR – left: Tim e Sequence Plot, right: Residual Normal Probability Plot



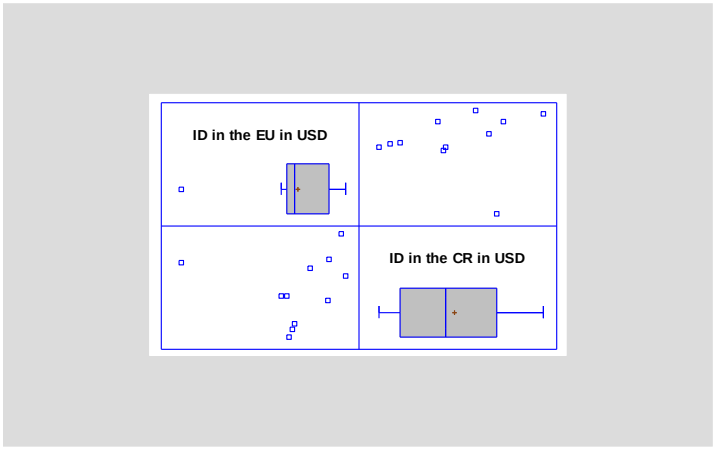


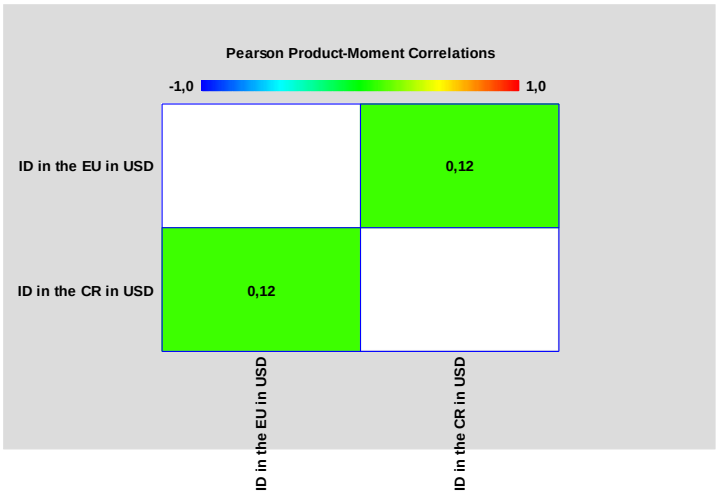
Figures: timeseries SR – left: Time Sequence Plot, right: Residual Normal Probability Plot



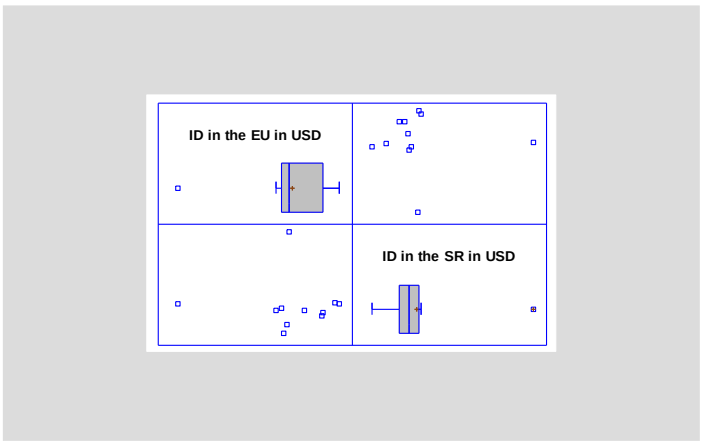


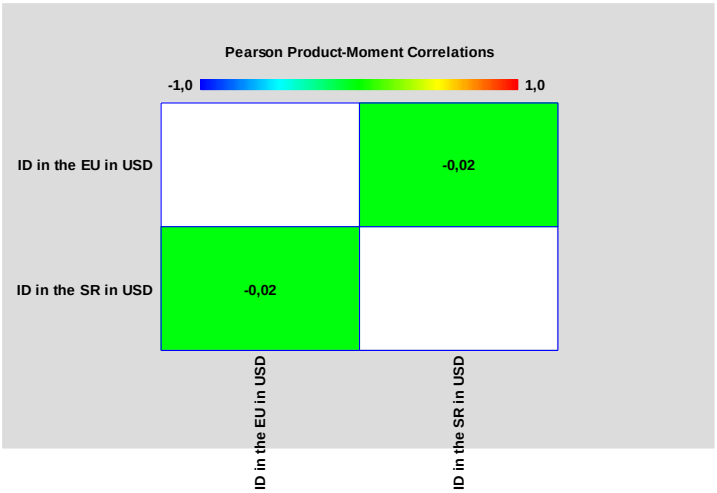
Figures: Correlation EU and Czech Republic



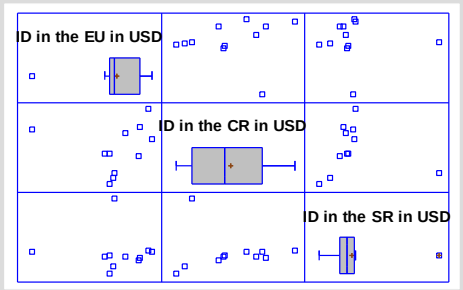


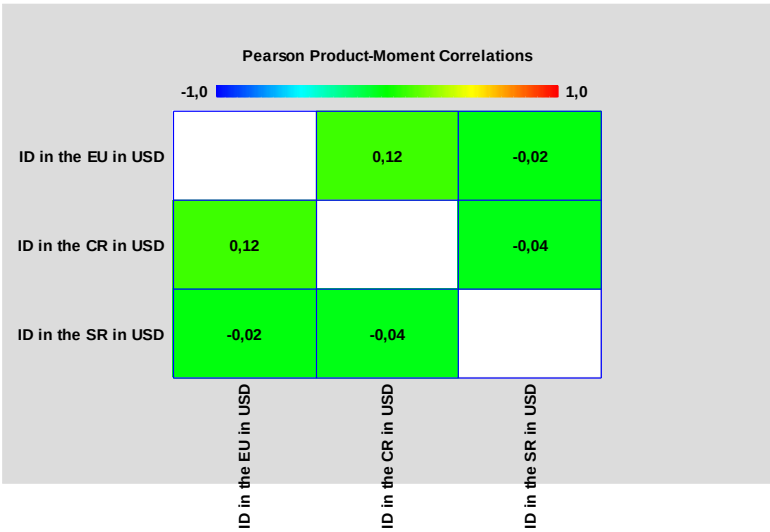
Figures: Correlation EU and Slovak Republic





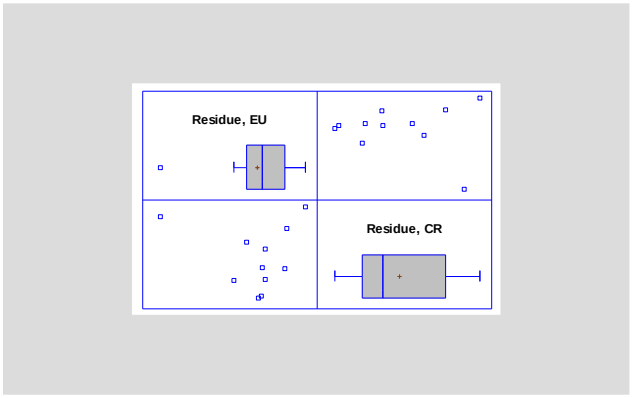
Figures: Correlation EU, Czech and Slovak Republic

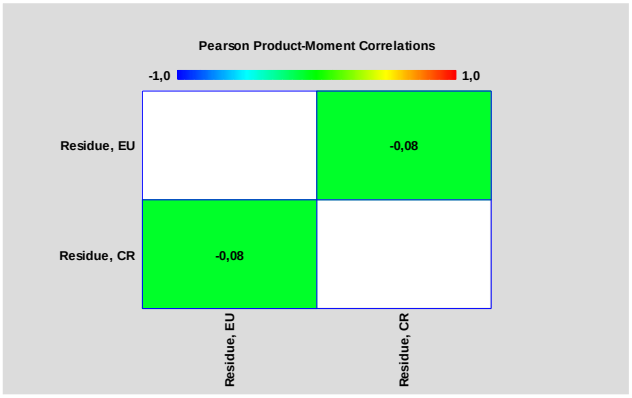




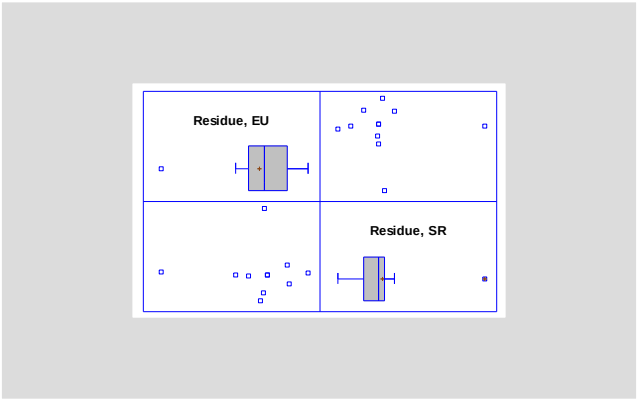
Analysis – Residues

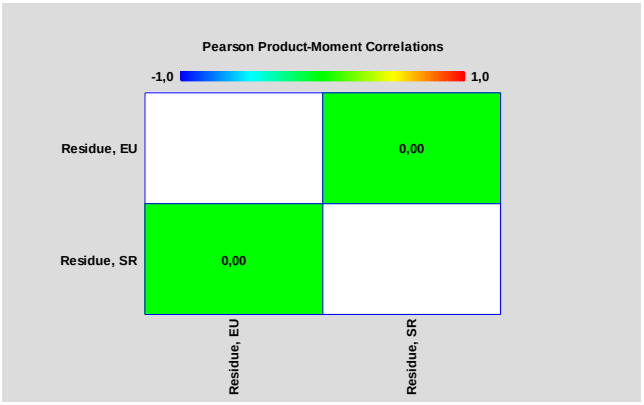
Figures: Multiple Variable Analysis, residues EU and CR





Figures: Multiple Variable Analysis, residues EU and SR





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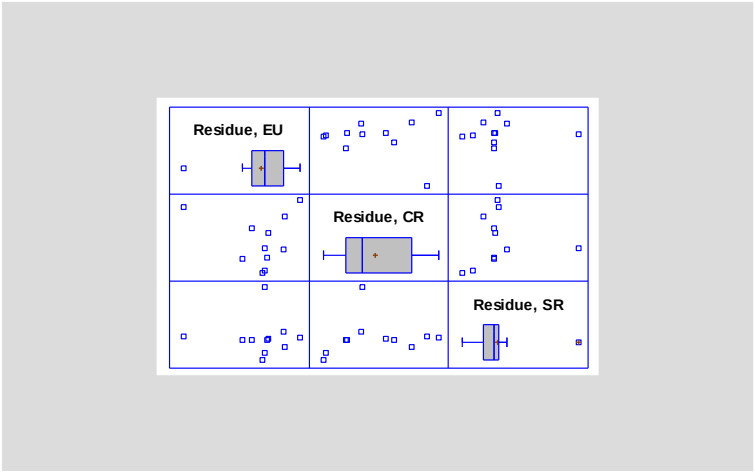

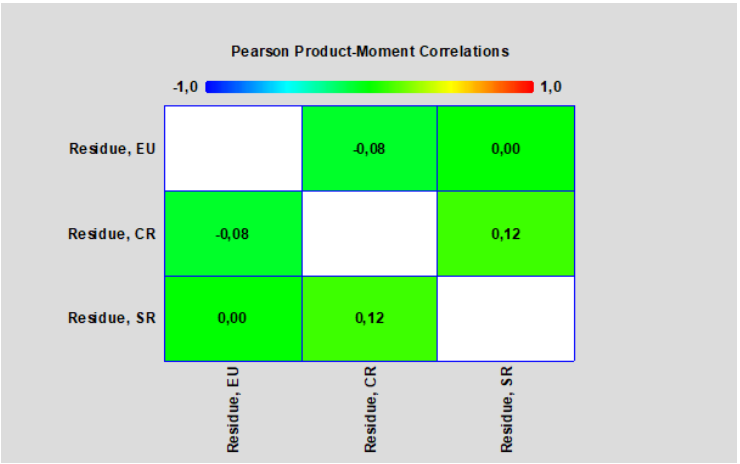

The Influence of Multi-Channel Advertising by the Pharmacy on Customers and Identification of Advertising Perceptions by Customers

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Abstract

Effective use of media channels in marketing requires a thorough understanding of the target audience and the channels they are most likely to use. Successful implementation of media channel strategies can increase brand awareness, customer loyalty and sales. Pharmacies are highly location-based and need to tailor their marketing efforts to specific regions to ensure maximum effectiveness. They need to tailor their marketing strategies to the specific preferences and behaviours of the target audience in each region. A company targeting a region (e.g. village regions) where many families live, for example, may need to tailor its marketing messages to required values. This includes highlighting families in advertising or emphasising how their products or services can add value to them. There needs to be a coordinated marketing strategy. In this paper, the objective is to find out whether customers are generally interested in advertising medical products and, if so, which media channels they prefer. From this it can be deduced whether a multi-channel strategy would be worthwhile for retail pharmacies. Based on the results of a customer survey, it can be said that medical product advertising is perceived on various channels, but that the proportion is low, with only about half as a target group.

Keywords

Industry analysis, advertising, pharmaceutical industry, dispensary pharmacy, medical devices, marketing

JEL classification:

Introduction

The pharmacy market is strongly influenced by changing customer preferences in the purchase of medicines, as mail order is taking an increasingly strong position in the supply of medicines and self-medication is increasingly used by customers as a preventive measure (cf. Haramiova et al., 2017). In the existing competition, pharmacies continue to try to reach customers with expanded marketing methods, some of which are new to them, which presents them with the challenge of which marketing channels can be considered most effective here. In this context, the preference of the orientations is determined in marketing by the demand orientation towards the customers, as they are perceived as one of the strongest market forces (cf. Grote, 2019, p. 18f.). This does not yet determine how pharmacy marketing for medicines and medical goods is received by customers. What needs to be clarified is whether and how this perception prevails and whether it forces pharmacies to blindly follow any marketing path because the customer wants it that way (cf. Haubrock/Öhlschlegel-Haubrock, 2015, p. 3). The extent to which market dominance forces pharmacies to follow every marketing path used by customers has not yet been sufficiently researched, although it is important to know the views and

preferences of consumers in the pharmacy sector. The main objective is to assess how pharmacy customers are influenced by advertising and to learn what information is most valued by medical product demanders. The aim is to highlight whether multi-channel marketing (MCM) proves to be worthwhile for pharmacies.

1. Methodology

The customer is of fundamental importance in the business relationship with retailers. For pharmacies, this relationship is even more important, as many pharmacies have not yet established online trade in a professional form.

"In primarily service and service-oriented companies, as pharmacies are, the customers are the most important thing. Fulfilling their wishes and expectations is therefore the real goal. After all, pharmacies depend on satisfied customers in order to exist at all. This high level of dependence means that every customer is valuable to the pharmacy, which is interested in retaining as many customers as possible in the long term." (Zentiva, 2019, p. 2)

An increasing development of self-medication is noticeable due to a changing and increasing health awareness in society, which is also reflected in the demand at pharmacies. Of the >40% of sales of over-the-counter medicines at retail pharmacies in 2022, 6% are accounted for by over-the-counter medicines and 76% by pharmacy-only medicines (cf. ABDA, 2023 (a), p. 15). These are largely free of price fixing and lend themselves to marketing. Therefore, it can be assumed from such a trend development that customers increasingly pay attention to advertisements for medical products and consciously perceive them. By asking customers in our own survey, this trend should be checked for its general validity.

In order to identify customers as an influencing factor in relation to the impact of advertising measures on the part of pharmacies, a survey with four core questions was conducted by the authors with their pharmacy customers to find out which channels are preferred and how intensively customers engage with this advertising. The questions were asked as follows:

- Do you consciously perceive advertising for medical products? (ordinal; scale 1-10)
- What is important to you in advertising about medical products? (nominal; multiple answers for 4 options)
- What is your preferred way of advertising medical products? (nominal; 7 options)
- Do you consciously perceive advertising by pharmacies in your preferred media channels? (ordinal; 5-point scale from *never* to *very often*)

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The customers were not differentiated here according to specific parameters, but a general perception was targeted. The survey was conducted by means of an online questionnaire with the software Survio. The total sample comprised n=1,213 customers from Germany when it was conducted at the end of 2022.

2. Multi-channel marketing at pharmacies

The increase in competition from large online providers is forcing pharmacies to take new measures, including marketing, to reach customers. However, the transition to more digital marketing methods is still slow and poses challenges for pharmacies, as these areas are not part of their core competencies. Marketing is emphasised as an important starting point in the literature here, but the focus on multi-channel approaches for this particular form of retail is hardly considered in the research.

Many marketing researches for pharmacies are designed for areas that deal with content or brand marketing (cf. among others Bill, 2020; Samoshenkova and Garankina, 2017; Mnushko et al., 2016; Brodtkorb, 2016; Brandmeyer et al., 2015). They address a core issue for pharmacy marketing but leave out the area of other marketing channels. Other articles and publications refer to pharmaceutical companies and wholesalers (cf. among others Moreira and Santos, 2020; Umbach, 2018; Walter and Lazic-Peric, 2017; Macarthur, 2007). According to our own research, a direct reference is the article by Schrage[1] , which emphasises MCM as interactive advertising with a strong integration of the customer as the ultimate purchase decision maker (cf. Schrage, 2012). It shows a gap in research that is necessary for the pharmacy sector and the supply of medicines with declining sales outlets in order to position themselves more resiliently in the competition.

Multi-channel marketing takes into account all marketing instruments that can be used in a particular sector to address customers via differentiated communication and sales channels. Stationary trade now also uses digital channels for marketing and sales with the various media (cf. Meffert et al., 2019, p. 354), so this marketing system can theoretically be used for pharmacies of any form.

Strategic multi-channel advertising involves combining different marketing channels to provide customers with services, products and benefits across all channels. One of the advantages of strategic multi-channel marketing is that it allows companies to diversify their advertising efforts. In the past, pharmacies in particular focused on a few advertising and marketing channels (mostly analogue) to reach their target audience, but this method is no longer considered effective. With new technologies and systems, pharmacies can adopt a multi-channel technique to remain competitive in the market (cf. McKinsey & Company, 2020, p. 78).

Marketing in sensitive product areas that require a high level of attention to usage information in addition to pure product information is also closely linked to the provision of information (cf. Moreira et al., 2020, p. 1053f.).

The main goal of a multi-channel marketing strategy for pharmacies is to create a consistent and seamless customer experience across all channels. This includes providing customers with relevant information about products and services, personalised recommendations based on their preferences and ensuring that they can buy products

[1] Research was conducted in portals such as Researchgate, Elevisier, Springer-Medizin and Medconweb.

effortlessly online and offline. Ultimately, the goal is to increase customer loyalty and retention while boosting pharmacy sales and revenue.

The pharmacy customer is primarily the end customer who ultimately buys and consumes or uses products (cf. Mubarak/Yusoff, 2019, p. 78f.). Perception is also determined by the marketing and channels a company uses. Particularly in the case of new launches and realignments of previous strategies, multi-channel strategies lend themselves to presenting themselves with corresponding innovations (cf. Meffert et al., 2019, p. 453).

From a customer perspective, pharmacies can use several strategic opportunities to improve their services and increase competitiveness. These opportunities include:

Personalisation: Customers expect pharmacies to tailor their services and products to their needs. This can include personalised advice on medicines, the creation of individual medication plans and the provision of tailored health and wellness programmes.

Convenience: Customers value convenience and expect pharmacies to offer a range of services that are easily accessible and available at convenient times. These may include extended opening hours, drive-thru services, online ordering and home delivery.

Expertise: Customers expect pharmacies to have knowledgeable and well-trained staff who can give them expert advice on medicines, health conditions and wellness products. They also expect pharmacies to keep up to date with the latest health and wellness trends and provide them with information and resources to make informed decisions about their health.

Competitive prices: Customers expect pharmacies to offer competitive prices for medicines and health and wellness products. They also value transparency and want to know that they are getting the best value for their money.

Technology: Customers expect pharmacies to use technology to improve their services and make them more convenient and accessible. This may include online prescription refills, mobile apps for medication reminders and tracking, and telemedicine services.

The pharmacies that are present here must constantly adapt if they want to continue to retain customers with their strategy (cf. Barbosa et al., 2020, p. 15). Such perceptions also extend to comparisons of quality, service and price. Medicines are highly standardised here and prices for certain product groups are not interchangeable. Therefore, the additional services and over-the-counter medicines are decisive for the decision. (cf. Mubarak/Yusoff, 2019, p. 67). However, the question is whether the customers show a high level of attention and perception in the segment of medical product advertising. The results of the survey of pharmacy customers will contribute to this.

3. Results

The survey of 1,213 customers found that pharmacy consumers have a good understanding of health product promotion (6.23 out of 10 points). However, there is room for improvement, suggesting that targeted marketing could increase consumer awareness and participation. The 584 respondents who had recently purchased a medical product ranked knowing the manufacturer as the most important factor. A total of 576 respondents emphasised the need to know the intended use of a medical product. 223 people rated knowing what is in a product as very important.

The data shows that internet-based advertising is the most successful way to attract new customers for pharmacies. Widely used online advertising (47.37) and personalised emails (44.76) received the best scores. The score of 41.43 for "personal approach in the

pharmacy" was the second lowest, behind TV advertising (43.21). Newspapers, magazines and journals received mixed scores, as did other print publications and traditional advertising media such as leaflets and posters. A large percentage of respondents (29.3%) said they only pay attention to advertising when they have to. Of the population, 26.1% said they rarely see an advertisement, 19.4% said they often see advertisements, and 14.9% said they see advertisements all the time. Only 10.3 % of the population said they do not pay attention to advertising at all.

In the pharmacy sector, it has been shown that customers react very differently to pharmaceutical advertising, which points to opportunities for development. Advertising for drugstores could do better if it highlights amenities that customers value most. Customers seem to prefer internet advertising platforms, so pharmacies would do well to shift their focus there. It seems that customers are more receptive to advertising when they have an acute need for information, regardless of their mental state at the time.

These results underline the importance of a pharmacy's brand for customer loyalty. This shows that a pharmacy's brand and reputation are critical to building and maintaining customer loyalty. This means that the data supports the idea that the pharmaceutical sector can increase productivity and customer loyalty by using digital advertising networks to target ads to specific individuals based on their demographic and other personal characteristics. The research can help shape future pharmacy advertising campaigns to better meet the needs of their growing customer base.

Discussion

Pirck noted for the pharmacy sector in 2015: "Individual pharmacies have positioned themselves as specialists - in the sense of a clear brand positioning. They have succeeded in differentiating themselves (also economically) from the competition. For the majority of pharmacies, however, there is still work to be done. They appear interchangeable, they do not provide clear, comprehensible and narratable arguments for buying from them. Many of these pharmacies are threatened in their existence in the medium term." (Prick, 2015, p. 145)

2023, it can be said that the number of pharmacies has fallen since 2015 from 20,249 to 18,068 in 2022 (cf. ABDA, 2023, p. 20). By April 2023, the number had fallen again by 129 to 17,939 (cf. Bauer, 2023). The conversions in all areas (technology, online trade, marketing, etc.) have not helped the pharmacies and there is a threat of a dissolution of the nationwide services of pharmacies both in the dispensing of medical goods and in the qualitative advice to customers. Pharmacies must therefore become more 'visible' and be present to the customer. Marketing is an important factor in this.

The results of the survey show a certain direction of customer perception of pharmaceutical advertising. The subjects' perception of advertising is slightly above the mean with 6.23 points, which shows a certain interest that is, however, not overly pronounced. This is also confirmed by the subjects' perception of their preferred advertising media, with the internet generally occupying the most important position. Television advertising still has a higher ranking here than all the analogue advertising measures listed, which is also related to media behaviour. However, it must be noted here that such media channels are predominantly used by cooperations because the costs for an individual pharmacy are too high. Newspapers and other print media as well as radio are used by fewer and fewer people as a source of information. Finally, it can be seen that there is also brand awareness among customers for medicines, which is expressed in the

fact that the manufacturer is valued more highly than information about applications and ingredients. Ott already showed here in 2008 that brand awareness has existed for a long time, for example with the painkiller Aspirin (cf. Ott, 2008, p. 14f.; on this also Bill, 2020, p. 11). Assuming that there is only a low level of awareness of pharmaceutical or medical product advertising among the test persons, it should be examined whether comprehensive marketing appears necessary for pharmacies and whether the market power of customers should be assessed in such a way that pharmacies must follow the customer in all areas of marketing. The results show that the market power of customers in the area of medicinal products and medical devices is increasingly moving in the direction of the Internet. An orientation in this direction is therefore advisable for the marketing of pharmacies. Generations Y and Z in particular are increasingly orienting their information procurement and consumption towards the internet and its offers. Advertising media from the analogue sector are therefore declining and should increasingly be removed from the advertising portfolio. Analogue is only worthwhile for a target group that is more likely to be found among the older generations. The identified groups of chronically ill and acute cases deserve special attention here (cf. Noweda, 2017, p. 25). For this purpose, the immediate proximity and profession of doctors and clinics located in the immediate catchment area of the respective pharmacy can also be included. It is important for pharmacies to break away from existing marketing concepts insofar as they increasingly advertise digitally, seek and enable contact (cf. Weißenfeldt, 2018, p. 17f.). A targeted multi-channel strategy is needed that reaches customers who can and want to be reached. The results of the subjects suggest this, as the perception in the area of medical advertising is not strong.

Conclusion

Effective use of media channels requires a thorough understanding of the target audience and the channels they use most. Successful implementation of media channel strategies can increase brand awareness, customer loyalty and sales. Therefore, pharmacies need to tailor their marketing efforts to specific regions to ensure maximum effectiveness. The findings suggest that pharmacies need to recognise the importance of tailoring their marketing strategies to different demographic groups and regions, which is supported by previous research in the marketing literature. In this way, companies can increase the effectiveness of their marketing efforts and better target their audiences. Cultural, social and economic factors can vary greatly from region to region, and companies need to understand these factors in order to develop effective marketing strategies. Economic factors, such as income levels and buying habits, can also differ from region to region. Businesses need to understand these factors in order to determine pricing strategies, promotional activities and the types of products or services that will be most attractive to their target audience. However, the basic conclusion is that multi-channel marketing is only worthwhile to a limited extent, as the interest of customers is not considered to be as high as in other sectors. Since medical products do not have the same experience factor as clothing or technical devices, only the channels that are primarily used here are worthwhile. Pharmacies are well positioned here if they follow the high-frequency media channels that can also be operated in a lower budget. These continue to be analogue channels as well as the internet in the form of their own homepage, cooperation sites or - if available - their own web shop.

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The Clarity of Financial Reports in the Global Environment: A Comparative Study of Selected Issues in the Czech and Brazilian Accounting Systems

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Abstract
The paper focuses on selected Czech and Brazilian financial accounting systems issues. These two systems have historically developed in quite different socio-economic conditions, but due to globalisation in recent decades, there has been a growing demand to harmonise the conditions for the creation of the content of financial information disclosed primarily by entities that are in the public interest. This paper aims to investigate to what extent similarities and differences can be identified in selected areas of financial accounting and reporting. Given the limited scope of the paper, the areas discussed are accounting regulation, and the form and structure of balance sheets of business entities. The objective was achieved by applying traditional scientific methods, namely by searching scientific and professional papers to obtain knowledge about the current level of knowledge in the field under study, as well as by describing the current state of accounting regulation in both countries and comparative analysis of the requirements placed on the balance sheet of entrepreneurs. The historical method was partly applied to obtain knowledge in the necessary historical context of the topic. The final discussion provides a synthesis of the knowledge gained on the identified similarities and differences in the above areas of financial accounting. The paper can be seen as unique, as it introduces the previously unpublished topic of comparability of the accounting systems of the Czech Republic and Brazil.

Key Words
Accounting regulation, financial reporting, balance sheet, business entities

JEL Classification: G39, M41, M48

Introduction

Financial accounting aims to provide summarised financial information about the entity, or about the financial position and performance of the entity, which is disclosed so that users (internal and external) can make decisions based on it. (Lang et al. 2016) To ensure the comparability of this type of information over time and space, it is essential that financial accounting is regulated. Accounting regulation can be viewed from different angles. Bokšová (2013), for example, distinguishes between external regulation, where accounting is managed by the state or professional bodies, and self-regulation, which takes place based on standards set directly by the firm or accounting professional. Regulation of financial accounting has so far taken place at both national and supranational levels. The degree of regulation of financial accounting varies from country to country and also takes different forms, ranging from various recommendations by delegated bodies to statutory measures. It can range from a milder level of regulation of financial statements to a strong level of regulation of accounting practices (Kovanicová 2004), (Nobes and Parker 2020). According to Bokšová (2013), regulation at the national

level should either provide a true and fair view of the financial position and performance of the enterprise or serve tax purposes. However, for many decades, globalization, international trade and foreign direct investment have also been some of the hallmarks of corporate activity (Nobes and Parker, 2020). Dvořáková (2022) mentions enterprise information systems as another factor and sees them as an important determinant of the further development of the global economy. All this entails a reduction of national autonomy in all areas affecting a given national economic environment, not excluding accounting. As one of the consequences of this process, Bokšová (2013) states that regulation along the lines of conventional accounting is gradually weakening, laws are being slimmed down and reporting regulation is being strengthened.

It should be noted that the financial accounting statements presented still vary not only within each multinational economic grouping but also within a given country. Nobes and Parker (2020) cite the reasons for these differences as the cultural environment of the country, its legal system, the most common funders, the way different entities are taxed and other external influences such as the extent of adoption of international accounting standards into national accounting regulation. The effects of these influences are then manifested in differences in how important accounting principles are adopted and applied (the precautionary principle and the accrual principle), how assets and debts are valued, what the regulator's requirements are for the form and content of the financial accounting statements presented, and how often these requirements change. Ultimately, this leads to an inability to compare the financial information presented both in terms of its evolution over time and between companies. For the above reasons, it can be said that there are increasing pressures for the harmonisation of national accounting systems towards supranational financial reporting requirements and for a process of convergence of the major accounting standard setters at the international level.

In order to understand all the implications of the current state of affairs and predict possible future developments and make a qualified professional judgement in a given area, it is necessary to study and understand the historical context of the development of the discipline at national as well as global context, but the paper focuses on the current state of Czech and Brazilian accounting regulation at the most, with implications mainly for reporting. It does not aim to comment on the linkage of accounting to the tax system and possible contradictions arising therefrom. The links with international accounting standards (IFRS and US-GAAP) are addressed only in a partial way in the context of the issues primarily addressed in the Czech and Brazilian accounting systems.

1. Methods of the Research

The paper examines chosen aspects and characteristics of the accounting framework in the Czech Republic and in Brazil. Making a literature review, it was covered by exploring the regulatory environment, chosen accounting principles, and reporting requirements. To obtain the outputs, in addition to traditional approaches such as description and comparison, the historical method was also partly used, i.e. working methods and means were used to obtain knowledge about the past, combining direct methods in obtaining historical facts by directly examining the historical source in which the information is directly contained, with a progressive method that traces and captures events as they followed one another. The method of induction has also been used, whereby the knowledge gained is used to infer the possible implications of the current state of affairs in the field of financial accounting.

The following research questions were identified concerning the stated objective:

1. Is the form and strength of financial accounting regulation in the Czech Republic and Brazil comparable despite the different external economic conditions?
2. Are the financial reporting requirements comparable in national settings?
3. Do the balance sheets of businesses in the two countries provide comparable information?

2. Results of the Research

In line with the stated research questions, the research was divided into two areas, namely a comparison of accounting regulation and, financial reporting with a partial focus on the balance sheet of business entities in the Czech Republic and Brazil.

2.1 Accounting Regulation in the Czech Republic and in Brazil

In the Czech Republic, financial accounting is regulated by a statutory standard and related implementing regulations set by the Ministry of Finance of the Czech Republic. This is the strongest possible regulation in contrast to, for example, the Anglo-Saxon model, where financial accounting is regulated at the level of recommendations of professional bodies (Nobes and Parker 2020) . Regulation is carried out in a three-stage sequence, firstly, by Act No. 563/1991 Coll., on Accounting, secondly, by Implementing decrees to the Accounting Act, and thirdly, by the Czech Accounting Standards. The Act on Accounting is the highest standard, it addresses the basic accounting concepts (incl. the content and scope of financial statements) applicable to any entities, which are considered as accounting entities according to the criteria given by this Act and are obliged to keep accounting records. Certain provisions of the Act on Accounting are further elaborated by implementing decrees to this Act about the sectoral focus of individual entities. The main content of the implementing decrees is the provisions concerning the scope and method of preparation of the financial statements, the content of selected items reported in the balance sheet and income statement, and the basic requirements for the arrangement and content of explanatory and supplementary information presented by the entity in the notes to the financial statements, or other requirements related to the financial statements. The annexes to the implementing decrees contain the binding text of the charts of accounts for a given type of entity and binding models for the arrangement and labelling of items in the financial statements that the entity is required by law to publish in the Collection of documents. Currently, a total of six implementing decrees are in force (for entrepreneurs, banks, commercial insurance companies, health insurance companies, non-governmental non-profit organisations and state non-profit organisations). Each decree is followed by a separate set of Czech Accounting Standards. The most comprehensive information must be reported by large companies (if they exceed two of three limits, a. total net assets over CZK 500 mil., i.e. EUR 21 mil., b. total gross revenue over CZK 1000 mil., i.e. EUR 42 mil. and, c. total employees over 250). They also include public interest entities (hereafter PIEs). They are defined by the Accounting Act and include listed companies, banks, commercial and health insurance companies, pension companies and investment funds. The Accounting Act stipulates that listed companies and those that are part of consolidated companies (mostly multinationals) maintain their accounts by International Financial Reporting Standards (hereafter IFRS), however, they are liable for income tax on the basis set by Czech accounting legislation. (Česko 1991) It should be added, however, that a new major

amendment to the accounting legislation has been in preparation since 2018, which is expected to come into force in 2025 and under which, for example, banks and commercial insurance companies would report exclusively under IFRS. (Mejzlík 2023) Regarding informal regulation of financial accounting, the Czech Republic has an independent professional institution called Národní účetní rada (the National Accounting Council). This institution issues Interpretations to resolve cases which are controversial and difficult to determine under existing legislation, but which do not have the force of law; however, in several instances, draft Interpretations have subsequently been adopted into Czech accounting legislation. (Mejzlík 2023)

In Brazil, financial accounting is regulated by a statutory standard and related implementing regulations, similar to the Czech Republic. However, the financial reporting framework in Brazil is also influenced by international benchmarks, especially the IFRS issued by the International Accounting Standards Board (hereafter IASB). (Barbosa et al. 2018) The financial reporting framework in Brazil is established under the Corporations Law No. 6404/76 of 1976, amended in 2007 by Law No. 11638/07 to align financial reporting requirements in Brazil with international benchmarks. The Corporations Law requires all companies to prepare financial statements in accordance with Brazilian generally accepted accounting principles (CVM 2021). Public interest entities are defined in Brazil as listed companies, mutual funds, financial institutions, insurance companies, and large companies. In addition to complying with the requirements of the Corporations Law, PIEs are under the legal obligation to additional financial reporting requirements issued by the respective regulatory bodies. (LLOYDS BANK 2023) All corporate entities must comply with the National System of Commercial Registry (known as SINREM) filing requirements. As defined in the Corporations Law, a company or group of companies under common control whose total assets in the previous year amounted Brazilian Real (hereafter BRL) to over BRL 240 mil., i.e. EUR 45.3 mil., or whose total gross annual revenues exceed BRL 300 mil., i.e. EUR 56.6 mil. are considered large companies. An entity not meeting one of those thresholds is considered a small- and medium-sized entity (hereafter SMEs). The Decree Law 9295/46, amended by the Law 12249/10, delegates the Federal Council of Accounting (hereafter CFC) the responsibility for issuing accounting standards. In 2005, the Brazilian Accounting Pronouncements Committee (hereafter CPC) was created by the CFC Resolution 1055/05, to systematize and centralize the standard-setting process and promote international convergence of accounting standards. (CPC 2019) The CPC issues Brazilian GAAP, and its standards are enforced by the overseeing regulatory bodies (incl. CFC). As reported by the CFC, since 2010, Brazilian GAAP has been fully converged with IFRS, with an ongoing system in place to incorporate new and revised IFRS as they become available. Non-PIEs are obliged to prepare their financial statements in accordance with the Brazilian GAAP but are permitted to use IFRS for the consolidated financial statements, although there are no differences between Brazilian GAAP and IFRS. SMEs are required to apply the Brazilian GAAP for SMEs that is converged with the IFRS for SMEs and are allowed to use full Brazilian GAAP. In 2021, CFC issued a standard for small entities, when its annual gross revenue less than BRL 78 mil., and another for micro-sized companies (with annual gross revenue less than BRL 4.8 mil.). (IFAC, 2022) Regarding informal regulation of financial accounting, Brazil has an independent professional institution called the National Accounting Council. (Mendes et al. 2018) The role of this institution is quite similar to that in the Czech Republic.

2.2 Financial Reporting

Financial reporting is a set of financial information that an entity is required to disclose. This is represented by the so-called financial statements, including notes explaining significant items and their amounts and, the accounting methodology applied by the enterprise.

In the Czech Republic, since the 2016 Act on Accounting novelized the part of the scope of the financial statements and the legal disclosure of their elements for Czech entities depending on their size (Meixnerová and Sikorová 2017) and also, whether they have a legal obligation to have their financial statements audited by an independent auditor. (Česko 1991) A summary is provided in Tab. 1.

In Brazil, regulated by Corporations Law since 1976, amended in 2007 and 2009, the scope of the financial statements and the legal disclosure of their elements for Brazilian entities depends on their size and whether they have a legal obligation to have their financial statements audited by an independent auditor. All entities are required to annually publish a balance sheet, a statement of income for the year, a statement of changes in equity, a statement of cash flows and notes to the financial statements. The documents are required within four months after year-end for listed companies and within six months after year-end for non-listed companies. (Mendes et al. 2018) Furthermore, an entity that is obligated to give the full version of the financial statements is not required to give the simplified version, since the full version already contains all the information that the simplified version would have. However, an entity that is allowed to give the simplified version of a balance sheet may choose to give the full version instead, if it wishes to provide more information to the market. (Santis et al. 2016) Tab. 2 shows a comparable information to the financial statements due to Brazilian requirements.

Tab. 1: Financial reporting of the Czech entities according to their size

Size of the entity	Balance Sheet		Income Statement		Cash Flow Statement		Statement of Equity changes		Notes to financial statements
	Full form	Disclo-sure	Full form	Disclo-sure	Compi-lation	Disclo-sure	Compi-lation	Disclo-sure	
Micro without audit	NO	YES	NO	NO	NO	X	NO	X	YES
Micro, audited	YES	YES	YES	YES	NO	X	NO	X	YES
Small without audit	NO	YES	NO	NO	NO	X	NO	X	YES
Small, audited	YES	YES	YES	YES	NO	X	NO	X	YES
Middle, audited	YES	YES	YES	YES	YES	YES	YES	YES	YES
Large, audited	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: authors' elaboration according to (Česko, 1991)

Tab. 2: Financial reporting of the Brazilian entities according to their size

Size of the entity	Balance Sheet		Income Statement		Cash Flow Statement		Statement of Equity changes		Notes to financial statements
	Full form	Disclo-sure	Full form	Disclo-sure	Compi-lation	Disclo-sure	Compi-lation	Disclo-sure	
Micro without audit	NO	YES	NO	YES	NO	X	NO	X	NO
Micro, audited	NO	YES	NO	YES	NO	X	NO	X	NO
Small without audit	NO	YES	NO	YES	NO	X	NO	X	NO
Small, audited	NO	YES	NO	YES	NO	X	NO	X	NO
Middle, audited	YES	NO	YES	NO	YES	NO	YES	NO	YES
Large, audited	YES*	NO	YES*	NO	YES*	NO	YES*	NO	YES*

Source: authors' elaboration according to (Corporations Law No. 6404/76 of 1976)

**Required for publicly traded companies and nonpublic companies with assets exceeding BRL 240 million or gross revenue exceeding BRL 300 million.*

The size of an entity (micro, small, medium and large) is determined in both countries by the total amount of net assets, annual turnover and the number of employees converted into full-time equivalents and the company has to test its size at the end of each accounting period. Depending on their size and audit obligation, accounting units prepare either full or condensed financial statements. The requirements for mandatory disclosure of elements of the financial statements also differ. The criteria for a statutory independent audit of financial statements are also determined by the Act on Accounting in the Czech Republic and by the Corporation Law in Brazil. As the highlighted cells in the Tab. 1 and Tab. 2 shows, it seems that regulation of publishing the financial statements is weaker than in the Czech Republic. It was also shown by the example of the large companies, the limits for the grouping of the firms according to their size differ in both countries.

In the Czech Republic, it is important to emphasise that in the Czech legislative environment, not only the content but also the form of the financial statements is binding. The binding templates of accounting statements and among them the balance sheet are contained in the implementing decree to the Act on Accounting. For entrepreneurs, there are two versions of the condensed scope and one full scope of the balance sheet. These are the templates that are prepared for individual financial statements. In the case of consolidations, the Accounting Act allows entities to prepare a balance sheet according to the requirements of IFRS. The form and content of the consolidated financial statements are also influenced by the requirements of the consolidating entity.

In Brazil, the Corporations Law also requires listed companies and PIEs to prepare consolidated financial statements in accordance with IFRS as issued by IASB. Non-PIEs are permitted but not required to use IFRS for their consolidated financial statements. SMEs are allowed but not required to use IFRS for SMEs. The form and content of the financial statements are prescribed by Brazilian GAAP as issued by CPC and enforced by CFC and other regulators (Mendes et al. 2018). The financial statements must be presented in Brazilian currency (i.e. Brazilian Real) and rounded to thousands. (Mendes et al. 2018).

Tab. 3 shows the comparison of the very basic content of the balance sheet of the business entities according to the regulatory requirements in the Czech Republic and in Brazil.

Tab. 3: Balance Sheet elements reported by the entrepreneurs in the Czech Republic and in Brazil

Balance Sheet in the Czech Republic (basic structure)		**Balance Sheet in Brazil (basic structure)**	
ASSETS	**EQUITY AND OTHER LIABILITIES**	**ASSETS**	**LIABILITIES AND EQUITY**
A-Receivables for Subscription	**A-Equity** Registered subscribed capital; Additional paid in capital, share premium; Reserves created from net profits; Retained earnings/losses; Profit/loss of current accounting period	**1. Current Asset** 1.1 Cash and cash equivalents 1.2 Financial investments 1.3 Clients receivables 1.4 Inventories 1.5 Other	**1. Current Liabilities** 1.1 Suppliers and contractors 1.2 Loans, borrowings and leases 1.3 Other financial liabilities 1.4 Taxes payable 1.5 Provisions 1.6 Other
B-Long-lived Assets: Property, plant and equipment intangibles, tangibles; Financial securities	**B-Provisions**		**2. Non-current Liabilities** 2.1 Loans, borrowings and leases 2.2 Other financial liabilities 2.3 Deferred income taxes 2.4 Provisions 2.5 other
C-Current Assets Inventories; Receivable accounts; Marketable financial securities; Cash (in hand, in bank);	**C-Other Liabilities (Non-current and Current)** Issued bonds; Bank borrowings; Payable accounts (trade, employees, taxes etc.)	**2. Non-Current Assets** 2.1 Long-term assets 2.1.1 Financial investments 2.1.2 Clients receivables 2.1.3 Recoverable taxes 2.2 Fixed assets (property, plant, and equipment) 2.3 Intangible assets 2.4 Other	
D-Accruals and deffered items (receivables)	**D-Accruals and deffered items** (liabilities)		**3. Equity** 3.1 Share Capital 3.2 Retained earnings

Source: authors' elaboration according to (Česko 1991), (CVM 2021)

As it can be seen from the above comparative table, the content of both balance sheets is very similar. The difference is in the structuring the reported items. In the Czech balance sheet the asset items are ranked from least liquid to most liquid, in the Brazilian balance sheet it is the other way around. On the other side in the balance sheet, in the Czech reporting system, equity is first reported followed by other non-current and current liabilities. In Brazil, the user first reads information about current payables followed by long-term payments and then about equity.

3. Discussion

As can be seen from the study conducted, in some aspects the two systems are close or identical (for example, both systems are heavily regulated by legislation, but in different ways). From Table 1 and Table 2 it appears that the regulation of financial reporting in the Czech Republic could be stronger. On the other hand, the desire of most accounting professionals and theorists (Mejzlík 2023), (Afeltra et al. 2023), (Závodný and Procházka 2023), is to achieve the situation that has existed in Brazil for several years, namely, greater acceptance of IFRS in national accounting regulations (Barbosa et al. 2018). If the amendment to the Czech Accounting Act is approved as proposed, it will be possible to apply IFRS fully to some PIEs in the Czech Republic from the 2025 .

As regards the form of the balance sheet, the influence of the EU Directives on the content and structure of balance sheet items in the Czech Republic is evident. On the other hand, for the Brazilian balance sheet, the influence of US practices persists, although Brazil has subsequently implemented IFRS into Brazilian GAAP. In terms of the content, both balance sheets appear identical, but it should be taken into account that a number of factors such as the valuation and recognition conditions of the items to be reported and

other practices such as the recognition of national tax requirements as accounting rules, which may commonly occur in SMEs, may affect the items reported. However, in the end, it can be stated that Czech and Brazilian firms listed on the world's public financial markets have comparable information in their published financial statements, as they are required to report under IFRS.

The significance and importance of the chosen accounting methodologies and the subsequent recognition of items is an increasingly debated topic that has been addressed in various aspects by a number of authors. Sedlacek (2020) touches on the importance of reported non-financial information that is essential for a comprehensive view of a firm. Afeltra et al. (2023) conducted a study on the quality of reporting with respect to mandatory and voluntary disclosures. Based on this study, the authors propose to conduct research on, for example, the digitisation and adoption of IFRS into national accounting systems, which is also addressed by Závodný and Procházka (2023). Another possible direction of research could be the impact of the accounting techniques used on the predictive ability of subsequent financial analyses (Scalzer et al. 2018) or the impact of tax regulation on selected reporting items, for example, the impact of tax support of national economies on R&D (Černíková and Hyblerová 2021). The above studies by renowned authors provide inspiration for further issues that can be further addressed in the comparison of the Czech and Brazilian accounting and reporting systems.

Conclusion

In a global business environment, it is essential that companies can communicate through easy-to-understand tools. Financial reporting can be seen as one of the important tools for this purpose. This paper presents a pilot research that can be considered unique, as no paper has been published on the comparability of the Czech and Brazilian accounting systems. The results obtained showed that in order to understand both accounting systems, it is necessary to continue and deepen the research to the level of analysis of individual items of financial statements, their recognition, valuation and reporting as well as related tax issues.

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Knowledge Management as a Necessity for the Digitalisation of Processes Among Tax Advisors– A Survey of German Tax Firms 2022

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Abstract

Digitalisation requirements are the challenge for tax firms in the 21st century. Reserved tasks should become more automated, communications should expand to digital channels and core competences should be expanded to include more consulting. Since digitisation and the necessary technology and its application are not among the core competences of tax consultancies, the transformation of services is slow.

A survey of tax firm owners shows that the digitalisation of services and processes has only been implemented to a limited extent in the firms. Furthermore, the data shows that due to the lack of digital transformation, the majority of tax consultants are unable to offer new services to clients. This is attributed to the fact that the lack of internal knowledge management does not allow the transformation to take place in a structured framework and therefore many tax consultants are still in the planning phase, even though client requirements have been tending to be offered digital options in tax advice for some time.

This paper deals with the need for internal knowledge management, which forms the basis for the necessary transformation. For this purpose, the knowledge areas that are necessary for comprehensive knowledge management are presented. In addition, the model of Büren et al. provides a framework for the development of coordinated knowledge management that can be adapted by tax consultancies. For this purpose, basic requirements are presented in a self-created integrated management approach as an example in which tax firms can start a knowledge management for digitalisation.

Key Words

Tax consultant, knowledge management, digitization,

JEL Classification: C21, R13

Introduction

Tax consultancies, like other sectors, are in a process of transforming their own services into an extended digitalisation. For a sector that has long been active in task areas that were designated as reserved tasks, such transformations are considerably more difficult than is the case in industry or commerce (cf. Heßler/Mosebach, 2013, pp. 3 and 19). The requirements for the knowledge-intensive service sector in the area of 'professional services' (cf. Diesterer, 2008, p. 2) are coupled with strict specifications by the legislator, as the freelance tax advisor works with sensitive data from the client side. This applies

above all to data protection compliance in accordance with the European directives (2016) since 2018 (cf. DSGVO, 2016).

However, the need for more digitisation is necessary in order to meet changing demand behaviour and not only advise clients locally, but also provide them with services digitally without compromising on quality. Digitisation is not a core competence and tax firms are rarely in a position to carry out the complex tasks of transformation in a short period of time. The need for knowledge management in this area is the basis of restructuring in a comprehensive project. However, this is not sufficiently built up in the tax firms and implemented in the existing processes, so that comprehensive digitisation in the industry has not succeeded to date (cf. among others Rieg et al. 2021, p. 6; Ulrich et al., 2021, p. 6).

A specially prepared and conducted survey of 254 tax firms has shown that the level of transformation in the sector is still very low. Only a few standardised tasks are automated in the firms, and as a result, there is little expansion of the advisory services offered. A core area that prevents the transformation to more digitalisation is the lack of knowledge and the application possibilities of digital tools, changes in processes and the need for compliance due to data protection.

The necessary areas in which knowledge management must be actively implemented are to be presented here and adapted to the services of tax advisors. This provides a framework that shows how the complexity of managing knowledge can be reduced to the essential factors. For this purpose, the knowledge management model according to Büren et al. is used, which includes the necessary measures in a holistic model for service companies.

With the creation of our own digital approach, we want to show which areas in the transformations require special attention in order to fulfil the requirements and to adapt the processes internally as well as to integrate the clients into the process in order to reduce the risk of errors on both sides at the interfaces between both process levels. The aim of this practically oriented approach is to show tax consultancies an approach to process-oriented knowledge management that can be used for all processes in the basic architecture.

1. Methodology

Knowledge management in tax firms is an area in research that has not yet been taken up intensively as a separate topic for the transformation to digitalisation of services and processes. Although there are indications that speak of knowledge about digital measures and possibilities, they omit management specifically for this industry. Above all, the research literature lacks practically usable explanations and methods. The existing contributions tend to offer pure frameworks that encompass the planning level and show organisational possibilities but have little impact on the everyday work of tax advisors.

Thus, developments and strategies that will be necessary in the future orientation of tax consulting are increasingly described in general terms. However, these are defined as umbrella terms and move on the surface of the areas in which digitalisation will change the work of tax consultants (cf. Deutsche Bank, 2015; Deloitte, 2018).

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Other publications deal with digitalisations in tax administrations, which only indirectly deal with tax firms as an intermediary and control function. All contributions provide very good information for the company-tax office/tax authority interfaces, but here, too, the direct reference to advisors is missing (cf. among others Al-Rubaye and Al-Ta'I, 2023; Ihnatišinová, 2022; Saruji and Hamid, 2020; Bentley, 2020; OECD, 2017; Chen, Grimshaw and Myles, 2017).

In an approach for the integration of explicit knowledge management for tax advisors, an article from 2008 by Diesterer was found in the course of the literature search in several databases (including Research Gate; JStor; Elevisier; Springer), which, however, also provides the framework planning and directions that deal with the development of knowledge management. It is also true for this contribution that it describes the approaches and areas, but omits a stronger practical reference, at which points, and interfaces explicitly certain measures have to be taken (cf. Diesterer, 2008). The same applies to publications by Haufe, one of the largest consultancies in Europe for services in industries in the German region, which publish articles on the topic online (cf. Dersch, 2019; Haufe Online-Redaktion, 2014).

As part of a survey on the topic of digitalisation and integrated management of offerings in the period April 2021 to September 2022, German tax firms were offered a questionnaire online. 254 participants completed the questionnaire in full. No limitation was made, as it is assumed that all tax firms are in this process of change or intend to be.

In the questionnaire, ten questions are asked that are highly relevant to the topic of knowledge management in tax firms.

The hypotheses established for this research paper are:

H1: The transformation of processes from analogue to digital services has only been actively addressed by a small number of tax firms.

H2: Only a small proportion of tax firms use in-house knowledge management to redesign processes.

H3: Very little staff and client training is provided by tax consultants.

1.1 Knowledge as a competitive factor in professional services

Tax consultancy inherently involves the need for accumulated knowledge and internally available experience from many years of activity, which make consultancy possible in the first place. For this purpose, the preservation of knowledge is essential in order to make the advisory activities efficiently usable for the clients at the level of the acquired knowledge.

However, the field of taxation and related specialist areas is not to be understood as static, but dynamic, since the basic conditions for taxation and other tangential financial areas are constantly changing as a result of legislation.

> "Innovations in tax consulting are the introduction of new ideas, intelligent products, advisory technologies on taxation and the entrepreneurial activities of its subjects. Innovative tax consulting services are new or improved professional actions of lawyers to provide individuals and legal entities with legal assistance on taxation issues to achieve the legal result and ensure the satisfaction of the needs and benefits of consulting process participants." (Marchenko et al., 2018, p. 240)

This requirement alone means that tax consultancies must always be up to date with information and the necessary legal bases in order to be able to provide changes for clients in terms of compliance (cf. Mangoting et al., 2019, p. 30).

The concept of knowledge generally encompasses knowledge and experience that is bundled and offered within a company as internal capacity to act and to customers as a service. This results in value added that should secure the existence of the company and expand it through continuous development (cf. North/Meier, 2018, p. 4). Since knowledge is of high value to companies, it should not be handled casually and haphazardly, but consciously, purposefully, systematically, and methodically. Knowledge is a scarce resource, although the procurement of information has expanded due to the internet and more communication possibilities (cf. Schreuder/Reiländer, 2022, p. 8). Knowledge therefore needs to be systematised and ordered in order to make it usable, to allow it to flow efficiently into processes and to gain added value from it. This results in the need for knowledge management.

Like every management concept in science and the everyday practice of companies, the core of handling knowledge is geared towards organising it. In this context, knowledge management is repeatedly criticised for not being manageable as such, as it is considered immaterial (cf. North, 2016, p. 3) and, against the backdrop of a comprehensive provision of information on analogue as well as digital channels, cannot be organised simply because of the 'information overload' and the high fluctuation of new knowledge (cf. Lucht, 2019, p. 8).

However, knowledge management is not designed to integrate any information or file into any cluster, but rather to determine the need for knowledge and then to make a selection that appears helpful to a company and generates added value. Accordingly, information does not represent knowledge if it is not implemented in a process as an action or way of thinking (cf. North, 2016, p. 4).

Knowledge is present in every company and can be found in two segments. Either it is available as explicit knowledge to each individual employee, or it is tacit knowledge that is hidden in individual employees and has not yet been used. It is necessary to offer incentives so that employees are willing to turn their tacit knowledge resources into explicit knowledge for the company (cf. Wewer/Fischer, 2019, p. 2f.).

> "Communication and cooperation between employees are the basis of corporate knowledge processing. The use, generation and sharing of knowledge for the company as a whole are therefore also based on the quality of knowledge-intensive cooperation between employees. Factors that promote or inhibit this cooperation can lie in the organisational structure and the technical infrastructure of the company. But the cooperation skills of the employees, the working atmosphere or the corporate culture also have an effect on the quality of knowledge-intensive cooperation." (Schreuder/Reiländer, 2022, p. 27)

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This also applies to small and medium-sized enterprises, such as tax firms.

1.2 Distinctions between relevant types of knowledge for tax consultancies

For the area of digitalisation of tax advisory services, as for any other industry, knowledge of the tasks, services and processes applies.

> "With the failure of appropriately designed large-scale projects, it became clear that the use of information technology alone does not constitute knowledge management. The initially naïve concept of knowledge was also increasingly problematised and knowledge was understood as a more complex phenomenon." (Wewer and Fischer, 2019, p. 4)

Ergo, despite experience and existing expertise, the entire task structure of one's own tax firm must be modelled (cf. Fleischmann et al., 2018, p. 2). This relearning is necessary insofar as with the implementation of digital methods and the use of technical tools, the processes must be completely adapted to the new way of providing services. The basis for this are the principles for the proper keeping and storage of books, records and documents in electronic form (GoBD) (cf. Groß, 2017, p. 10f.).

- Principle of clarity
- Principle of completeness
- Principle of correctness
- Principle of regularity
- Safety principle
- Document principle (own document creation for posting if no external document is available)
- The mere storage of data and documents in a pure file system does not regularly fulfil the requirements of immutability!

Tax consultancies know their areas of responsibility and processes that they have carried out so far, but they are necessarily adapting them to a digital level that places different demands on the presentation and processing internally and externally with the clients. To this end, the perspective must not be solely focused on their own service provision, but the digital processes must - as previously analogue - be primarily oriented towards the client and thus adapted to their demands (cf. among others Heßler/Mosebach, 2013, p. 140f.;Lucht, 2019, p. 63). However, prerequisites are

- Knowledge of digitalisation, the existing technical possibilities in the form of software and tool functions as well as compliance in this field,
- Knowledge of the implication of digital functions internally and vis-à-vis the client,
- Knowledge of the redesign of processes that must be in place both internally with staff and with clients,
- Economic and business knowledge that enables consulting beyond the previous core competencies and

- Integration of customised digital, automated solutions in the form of software as well as tools and advisory services for clients (all in one hand as a leitmotif).

Restructuring of processes or the entire business strategy is linked to a project in which it is determined what the starting position is, what goals are formulated, how the goals can be achieved, how successful an implication is and how the project leads to further improvement in continuing stages.

> "Most companies that have actively dealt with the management of their relevant knowledge come to the conclusion that it makes a lot of sense not only to start isolated, technology-oriented individual projects, but to deal with the preparation, introduction and consolidation of company-wide knowledge management in the sense of a strategic approach. In other words, knowledge management should be designed in a strategy-oriented way. In this respect, it makes sense to closely dovetail the establishment and further development of sustainable knowledge management with planned digitisation transformation steps in the company". (Schreuder/Reiländer, 2022, p. 8)

Consequently, knowledge management is not only a framework function here by finding out what one knows and can do, but above all it serves to detect in which areas there are gaps in knowledge that are important for the digitalisation of processes. To this end, various areas of existing knowledge must be examined (cf. Lucht, 2019, p. 337f.).

Administrative knowledge: Administrative knowledge includes knowledge concerning the tasks of a tax firm. It is necessary to determine how the processes have run so far, which persons are responsible for them and what the client structure is. Administrative knowledge is an elementary component of the operative business and generally determines the added value of a company (cf. Schreuder/Reiländer, 2022, p. 17).

Declarative knowledge: This is where the compliance of tasks and the knowledge of the legal basis in the tax system is anchored. This knowledge is also tied to persons who work as experts in the firm and delegate and implement an area of responsibility. Due to the high dynamics in national, supranational and international tax systems through constant legal adjustments and changes, this knowledge must be updated again and again in order to ensure compliance of one's own services and for the client. They are the necessary basic knowledge of tax firms in order to offer high-quality services. Digitised methods are an important area of knowledge accumulation and acquisition that must also be integrated into a digitisation project (cf. Egner, 2018, p. 4).

Procedural knowledge: It encompasses the knowledge of how to deal with tax matters in the tax consultant, which are offered to clients and with whom one coordinates the cooperation (cf. North, 2016, p. 77). As the overlaps between internal processes and external clients arise, these are particularly important as they represent the interfaces that are the most sensitive areas for value creation (cf. Grabner, 2019, p. 89). Here it is important to determine which methods, instruments and documents or data have been passed on to the clients. Since these are to be transferred to the possibilities of digitisation, they must be checked for their adaptability and - if possible - how this can be done most easily for the client. In this area of knowledge management, the involvement of all employees in this process step is important, as this existing knowledge is sometimes only available to a few employees and must therefore be made available in the project. So, when processes are redesigned, they must not only be checked for the individual case, but

they must be able to be determined as a standard in the digital form just as they were before with analogue methods. Both upstream and downstream process steps must be included and the relevant departments/persons responsible for these tangential steps must be determined (cf. North, 2016, p. 267).

Analytical knowledge: This form of knowledge is not overly available, especially in the early days of projects on digitalisation as a new field. Since the restructuring of processes involves methods that are largely considered unknown, the real gaps that could block the process appear here. The knowledge of all employees must be gathered here in order to be able to assess which areas are available as knowledge and which can only be built up with external support. This often requires partner companies from the relevant areas, which also carry out training and development activities (cf. Schreuder/Reiländer, 2022, p. 17). This analytical knowledge is closely linked to the so-called '**metaknowledge**', which is understood as a collection of existing knowledge stocks in individual persons. Here it is also important to include experiences that individual employees have when it comes to sifting through and deciding on external partners who will be involved in the project (cf. Diesterer, 2008, p. 10). Metaknowledge includes the skills in knowledge management, which knowledge states, information and data are needed and which can be ignored because they do not form an added value (Schneider, 2006, p. 14). In addition, metaknowledge also includes the knowledge and involvement of professionals who have external knowledge for the processes of the tax consultants. Here, corresponding databases or direct partnership contacts with these external knowledge carriers are part of knowledge archiving (cf. Grätsch, 2016, p. 68).

Whether these necessary elements, parameters and clusters can be found in the tax consultancies and are used in a uniform knowledge management for the digital transformation as well as allow for new possibilities of the offer is to be determined with the own results from the survey of tax consultants.

2. Results

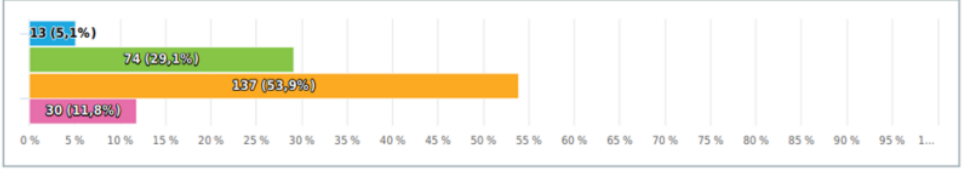
The results are listed descriptively and placed in an interpretative framework. As a distinguishing feature of the response options, information is given in the graphs as to whether there was a multiple response option or a single response option.

Figure 1.: Results on the question of changes in benefits

Have you changed or adjusted the range of services in your tax office?

Single choice, answered 254x, not answered 0x

Options	Answers	Ratio
Lots of changes/adjustments	13	5,1%
Some changes/adjustments	74	29,1%
Barley changes/adjustments	137	53,9%
None changes/adjustments	30	11,8%



Source: Own result (design by Survio ®, 2022)

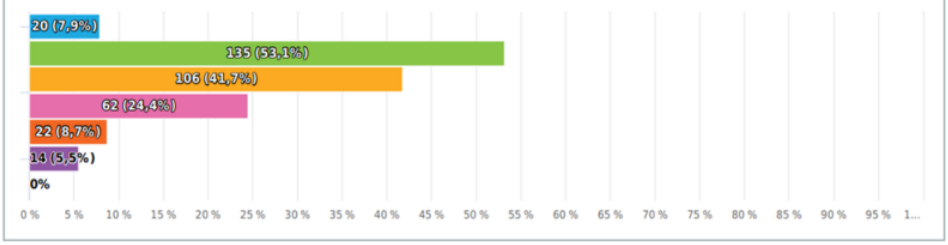
The proportion of tax consultants that have meanwhile comprehensively changed their service offerings and expanded them to areas other than purely reserved tasks can be described as very low at >5%. More than 50% have made small adjustments, which shows that only a few services from the previous portfolios have been restructured or digitally adapted. Approximately 12% are still at the level they have always been. This also circumstantially implies that digitalisations in the services have not or only slightly been adapted, as these possibilities would mean a relief and provide capacities for new areas.

Figure 2.: Results on the question of problem areas in digitalisation

Where do you see the biggest problem areas in digitization in tax office work?

Multiple responses, answered 254x, not answered 0x

Options	Answers	Ratio
Conversion of the processes	20	7,9%
Knowledge of digitization and instruments	135	53,1%
Knowledge of software and its possibilities	106	41,7%
Knowledge of compliance with data protection requirements	62	24,4%
Connectivity with clients	22	8,7%
Providing opportunities to the clients	14	5,5%
Other	0	0,0%



Source: Own result (design by Survio ®, 2022)

The information given here per item is given as a percentage on n=254. Therefore, only the rows are considered and not the columns, as these were not calculated to 100%. Of the total of 359 answers given here by the respondents, 303 were in the areas around knowledge stocks in the area of digitisation tasks. Alone >37% of 359 of all respondent answers concern general knowledge about digitisation and instruments or methods of implementation. Approx. 30% show a lack of knowledge about software and the possibilities of using it in the area of tax consultancy. >17% seem to be overtaxed in the area of data protection and the legally compliant handling of data and information.

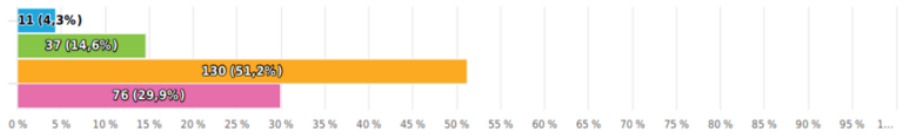
The results show that a large number of tax firms are only just beginning to deal with digitalisation and that problem areas are still preventing active implementation. A lack of development and sensible use of the necessary knowledge management can also be seen internally.

Figure 3. Results on the question about the degree of digitalisation of the clients

How do you rate the degree of digitization of the processes in clients companies?

Single choice, answered 254x, not answered 0x

Options	Answers	Ratio
Very high	11	4,3%
High	37	14,6%
Less high	130	51,2%
Barely	76	29,9%



Source: Own result (design by Survio ®, 2022)

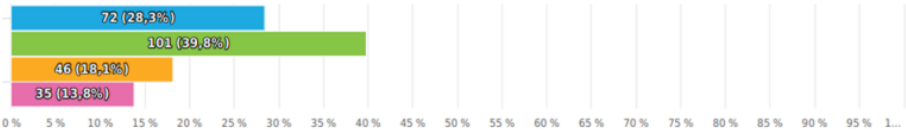
More than 50% of the respondents are of the opinion, according to their own experience, that their clients or, in general, clients with their own companies are still very little digitised. Only 1/5 are convinced of a high level of digitalisation. If one takes these results in comparison with the previous question and the results obtained, then it seems that the tax consultancies are not digitising hastily because their clients have not done so either. This reasoning interpretation is also applied to other results and analysed further.

Figure 4. Results on the question of training opportunities with clients

Do you offer training for clients (companies and organisations) to make digital adaptions easier?

Single choice, answered 254x, not answered 0x

Options	Answers	Ratio
Yes	72	28,3%
No	101	39,8%
Planned	46	18,1%
Made by extern partners	35	13,8%

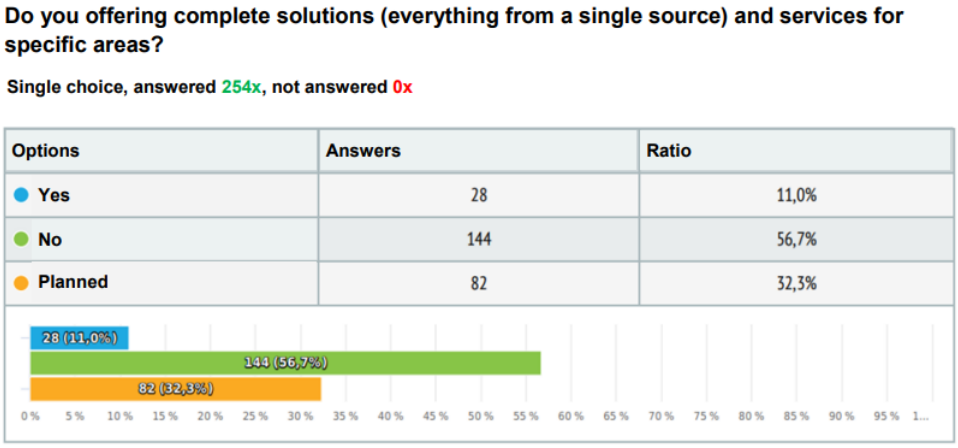


Source: Own result (design by Survio ®, 2022)

The results determined above also correlate with the results regarding offers for clients on the part of the tax firms. Almost 40% do not offer training for clients, which is relatively consistent with the results on the adjustments of the service areas. Since only a minority of tax firms actively and completely address the digitalisation area, it also follows those additional services are also offered to a lesser extent. Approximately 30% of the respondents who also offer training for clients also roughly correspond to the respondents who have adapted and expanded their services in some or many areas (approx. 34% in the first results table). Almost 14% of the respondents use partner

companies for these external trainings for clients, which as outsourcing is a high-cost-factor and can thus be borne by large tax consultants or alliances.

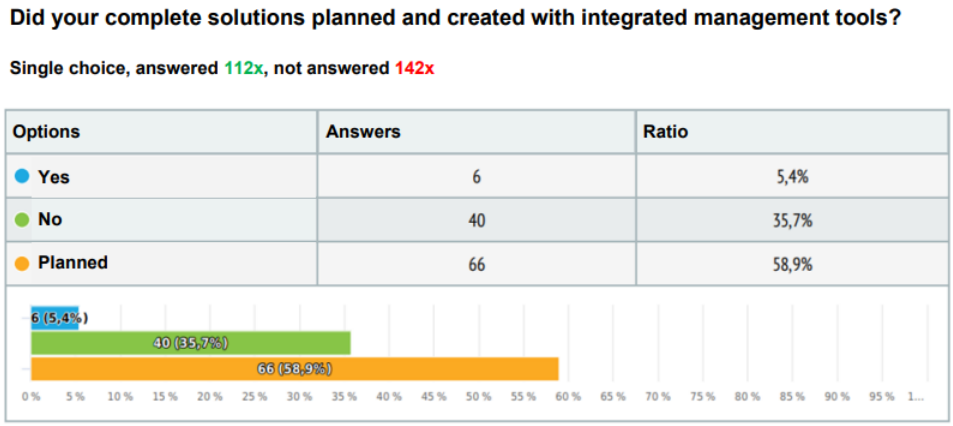
Figure 5. Results on the question of integrated offers



Source: Own result (design by Survio ®, 2022)

In the case of integrated approaches to services in areas of tax advice (e.g., reserved tasks, legal and economic advice in the area of real estate) offered by tax consultants without partners, the result of 11% was expected. >50% are not represented here with such complete solutions for clients. >30% are planning such offers. Overall, these results also show that digitisation is not yet being used comprehensively by most tax consultants, as extensions of services in integrated offerings can only be passed on to clients in a beneficial way by means of digitised processes.

Figure 6.: Results for the question on the use of management tools for complete solutions



Source: Own result (design by Survio ®, 2022)

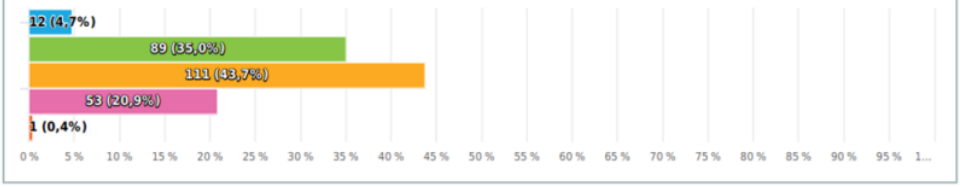
The use of existing management tools in the area of integrated management of services is only used by >5% of the subjects. Compared to the integrated offers, only half used ready-made management concepts, so that individual planning was carried out for the other subjects. The use of ready-made tools and concepts is planned by approx. 60% of the total of 112 respondents who answered the question. It remains open here whether the management tools can be assessed as successful for implementation, which would have to be determined in a further survey in the future.

Figure 7.: Results on the question of highest potentials in areas with complete solutions

Where do you see the most potential in tax advice by offering complete solutions?

Multiple responses, answered 254x, not answered 0x

Options	Answers	Ratio
Business consulting	12	4,7%
Business consulting private	89	35,0%
Real Estate Advice	111	43,7%
Legal advice	53	20,9%
Other	1	0,4%



Source: Own result (design by Survio ®, 2022)

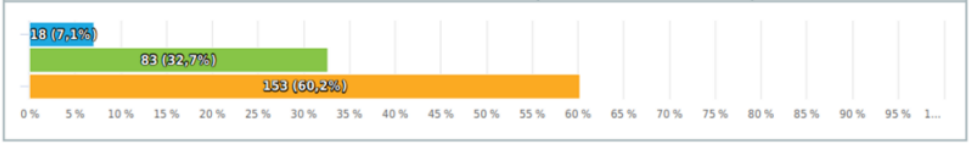
Among the areas in which the respondents can imagine or have possibly already implied an integrated approach, the real estate area has been indicated most frequently. This is followed by consulting in the area of private clients before legal consulting. Management consultancy is very poorly represented at around 5%, ahead of other, undefined areas (<1%). Reasons can be seen in the fact that the areas are staggered in their similarity of processes and requirements and offer a high adaptability for holistic services. The area of management consulting is much more specific here, as companies from different industries and sectors require more individualised support and it seems difficult to offer all the necessary services from a single source.

Figure 8.: Results of the question on the need for training of employees

Did you have to train your employees as part of digitization?

Single choice, answered 254x, not answered 0x

Options	Answers	Ratio
Training necessary	18	7,1%
In some areas	83	32,7%
Training not necessary	153	60,2%



Source: Own result (design by Survio ®, 2022)

As before, the results obtained give a picture of digitalisation in the tax consultancy sector. The high proportion of respondents who did not consider training to be necessary have not yet embarked on the transformation of processes. One third of the respondents felt that staff training was necessary in some areas, which is close to the results that can also

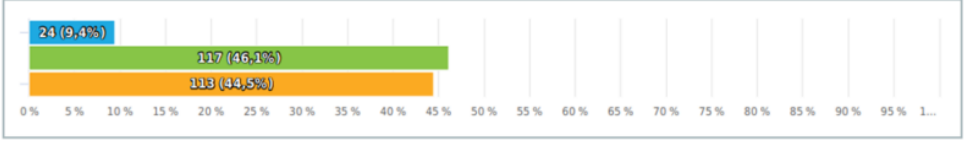
be transferred to the sector in general. Employees have gained their own experience in the area of digitalisation and are already sufficiently trained in basic functions through experience. Special requirements in the processes still need further education and training in order to smoothly integrate the new services into the company processes. The differences in the digitalisation maturity of the tax consultants can be seen with 18% of the test persons for whom comprehensive training was necessary.

Figure 9.: Results for the question about knowledge management in the tax firm

Do you use an own knowledge management in your office?

Single choice, answered 254x, not answered 0x

Options	Answers	Ratio
Yes	24	9,4%
No	117	46,1%
Planned	113	44,5%



Source: Own result (design by Survio ®, 2022)

The concretisation of the use of knowledge management in the presented framework of the research paper is only used by >10% of the subjects, which shows that a pre-established knowledge stock and management of required information for digitisation was not undertaken. Approximately 45% plan such use in the future and almost the same number of subjects do not use knowledge management. Considering the need for the use of digital technology in the reservation tasks, which has been discussed for two decades, as well as the creation of more consultation, which should also be digitally supported, the results show a largely non-existent digitisation in the sector.

If we look at the results in relation to the hypotheses that have been put forward, the following findings can be identified.

H1: The transformation of processes from analogue to digital services has only been actively addressed by a small number of tax firms.

It is generally assumed that the expansion of task areas in tax consultancies to more consultations and integrated complete solutions can only be achieved through expanded digitalisation and automation (cf. among others Heßler/Mosebach, 2013 ,p. 3; Bär, 2015, p. 47; Pfeffer/Stein, 2016, p. 382; Egner, 2018, p. 4.). Implementation to change/expand service provision (Figure 1) was reported by only >34% in the survey. More than half have only made minor changes and about 12% are in the same service portfolio as before in their firm. This shows that only a portion has adapted to the requirements that are proving to be future-oriented for the industry.

As a result, only >11% of the tax consultants can offer their clients complete solutions with reservation tasks, consultations and possibly necessary training (Figure 5). That there is an awareness of building such solutions for clients is shown by the >32% of respondents who indicate plans in this regard.

Structured change also requires the use of management of the processes in which it takes place. Here, only >5% have used existing science-based management tools (112 out of 254 respondents answered here). Approx. 36% have denied this, but >58% are planning in this direction (Figure 6).

In the perceived areas in which complete solutions can be offered (Figure 7), the respondents see the best opportunities with >43% in the area of the real estate industry (private as well as business). In addition, great potential is also perceived in the area of private consulting with 35%. The low proportion of corporate clients (<5%) is striking. This may be due to fixed structures in the real estate industry, which have similar workloads and conditions in tax consulting. In the case of private clients, the workloads are not considered as high as is the case with companies, whose complexity in tax-relevant areas is much higher. In this context, the requirements of digitalisation are also expanding, which, given the existing results, only allows the conclusion that few tax consultancies can offer this at a professional level.

In these results, the hypothesis of low transformation can be substantiated, although a larger part of the test persons is prepared to tackle more planning and implementation in this direction in the future. It should be noted at this point, however, that this must be seen as very late in a development that has existed for more than 20 years.

H2: Only a small proportion of tax firms use in-house knowledge management to redesign processes.

The results of the question on the introduction and use of knowledge management (Figure 9) clearly show that less than 10% or 25 out of 254 of the tax consultants surveyed use it. The lack of knowledge, and thus the identifiable lack of knowledge management use, is also evident in the areas that are perceived as the biggest problem areas by tax consultants in the area of digitalisation (Figure 2). There are primarily three important knowledge components that enable the digitisation of processes in the first place. Most tax consultants (over 50%) lack basic knowledge about digitalisation and the necessary tools for implementation. This basically represents the foundations for the transformation of processes that are to be redesigned from analogue to digital.

Approximately 42% of all answers given by the respondents also show a low level of knowledge about the necessary software and its use in the processes, which makes it very difficult to select a product as an instrument of digitalisation.

In addition, about ¼ of all tax consultants see themselves facing major challenges in securely designing the digitalisation of their own processes and in cooperation with their clients in terms of data protection.

The results confirm the hypothesis that only a small proportion of providers in the sector can offer efficient and resilient knowledge management in the area of digital transformation of tax firms.

H3: Very little staff and client training is provided by tax consultants.

The use of training for clients (Figure 4) and their own staff (Figure 8) is only offered or used by a few tax consultants. Client training can only be offered comprehensively if the firm understands digitisation and the implementation of digital tools in its own work and

processes. Approximately 40% do not offer such training, whereby it must be assumed that due to a lack of implementation and understanding, such training cannot be passed on to the clients internally. If one compares the use of knowledge management with the perceived degrees of digitalisation of the clients (Figure 3), as perceived by the tax consultants, then an indicative chain emerges. >80% of tax consultants determine the degree as either low or almost non-existent. This would make training as a service on the part of the tax consultants necessary for better and closer cooperation, but this is not the case in the majority of the test group.

The picture is similar for employee training, where 60% of the respondent's state that no training in the area of digitalisation is necessary. At first glance, it seems that the employees already have all the necessary knowledge. However, this does not correspond to reality. Rather, this result is to be interpreted in the direction that training is not necessarily due to the fact that the transformation of processes towards digitalisation is largely absent.

Since both areas, staff and clients, receive little training, this hypothesis is also considered confirmed.

3. Discussion

Digitalisation enables companies to address and interact with clients, partner companies and other relevant groups in new ways through new technology in the field of information processing and communication. One would generally expect that freelance, scientific and technical service providers would take advantage of these developments and make their activities and processes more productive. This is all truer because numerous higher-skilled, knowledge-intensive service activities are performed here, which should actually benefit particularly from the opportunities of digitalisation (Sorbe et al., 2018, p. 27f.). In fact, however, this sector of the economy has the lowest growth in labour productivity between 1991 and 2018 in Germany. Moreover, it even experienced a decline in labour productivity over longer periods, which can be seen in the figures below. The break occurred during the economic crisis from 2007 onwards, when there were many legal innovations in the financial services sector that required companies to adapt quickly, but which could only be implemented slowly (cf. Flegler/Krämer, 2021, p. 39).

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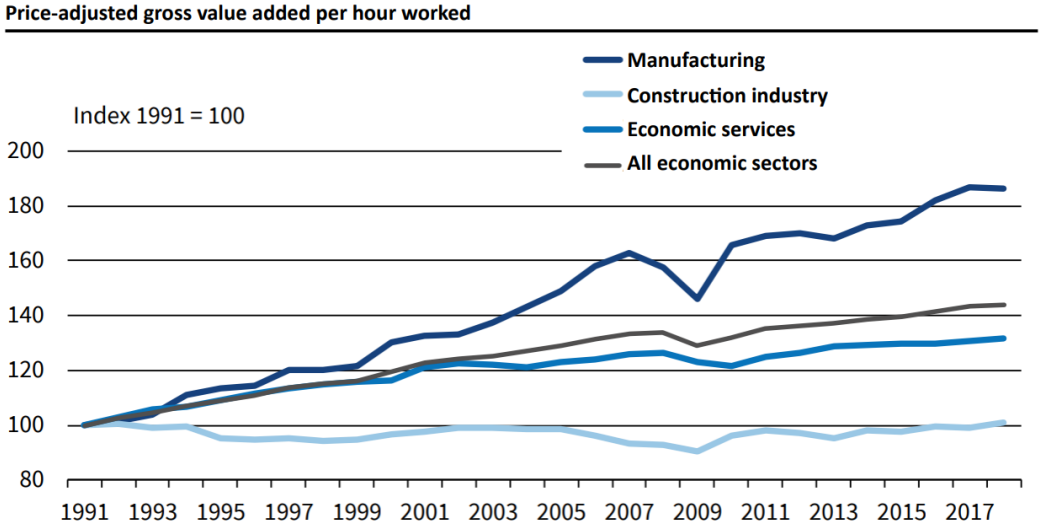
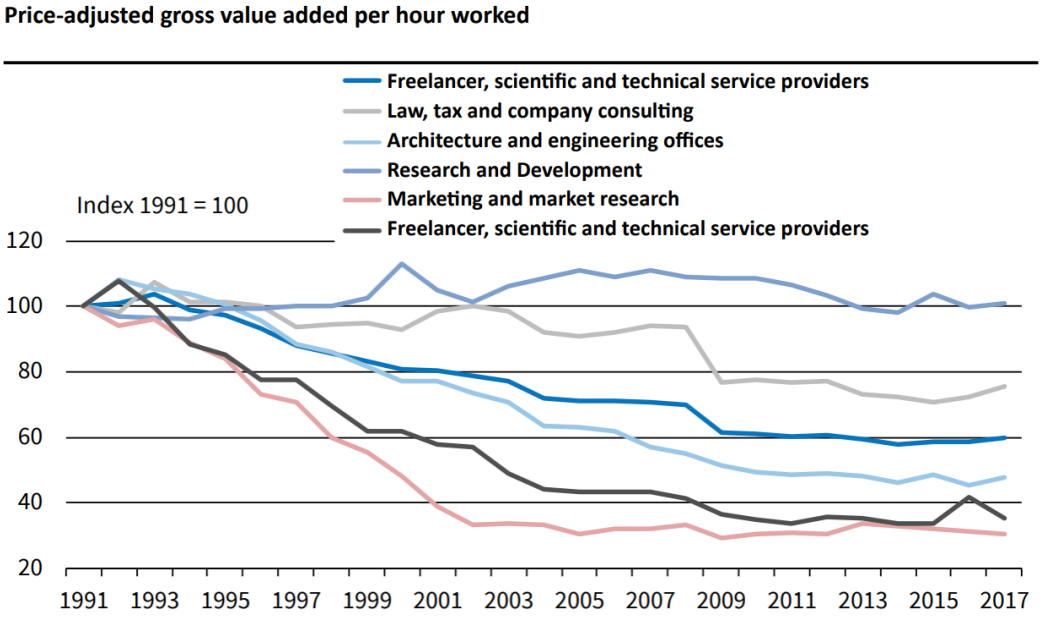
Figure 10. Hourly labour force by price-adjusted gross value added



Source: Flegler/Krämer, 2021, p. 39

Figure 11. Hourly labour force by price-adjusted gross value added in business-related services



Source: Flegler/Krämer, 2021, p. 39

The low level of digitalisation and the associated low expansion and changes in the offer structures of tax firms has been shown by the results of our own survey. The future direction of the industry requires increased efforts on the part of the individual firms if they do not want to disappear from the industry.

As a basis for these transformations, tax firms need - as the results clearly show - a structured knowledge management that extends across the entire firm and also includes the client and tax authority interfaces.

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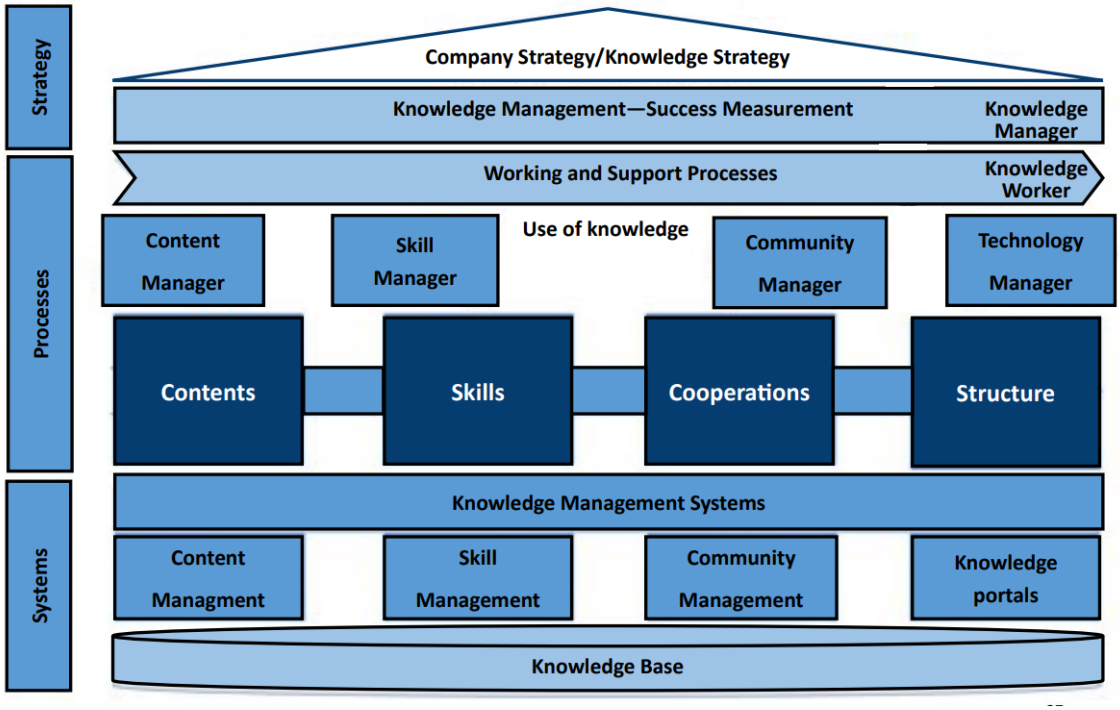
For use in tax firms, the integrated approach according to Büren et al. of the University of St. Gallen offers a holistic approach to knowledge management. The model is shown below in a specially adapted form.

Figure 12.: Integrated knowledge management according to Büren et al.



Source: Schreuder/Reinländer, 2022, p. 33

Operationalizability is based on the factors of collaboration, accessibility by all staff, involvement of staff by posting suggestions and directly usable knowledge, and structured provision for quick application. It also serves as a basis for the knowledge levels of staff and the ACTUAL state of digital application. Tax firms need to know their processes in all steps, internally as well as externally. This requires workflow models that show how the processes function in the individual processing steps. It is also necessary to determine which form of communication takes place (analogue or digital) and how the digital uses are designed in order to determine the current state of their own use and knowledge. An example of this would be the forwarding of documents in the process by email.

The distribution of tasks in this model is clearly defined and has people responsible for managing the knowledge areas. This includes research, new knowledge acquisition, provision and control of the respective knowledge status. The relevant responsible persons can take on not just one, but several tasks, as these are very closely linked. Initiators and framework conditions for knowledge management and digitalisation usually start from the company management, but delegate further tasks within the company.

Particularly at the beginning of the transition to digitalisation or automation, external consultants with the relevant expertise are often integrated into knowledge management and interact with the responsible person(s) in the company (cf. Weinzierl, 2016, p. 312). In the process, other ways in which digital tools can be re-implemented to replace traditional ones due to inefficiencies can be determined with the external experts. The

previous example of transferring documents by email could be replaced by an in-house cloud.

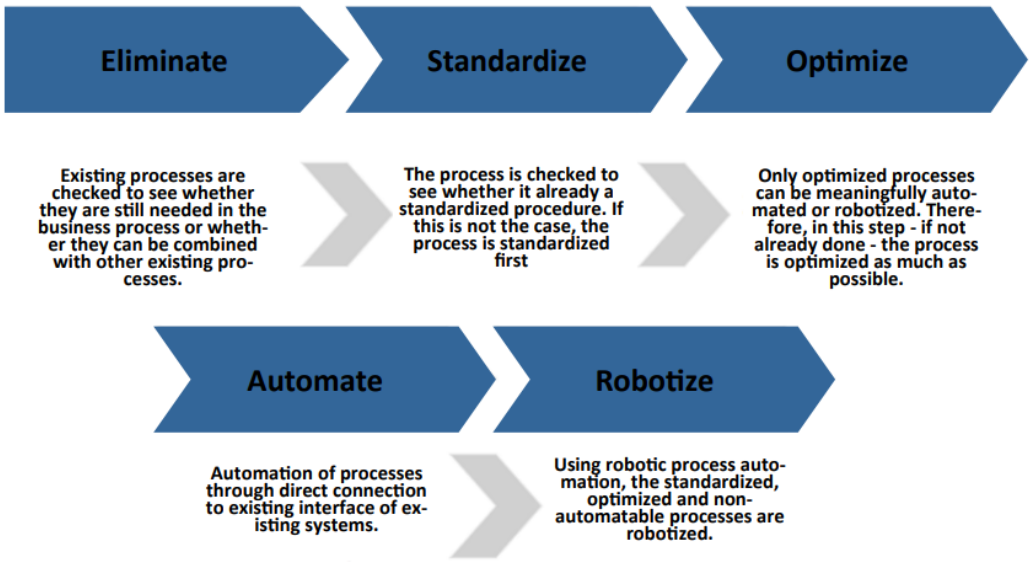
The same applies to the use of digital solutions for interfaces with clients. Previous forms of data transfer must be checked to see if they can be redesigned in digital form and, if possible, used as a new process structure. Automations of work areas represent an important factor here that calls for these harmonisations.

Automation arises with the degree of digitalisation, but also through the establishment and use of appropriate software that can perform such automation. This will become more prevalent in the field of accounting (cf. Sanz de Lama, 2018, p. 2).

To determine the degree, first and foremost the complete digitalisation of accounting within the processes, which also includes automations, since numerous work areas are always repeated and can thus be managed by computers and suitable software. Here, for example, there are tasks that deal with the account movements and invoicing of one's own tax consultant, but also of the clients (cf. Zinnöcker, 2019, p. 11). These must be processable for the tax consultants, which makes it necessary to harmonise content, data and information and to make them digitally feedable and evaluable for the automation process. They are also a part of the knowledge that the tax consultants have to build up, whereby the external partners from the IT sector develop the structures in cooperation with the tax advisors' knowledge of tax-relevant references into a process that takes all relevant content into account. The external partner is also at the same time the coach for the tax consultancies so that they can pass on the acquired knowledge to the clients.

The analysis, sorting and implementation of automation processes is as follows.

Figure 13. Sequence of selecting processes that can be subjected to automation



Source: Zinnöcker, 2019, p. 20

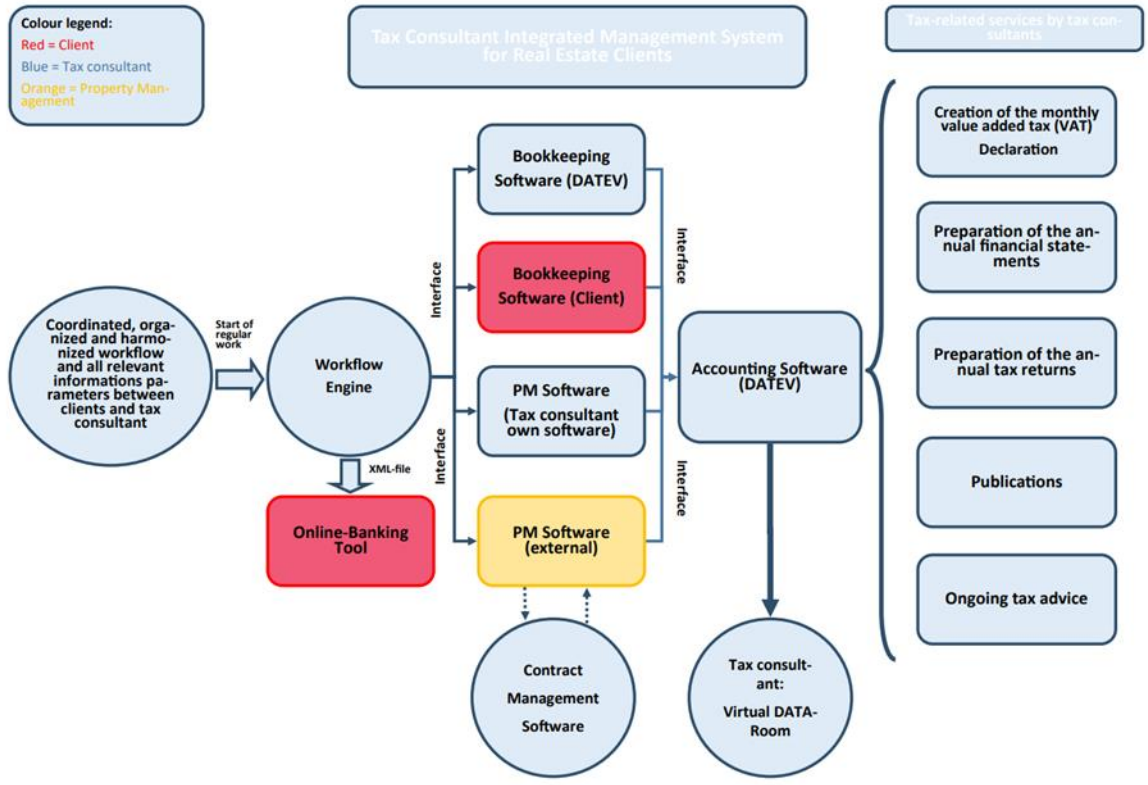
If such basic conditions are implemented within the office processes, the original task of the tax advisor as information and data collector is only a small part of the tasks set. The change takes place at this interface, where the structure of the task changes from pure recording to the area of analysing the information. The tax advisor is increasingly

becoming a controller in the sense of the client, which leads the demand for breadth and depth of advice from the actual core competences to a greater environmental consideration of the client and his business conduct. Thus, the business management tasks will concentrate more on the area of consulting and the tax advisor will be an important consulting partner for the client, for example, from the founding of a company to the determination of a succession. This also includes the area of digitalisation in the new concept, as the contacts between the client and the firm will no longer only take place selectively when consulting is expanded, but the advisory function will expand due to improved information situations on the part of the tax advisor, as the latter can intervene more and more in detail in the processes. This can concern acute interventions, such as deferral applications for tax burdens when liquidity bottlenecks are imminent, but also changes in the legal area, which are passed on to the client by the tax advisor and implemented with him in order to ensure compliance.

By using external experts in tax consultants as coaches to build and expand the knowledge base, learning digital processes depends on how intensively tax consultant staff are trained in renewal and change through digitalisation (cf. Hübl, 2016, p. 808f.).

Looking at a practically oriented process design by means of digital uses at the interfaces between client and tax consultant as well as the structure of the internal processing of tax advice, a requirements profile emerges on the basis of the process architecture as shown below. The present example has been set up in the area of real estate services, which was also seen as an important area for digitalisation by the respondents in the survey.

Figure 14. Exemplary digital process workflow of the cooperation between client and tax firm



Source: Own presentation, 2022

The preconditions of such a process architecture are aligned with the tax consultants' knowledge of software, tools and usefulness in relation to the requirements of the tax consultants' services for the clients. This concerns both the internal processes, which must be checked for automation by carrying out test runs with fictitious data in order to establish the fit and complete capture of all relevant information at the interfaces to the clients. This can only be done through extensive research for the existing software and tools that need to be checked for their suitability. For the shortlist, direct cooperation with the manufacturers is necessary in order to eliminate existing problems and to enable the use for all employees through training. Despite the automation of processes, it must always be possible for tax consultants to carry out targeted controlling of the information and data collected in order to eliminate errors before forwarding them to the clients.

In addition, when tasks are automated, it must be determined which advisory services are possible from the data and which employees are capable of doing this. In the Büren et al. model, this determination can be seen at the process level, where contents, competences, cooperation and structures are determined and responsibly divided in the processes. If knowledge resources are not determined in advance, advisory services, for example, cannot be carried out adequately. It is important to identify and promote internal specialists and, if necessary, to hire new specialists who can provide these services without further training. Here it is important to use knowledge management according to Büren et al. as a knowledge base and to determine the knowledge workers in advance.

Especially in the area of client care, it is necessary that there is close cooperation between both parties. In the model in Figure 13, this is shown as a prerequisite for regular cooperation. Such preliminary work is only possible if the tax firms are aware of the use, effects and advantages of their own process design in the course of digitalisation. In addition to tax-relevant and economic as well as legal knowledge, it is also necessary to establish a level of knowledge that allows them to independently pass on these processes and their requirements to their clients. External partners could be called in for this purpose, but they are not trained in all relevant areas in such a way that they enable holistic support. It is important to offer everything from a single source at the highest level as an added value of the tax consultants' services. This also implies the specialised digital coach as a service for all areas of requirements affecting the clients.

For this purpose, the tax consultancies must gain insight into the processes of the clients and already provide a consultancy service at this level that allows for a later efficient process design between both parties. In the area of the presented example 'real estate', this is data and information from property management and asset management that require harmonisation. Important areas here are

- Harmonisation of information, data and their preparation (avoidance of different accounting records and transcriptions of accounts),
- clear designations of persons in areas of responsibility in the tax-relevant areas of work that allow for easy consultation and consultation,
- Provision of software and tools by tax consultancies that are applied uniformly for mutual benefit (faster processing for the client, faster internal processes for the tax consultancy, sustainability in the use of data and information),
- Software and tool customisations with the clients allow the automatic allocation of vouchers, bookings, payment transactions, etc., which are received directly by the tax consultancies and integrated into the process and

- new processes are used as standardisation at both parties independently and with each other.

By observing the preliminary services, the generated results of the tax consultations can be used uniformly for the relevant client areas. Based on this, it is possible for tax firms to provide advice that offers additional benefits for clients in a business context.

The area of standardisation, which is synonymous with successful implementation of the strategy, is one of the most important here in the context of continuing knowledge management, as these processes are offered as ongoing services, can be quickly adapted to changes and can also be applied by new staff in the tax consultants with internal training. This requires comprehensive documentation that allows structures that have been built up to be internalised and updated again and again in further developments.

As a rule, it is an important task for tax firms to show readiness for the digitalisation of their own processes. This requires the corresponding investments in IT and external consulting, which are used for an introduction phase of the new structures and their requirements. The orientation of the individual changes must be geared to the client, since all functions of digital processes are geared to the client's benefit, which corresponds to the already developed market situation in which clients express demands and wishes that tax firms must follow for their own business success (cf. Ener and Hammer, 2019, p. 143f.).

From the time digital processes are implemented in the office, knowledge management must be structured in such a way that tax advisors offer themselves as coaches for their clients. The digital processes must work in harmony with the requirements of both the clients and the firm.

Theoretically, this is possible for every firm, but the survey results showed that the digitalisation of tax consultancies is still in its infancy in 2023.

Conclusion

Today, knowledge is one of the most important resources for tax advisors to survive in competition. Knowledge management provides the strategic and operational basis for the targeted and systematic handling of the resource knowledge for the renewal or change of existing processes. The administrability of knowledge is the basis on which tax consultants check their own processes to see if they can be successfully implemented with digital instruments. In doing so, they determine core competencies that they will continue to retain as core competencies in the transformation and expand with digital possibilities. This also includes the documents and records used so far, which must be digitally prepared and adaptable in the interface to the client.

This administrative analysis also allows tax firms to identify declarative knowledge, which mainly revolves around compliance that must be adhered to. This declarative knowledge is designed to comply with the provisions of data protection laws when transforming to digital work processes and full automation. The analysis of new processes must be built up in the structure with external experts on data security and internalised

in the communication to the client in such a way that tax consultants can do this educational work independently.

Only with these levels of knowledge can tax consultants turn to procedural knowledge that is developed internally and then given to clients as a more far-reaching service. In the development phases of transformation and client involvement, it is possible to gain analytical knowledge. The digital offers are to be communicated in such a way that they serve the clients as added value of the internal processes through harmonisation, optimisation, and final standardisation. In this way, tax consultants succeed in generating unique selling points in the internal competition within the sector. The results of the survey have shown that only a small proportion seem to be able to do this at present, which divides the industry into a two-speed development.

The area of meta-knowledge is the ability of a tax consultant to consolidate the knowledge it has acquired as its own standard and to document all knowledge elements in such a way that it is no longer implicitly anchored or 'hidden' in individual employees but is generally accessible to all employees. With this kind of knowledge archiving, tax firms can make themselves less susceptible to staff fluctuations and lose knowledge when knowledge carriers leave the company.

The sample process created for this purpose clearly shows which preliminary steps have to be taken before a finished offer can be passed on to the clients. Tax consultants that cannot establish the close cooperation with clients if they cannot implement the professionalisation to be obtained in advance by means of internal knowledge management in such a way as to be able to guide the clients.

Especially for companies that create knowledge-intensive services, targeted knowledge management is critical for success in order to use the knowledge of each individual professional and the knowledge of the company in the best possible and synergetic way (cf. Schnalzer et al, 2021, p. 3). In doing so, it is necessary to pursue a holistic management approach that can always be used flexibly in order to be able to offer agility in the services provided to clients. The integrated knowledge management approach presented here is considered adequate for tax consultancies, regardless of whether they have many offerings in their portfolio or specialise in a core area. Companies that can bundle, provide and implement knowledge quickly and securely will be able to offer their services efficiently and stably and thus dominate the markets for knowledge-intensive services. If firms do not emphatically and systematically use the network of their professionals, they will find it difficult to argue the added value of their work to their clients. Successful knowledge management requires an appropriate corporate culture and infrastructure that support and promote knowledge sharing and retention. The infrastructure can be created with the help of information and communication technologies. The necessary corporate culture can only be created through organisational and sociological measures.

Above all, the technical specifications on the part of communication with the tax authorities will become more complex in the future and require rapid adaptability. On the other hand, the processing times of routine activities will decrease and with the resulting time savings, further advisory services can be offered. The manual activities in accounting will probably be completely taken over by machines in the future. This form of digitalisation can be described as full automation, as neither the tax consultancy nor its clients will require a high number of hours for processing. As a result, more control activities will be taken over by the tax consultancy and the data and information can be

used in consulting, for example, to show clients new options for investments (cf. Schützinger, 2018, p. 32).

In the future, there will be more demand for activities that can be combined, such as business management consulting and subsidy consulting. These would be new services that would be made possible by the time savings of digitalisation that have been described.

Since the field of tax, consulting and compliance is also considered to be dynamic in the coming years, producing numerous innovations that tax consultancies must incorporate into their services, changes are tied to the principle of life-long learning (cf. Bentley, 2020, p. 367).

The dynamic behaviour of innovations also affects the development of software and tools that will be used in tax consultancy. As a result, the principles of lifelong learning are also required in tax consultants in this area (cf. Teichmann and Hüning, 2018, p. 26) and must be incorporated and archived in knowledge management.

Since both areas are aligned with a constant renewal of knowledge about applicable methods and instruments as well as information, they must also be structured and organised within organisational learning in a holistic knowledge management (cf. Schuster, 2018, p. 13). Due to the close interconnections in the cooperation between clients and tax firms, the digitalisation of processes and communication via more channels means that every relevant change is passed on to the clients in a timely manner. Depending on the scope and complexity of the innovations, the tax advisors are also in the role of coach and advisor at the same time, in order to train the clients and optimally adjust internally to all changes.

Due to the fact that many tax consultancies have not yet sufficiently embraced digitalisation and at the same time do not use knowledge management, in the medium term the industry will be reduced by those firms that have not adopted the requirements quickly enough or not at all.

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Solving Optimization Tasks on the Real Estate Market Using Multi-Criteria Decision-Making

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Abstract

The huge number of advertisements on the websites of real estate companies are deep unexplored data mines. Real estate data can be obtained daily by automatically analyzing such websites. Specifically, data on the square footage of apartments and their price are commonly available. It was thus possible to control the real estate market in every municipality of the Czech Republic. A software tool has been developed to obtain this data, which also monitors the number of advertisements in individual municipalities. The aim of the article is to design an application for selecting the optimal variant based on multi-criteria decision-making and evaluation of variants. The results of many multi-criteria decision-making methods (TOPSIS, ELECTRA, and others) will be implemented and compared, an10d a specific item that is most suitable for a given user will be proposed.

Key Words

multi-criteria decision making, ordinal information, cardinal information, real estate market

JEL Classification: E43, G21, G11

Introduction

Mentions of the first systematic study of human decision-making date back to the 4th century BC, where the ancient thinker Aristotle of Stageira addressed this topic. A person makes decisions several times a day, it is one of the most important mental activities to fulfill life and also a basic manifestation of the human psyche. This phenomenon is not only devoted to psychology or philosophy. Other disciplines that have focused on issues related to decision-making are, for example, mathematics, economics, computer science or the so-called marketing science. This diversity of scientific fields brings a whole range of approaches to decision-making, but also, on the contrary, inconsistency with concepts or nomenclature. (Brožová, 2003)

The aim of this article is to describe multi-criteria decision making and create an application in a high-level programming language used on a concrete example. Based on the data, this application is intended to help decide which advertisements from the Sreality.cz server (relating to the sale of apartments) are "optimal" according to the criteria specified by the user. The most advantageous selected properties will be searched using several methods for choosing compromise options.

The use of multi-criteria decision-making and the evaluation of variants is addressed in many scientific publications, for example (Vafaei, 2016), but there are not many applications to the real estate market. Analysis of the real estate market in sustainable development context for decision making is studied by (Kauškale, 2017).

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1. Methodology

The decision-making process consists of the following sub-processes:

- Identification of situations that need to be resolved in some way. This sub-process is focused on the collection, analysis and evaluation of informations
- Formulation of the decision problem. During this step, we analyze, formulate and determine the basic elements of the problem.
- Determining the criteria according to which the evaluation and subsequent selection of variants will take place.
- Creating a solution to the problem, or variants and formulating them.
- Determining the consequence for each variant from the point of view of the criteria.
- Selecting the resulting variant or arranging variants according to preferences and evaluating their consequences.
- Real implementation of the selected variant.
- Checking solutions. In this step, deviations from the goals that have been set are outlined. In the event of a difference, there is an option to implement a correction.

The initial step for multi-criteria evaluation of variants with certainty is usually the determination of individual weights of criteria. The weight of the criterion numerically expresses the significance of this criterion, where it is generally true that the higher the rating, the higher the significance. There are several methods for determining the weights of the criteria. The weights of the criteria are expressed in the interval [0,1] and their sum must be equal to one, so the last step in determining them is to normalize the individual weights. The result of the methods of determining the weights is a weight vector. (Fiala, 2008) (Ghosh, 2019) (Ramík, 1999)

Since multi-criteria decision-making includes tasks that are very diverse and it is not quite possible to present a universal decision-making algorithm, it is therefore necessary to present their classification. An important classification point of view is the way in which we enter the set of admissible variants into the decision problem. If the set of admissible variants is entered in the form of a finite list, we are talking about the task of multi-criteria evaluation of variants. If the set of admissible variants is defined by a set of requirements that individual alternatives must meet, we are talking about the task of multi-criteria programming.

Another way of classifying tasks is based on the information available to us about the decision options and the goals pursued by the decision maker. This information may already be part of the assignment or may be obtained during the solution. From this point of view, we divide them into the following four categories. The first category are tasks with information enabling the scalarization of the optimization criterion, sometimes referred to as tasks with cardinal information about the criteria. A category called scalarization-free information tasks are at the core of multicriteria decision theory and practice. In these tasks, the term "non-dominated solution" is used. Another category is tasks with information obtained during the solution, since in some situations it is difficult to obtain information in advance. The last, fourth category, referred to as parametric solutions to multi-criteria optimization tasks, gives priority to a broader insight into the issue over recommendations for action that are more or less unambiguous. One of the disadvantages of this category is that parametric solutions are usually quite confusing.

In the following chapters, important methods used to determine compromise variants will be described.

Methods of determining weights of criteria

Criteria weights are determined based on criteria preference information. Information can be ordinal, cardinal, nominal, or even none. If no information is available, it does not mean that nothing is known about the problem. The solver simply does not want or is unable to set preferences for individual criteria. In such a case, equal weight is assigned to all criteria. If the solver requires that the criteria do not have the same weight, the Entropic method is used. (Liu, 2011) Nominal information divides the variants according to the relevant criterion into acceptable and unacceptable. It is expressed using aspiration levels, which are represented by the worst possible values at which the variant can be accepted.

To determine the weights from ordinal information, it is assumed that the solver can and wants to express the importance of individual criteria in the form of ordinal numbers, or for all pairs, he determines which of the two currently compared criteria is more important. It is permissible to rate two or more criteria with the same preference. In this area, the order method and Fuller's triangle method are most often used, which transform ordinal information into the form of a weight vector.

If the decision-maker is able and willing to determine the order of importance of the criteria and at the same time their ratio for each pair, we are talking about methods of determining weights from cardinal information about criteria preferences. The most used methods are: the scoring method and Saaty's method of quantitative pairwise comparison, which derives a weight vector according to the information about the estimation of the weight ratio. (Liu, 2011)

Methods of selecting compromise variants

Methods with nominal criteria information

These methods are based on comparing the criterion values of all variants with the aspirational levels of individual criteria. This includes, for example, the conjunctive and disjunctive method or the PRIAM method. (Pozdílková, 2022)

Methods with ordinal criteria information

Methods on ordinal information require entering the order of importance of criteria and the order of variants according to individual criteria. We can have methods that are simpler and where their results are rather indicative, or methods that are more complicated, but in return provide a comprehensive view of the problem. The most used methods are the lexicographic method and ORESTE. (Liu, 2011)

The user is required to supply the complete quasi-ordering of the criteria (expressed by the vector q) and the complete quasi-ordering of the variants by all criteria (expressed by the matrix P), that is, indifference of both criteria and variants is allowed. The method has two parts. In the first part, the distance of all variants according to individual criteria from

the fictitious start is determined (the serial number of the fictitious variant or criterion is 0). The values of the distance matrix *D* is determined by the relation:

$$d_{ij} = \left(0{,}5\left(p_{ij}\right)^r + 0{,}5\left(q_j\right)^r\right)^{\frac{1}{r}} i = 1{,}2, \cdots m, j = 1{,}2, \cdots, n,$$

where the number r is a real number. As a rule, the value of this number is around the value 3. The calculated distances d_{ij} are then arranged in ascending order and evaluated by serial numbers rij or, in the case of the same values, evaluated by average serial numbers. From the resulting matrix $R = (r_{ij})$ we determine for each row its sum r_i. The quasi-arrangement of variants is obtained by ascending order of r_i values. The second part of the method contains a preferential analysis, thanks to which it is possible to determine for each pair of variants their preferences P, indifference I and incomparability N. (Liu, 2011). This method is described in more detail in (Fiala, 2008).

Methods with cardinal information

These are methods that require entering cardinal information about criteria in the form of weights and about variants in the form of a criterion matrix. There are three basic approaches: utility maximization, distance minimization from the ideal variant, and preferential relations. A number of methods are based on the concept of utility, e.g. UFA (utility function method), WSA (special linear version of UFA) or the AHP method.

The weighted sum method (WSA) is based on the principle of utility maximization, where only a linear utility function is assumed. The benefit from the variant a_i is equal to $u(a_i) = \sum v_j r_{ij}$, where $r_{ij} = \frac{y_{ij} - D_j}{H_j - D_j}$ and v_j is the weight of the criterion. (Hedvičáková, 2015), (Hedvičáková, 2021)

Another method mentioned is AHP. This is a method proposed by prof. Saatym, which decomposes unstructured situations into simpler components and thus creates a hierarchical system of the problem.

In the principle of minimizing the distance from the ideal variant, a variant that is closest to the ideal variant according to a certain metric is sought. The methods differ according to the way of measuring the distance from the ideal variant. For this group of methods, the TOPSIS method is the most used, which provides a complete arrangement of the set of all variants. (He, 2016)

The TOPSIS method uses the distance of individual variants from the ideal and basal variants to solve decision-making problems. The best variant has the smallest distance from the ideal variant and the greatest distance from the basal variant. The method also offers a complete arrangement of a set of variants, so it is suitable for solving tasks that require the order of variants. To use the method, it is necessary to convert all minimization criteria to maximization by multiplying them by the constant −1. (Pozdílková, 2022). This method is described in more detail in (Fiala, 2008).

Methods based on preference relation evaluation are based on relations (preference, indifference, incomparability) between pairs of variants with respect to individual criteria, and thanks to aggregation procedures, relations between pairs of variants are obtained from the point of view of all criteria. Aggregation procedures are usually built

on comparing session degrees with threshold values. A pairwise relation does not have to be transitive, so the aggregation procedures are supplemented with a procedure that finds the overall arrangement of the variants or sorts the variants into indifference classes. The advantage of these methods is that they do not require normalization of the criterion matrix. Methods include AGREP, PROMETHEE, GAIA, MAPPAC, PRAGMA, and the ELECTRE class of methods. (Liu, 2011)

2. Application

The multi-criteria decision-making system, which deals with the selection of the most advantageous investments in housing units, was written in the object-oriented programming language C# using the open-source development platform .NET 7.0. The application is divided into three main projects. Graphical user interface, DLL library ensuring communication with the Sreality.cz server and DDL library for multi-criteria decision making. Individual functionalities of the multi-criteria decision making library are tested using Unit tests in the MSTest project.

To demonstrate the application, let's consider the case that we are looking for a one room with facilities and one room with kitchen and facilities apartment in the Nymburk district, which does not cost more than three million crowns. Based on the specified limit, after pressing the "Select" button, a query is made for 20 advertisements. It is not necessary to load all 20 from Sreality.cz, if only a certain number of properties meet the conditions. There may be cases where more than 20 apartments are loaded. This is due to how the Sreality.cz portal works, as the returned list of properties sometimes also contains a tip. This property is loaded when it meets the user's constraint. In my sample case, 13 apartments were loaded. The following evaluation criteria were selected: distance from the bus stop (weight 35 points), train station (weight 10 points) and from the shop (weight 20 points), as well as year of approval (weight 5 points) and condition of the building (weight 30 points). The criterion of the state of the object is qualitative, therefore its groups are evaluated on a five-point verbal numerical scale.

Out of all thirteen listings, only four properties have data for all required metrics. All application distances are read in meters and criteria weights are normalized.

Tab. 1: Monitored parameters of apartments a their weights

Type of apartment	Bus station (0.35)	Train station (0.10)	Shop (0.20)	Year of approval (0.05)	State (0.30)
one room with facilities 36 m^2 (2 390 000.00 CZK)	0.1467	0.0591	0.0958	0.0251	0.1500
one room with kitchen and facilities 32 m^2 (2 390 000.00 CZK)	0.3108	0.0473	0.0949	0.0250	0.1500
one room with facilities 24 m^2 (1 999 000.00 CZK)	0.0512	0.0478	0.1021	0.0251	0.1500
one room with kitchen and facilities 36 m^2 (1 950 000.00 CZK)	0.0416	0.0445	0.1068	0.0248	0.1500

3. Results

Using the application, the results of five multi-criteria decision-making methods were implemented and compared using the given example: TOPSIS, ELECTRE I., the weighted sum method, the lexicographic method and ORESTE.

TOPSIS

To find a compromise variant using the TOPSIS method, the loaded data must first be normalized by a transformation formula and then the normalized weighted criterion matrix W must be calculated.

The ideal variant for this example is H=(0.0417;0.0445;0.0949;0.0251;0.1500) and the basal variant is D=(0.3108;0.0591;0.1058;0.0248 ;0.1500). Sufficient information is now available to calculate a relative indicator of the distances of individual variants from the basal variant.

Tab. 2: Calculation of relative distance indicators for the TOPSIS method

Type of apartment	di^-	di^+	ci
one room with facilities 36 m^2 (2 390 000.00 CZK)	0.1645	0.1061	0.6079
one room with kitchen and facilities 32 m^2 (2 390 000.00 CZK)	0.0168	0.2692	0.0588
one room with facilities 24 m^2 (1 999 000.00 CZK)	0.2599	0.0124	0.9544
one room with kitchen and facilities 36 m^2 (1 950 000.00 CZK)	0.2695	0.0120	0.9574

In this case, the "one room with kitchen and facilities 36 m^2 (1,950,000.00 CZK)" apartment is considered to be the solution, according to the relative distance indicators.

ELECTRE I.

The first step in the evaluation of variants using the ELECTRE I method is the creation of a normalized weighted criterion matrix, in the same way as for the TOPSIS method. Subsequently, the matrices C and D are constructed, but we must not forget to take into account the types of criteria. After their creation, the boundaries of $c*$ and $d*$ must be determined. The C matrix is used to obtain $c*$ and the D matrix is used to obtain $d*$. The threshold $c*$ is given by the formula $c^* = \frac{1}{m(m-1)} \sum_{k=1}^{m} \sum_{l=1}^{m} c_{kl}$

where $k \neq l$ and m is the number of variants. Analogously, we also obtain $d*$.

Using the above calculations, we got the values $c*$=0.6625 and $d*$=0.5678.

Tab. 3: Pairwise preference matrix of the ELECTRE I method

Type of apartment	one room with facilities 36 m^2	one room with kitchen and facilities 32 m^2	one room with facilities 24 m^2	one room with kitchen and facilities 36 m^2
one room with facilities 36 m^2 (2 390 000.00 CZK)	0	1	0	0
one room with kitchen and facilities 32 m^2 (2 390 000.00 CZK)	0	0	0	0
one room with facilities 24 m^2 (1 999 000.00 CZK)	1	1	0	0
one room with kitchen and facilities 36 m^2 (1 950 000.00 CZK)	1	1	1	0

The only effective variant that dominates the others and at the same time is not dominated by any other variant is the "one room with kitchen and facilities 36 m^2 (1,950,000.00 CZK)" property.

Weighted sum algorithm (WSA)

In the first step of the WSA method, the ideal variant H=(48;1291;3191;2022;5) or the basal variant D=(358;1713;3594;2001;5) is found. Subsequently, the normalized criterion matrix R is calculated using the transformation formula. The variant that has the maximum utility value is "one room with facilities 24 m^2 (1,999,000.00 CZK)".

Lexicographic method

The lexicographic method evaluates from the criterion with the greatest weight until there is only one compromise option left or until there is no criterion to evaluate against. In our case, only one property will remain, namely "one room with kitchen and facilities 36 m^2 (1,950,000.00 CZK)", which is the closest to the bus stop.

ORESTE

The ORESTE method, like the lexicographic method, uses ordinal information. In the case of this method, indifference (comparability) of criteria and variants is permissible. If they really happen to be equally important (as in our case), their average ordinal number $n+(1+m)/2$ is taken into account, where n variants are followed by m indifferent variants.

First, the distance matrix was calculated, where the value r=3 is used, and then the distance ordinal number matrix was determined (Table 4). From this table it can be seen that the most advantageous property is "one room with facilities 24 m^2 (1,999,000.00 CZK)".

Tab. 4: R matrix of the ORESTE method

Type of apartment	Bus station	Train station	Shop	Year of approval	State	R_i
one room with facilities 36 m^2 (2 390 000.00 CZK)	7.5	4.5	9.0	16.0	17.5	**54.5**
one room with kitchen and facilities 32 m^2 (2 390 000.00 CZK)	11.5	4.5	7.5	13.0	19.0	**55.5**
one room with facilities 24 m^2 (1 999 000.00 CZK)	2.0	4.5	10	14.5	17.5	**48.5**
one room with kitchen and facilities 36 m^2 (1 950 000.00 CZK)	1.0	4.5	14.5	11.5	20.0	**51.5**

Conclusions and discussion

Each method has unique approaches to solving the search for compromise variants, therefore their results are not completely identical. As mentioned, not all methods use normalized criteria weights, but only their order of importance (see lexicographic method and ORESTE). The results (variants) differ from each other not only by the calculated weights, thanks to which they are subsequently ranked, but also by the number of these compromise variants. This is also the reason why the user should not be guided by the result of a selected one of them, but should create an overall view of the matter by using several methods. It is not possible to determine only one correct method and follow it.

The application can be modified and expanded by other criteria - for example, it would be interesting to solve the distance from the nearest larger city for work and other aspects.

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Financial Health of Cluster Organisations: A Case Study from the Czech and Slovak ICT Industry

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Abstract
This paper analyses the financial health of firms that are members of selected cluster organizations operating in the Czech and Slovak Republics. The research includes two research samples, which are member firms of cluster organizations IT Cluster and Košice IT Valley. Both of the above-mentioned cluster organizations were established as a result of a cluster initiative and associated entities from the ITC sector. The firms that form the cores of the above-mentioned cluster organizations are mostly active in the sectors with the following statistical classification: NACE 620100, 620200, and 620900. The main objective of the present research is to analyze selected financial health indicators of member firms of both cluster organizations and to determine whether or not there are significant differences in the development of selected financial indicators between individual firms. To achieve the objective, the profitability ratios and Altman's Z´´score model were used. The research results are discussed in the conclusion of the paper.

Key Words
cluster organization, financial health, ITC sector, Z´´ score, paired-samples t-test

JEL Classification: P13, F65, M15

Introduction

Over the past two decades, the concept of creating and maintaining cluster organizations has become an integral part of the growth of modern market economies in most developed countries. Increasingly, globalized and technologically advanced firms are coming together to gain a competitive advantage and enhance performance (DTI, 2002). The issue of cluster organizations is one of the very important research topics and clusters are perceived by firms as very attractive because if firms become members of a suitable cluster, they have a great opportunity to enhance their competitive advantage and performance (Porter, 1990, 1998; Krugman, 1991). In this research, we use Porter's (1990) definition of a cluster: "*Clusters are geographically proximate groups of interconnected enterprises and associated institutions in a particular field, linked by common technologies and skills. They usually exist within a geographic area where ease of communication, logistics, and personal interaction is possible. Clusters are usually concentrated in regions and sometimes in a single city*." There is much debate about the economic benefits of clusters. Porter (1990) and Saxenian (1994) argue that cluster member firms benefit primarily from agglomeration effects through a shared infrastructure that includes resources of skilled labor, suppliers, professional service firms, and research and development laboratories. Access to any of these factors can

enhance the performance and competitiveness of member firms. Furthermore, high-tech clusters, in particular, are expected to contribute to innovation and regional development by fostering collaboration and knowledge spillovers between research organizations and local firms (Okamuro and Nishimura, 2015). Other authors (Harrison, 1997; Krugman, 1991; Marshall, 1920; Storper, 1995) discuss the issue of the financial benefits of clusters. According to the aforementioned authors, membership in a cluster organization will help firms to achieve higher financial health through improved production or increased demand. Other financial benefits resulting from a firm's membership in a cluster include creating a competitive cost structure, the possibility of gaining new financial resources, productivity growth, and performance growth (Jirčíková et al., 2006). Despite these aforementioned financial benefits, however, there is still no generally applicable methodology in the literature for determining the impact of firms' involvement in a cluster on the financial health of firms. Thus, the present paper is one of the few to address the relationship between financial health and firm membership in cluster organizations and can be considered one of the first attempts to fill this gap. The aim of the research is to assess whether the association of firms into a cluster organization has a positive impact on the financial health of members. To this end, this research compares cluster organizations in the Czech Republic and Slovakia, focusing on two ITC cluster organizations in these countries: the IT Cluster (CZ) and Košice IT Valley (SK). The present research focuses on these countries for three reasons. First, these countries are comparable in economic terms. Second, both countries have recently promoted clusters through national policies by investing significant public funds in clusters. Third, the availability of data and financial reporting in these countries is relatively simple. The financial health of firms provides an answer to the question of where a firm stands financially. When assessing financial health, it is necessary to monitor basic financial ratios such as costs, sales, revenues, profits, cash flow, investments, asset utilization, and others. As part of the financial health assessment, a company should monitor several important financial ratios that are linked to the health of the company, such as return on invested capital, assets, sales, and also equity. It is also possible to assess financial health using methods of creating purposeful selections of indicators. These are diagnostic rating models that answer the question of whether a firm is good or bad. Credit rating models have the ability to rate a firm by a single coefficient based on a purposive selection of indicators that most accurately contribute to its classification.

1. Data and Methods

The following chapter will outline the process of conducting the research and describe the methodology for solving the main aim of the research. The research was focused on the period 2013-2020 due to the differences between the two cluster organizations evaluated in terms of their date of establishment and also due to the availability of financial statements in each country. Enterprise data for 2021 and later is not yet available for a significant part of the member firms. The research can be divided into the six steps described below.

1. Selection of cluster organizations from the ICT industry. The ICT industry was chosen for the research. For the purpose of the presented research, two cluster organizations operating in the Czech and Slovak modern ICT industry were selected. The first cluster organization analyzed was the Czech IT Cluster. This cluster organization brings together mainly business entities and educational institutions operating in the field of information and communication technologies, which are located in the Moravian-

Silesian Region. The IT Cluster was established in 2006 and provides its members with consultancy services, organizes educational activities, and ensures the preparation of grant projects. The cluster brings together member entities with statistical classification CZ-NACE 58290, 620100, 620200, and 620900. In the analyzed period, the IT Cluster had 21 members. A total of three members were entrepreneurial natural persons. In addition, four educational institutions were members of the cluster (University of Mining - Technical University Ostrava, Tomas Bata University in Zlín, Silesian University in Opava, and Secondary Industrial School of Electrical Engineering and Informatics). The Association for the Development of the Moravian-Silesian Region was also a member entity. The remaining members can be described as legal person. The second cluster organization analyzed was the Slovak cluster Košice IT Valley. The cluster has a significant role in developing the ICT industry in the Košice region. The cluster was established in 2007 as a joint initiative of educational institutions, state administration, and leading ITC companies. The cluster brings together member entities with statistical classification SK-NACE 62010, 62030, 62090, and 63110. In the analyzed period, the Košice IT Valley cluster had 55 members. A total of three members were non-profit organizations. Furthermore, three universities were members of the cluster (Technical University in Košice, Pavol Jozef Šafárik University in Košice, and the University of Security Management in Košice). Four public administration authorities were also members (Košice Self-Governing Region, City of Košice, City of Poprad, and City of Prešov). A large part of the membership base consisted of secondary schools, higher vocational schools, and institutes (15 entities). The remaining members can be classified as legal person.

2. Creating a list of rated companies. Since the research presented was focused on the evaluation of financial performance, only business entities were included in the research. All non-business entities (e.g., educational institutions, public authorities, non-profit organizations, etc.) were excluded from the research. All business entities with the status of natural persons were also excluded from the research, as these entities have not published any financial statements, and it is not possible to assess their financial performance. In the period analyzed, the IT Cluster had 21 members. Out of the total number of members, 13 entities can be classified as companies. In the research conducted, only companies that have been members of the cluster organization for the same length of time can be compared; only these companies can be considered as the so-called consistent core of the cluster. The core of the IT Cluster consists of a total of 13 business entities. The Košice IT Valley Cluster had 55 members at the time of the research. Of the total members, 30 entities can be classified as companies. As in the case of the IT Cluster, the core of the cluster was defined, which in the case of Košice IT Valley consists of 17 business entities.

3. Collection of financial statements. In the third step, data from the financial statements for 2013-2020 were obtained for the member companies. This period was chosen for the research mainly because of the development of both clusters and the beginning of their active activities. Furthermore, the fact that the impact of membership on the business entities can be expected with a time lag is also taken into account. Another reason for setting this research period is the limited availability of financial statements for the Slovak cluster Košice IT Valley. The Slovak Register of Financial Statements provides statements starting from 2013. The primary source of financial data in the case of the Czech cluster organization was the commercial database MagnusWeb (Bisnode, 2023).

4. Calculation of financial health indicators. Profitability ratios were then calculated for both cluster organizations. These indicators should provide a primary picture of the financial situation of the member companies in both ITC clusters. The first ratio chosen was the return on equity ROE (see Relation 1). ROE is one of the fundamental ratios that provides an overview of the overall return on equity. The ROE ratio includes EAT, the earnings after tax, in its calculation. The second ratio chosen was ROA (see Relation 2). This ratio measures how profitable a company is of its total assets. A high ROA means management uses the company's assets to generate profits. The ROA ratio includes EBIT, earnings before interest, and taxes.

$$\text{ROE} = \text{EAT}/\text{equity} \quad (1)$$

$$\text{ROA} = \text{EBIT}/\text{total assets} \quad (2)$$

5. Assessing the financial health of member firms using a credit model. The creditworthiness model was applied to the selected financial data in the next step. The model chosen in the presented research is the so-called Z´´ score of Altman analysis (see Relation 3). The main reason for selecting this model and its main advantage is that it was developed mainly for non-manufacturing companies to minimize the influence of potential industry effects (Marek, 2009).

$$Z'' = 6{,}56 \cdot X_1 + 3{,}26 \cdot X_2 + 6{,}72 \cdot X_3 + 1{,}05 \cdot X_4 \quad (3)$$

In Relation 3, variable X1 represents the net working capital/assets ratio, variable X2 can be calculated as the retained earnings/assets ratio, variable X3 is the EBIT/assets ratio, and the last variable X4 can be expressed as the equity/foreign equity ratio. The resulting value of the Z´´ score index has the following thresholds: a value of Z´´ > 2.6 indicates a creditworthy firm; a value of 1.1 < Z´´ ≤ 2.6 indicates a grey area; a value of Z´´ ≤ 1.1 indicates a bankrupt firm (Marek, 2009).

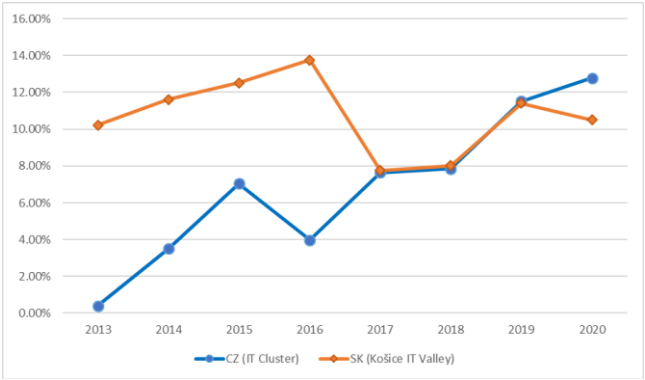
6. Statistical comparison. The assessment of the development of ROA and ROE in the Czech and Slovak clusters in 2013-2020 is performed using paired-samples t-tests for dependent samples. The main idea of this method is to compare consecutive values of the same indicator in two periods. First, two consecutive years are compared, and finally, the last period is compared with the first. The question is whether there is a statistically significant difference between the average ROA and ROE values. If such a difference is found, it is then determined whether the ROA/ROE is statistically significantly higher in the current year than in the previous year or vice versa. Details of the paired-samples t-test can be found in (Hindls et al., 2018). If it is shown that the average ROA/ROE values are higher in the current year compared to the previous year, it can be assumed that the development of this indicator is positive and cluster membership is beneficial for the companies.

2. Results of the Research

The first part presents the results of the development of profitability indicators, which give a basic overview of the situation of enterprises in both cluster organizations. The following part contains the findings from the application of Altman's Z'score analysis. Figure 1 compares the development of the median values of ROA of member firms in the IT Cluster and Košice IT Valley for 2013-2020. The profitability of total capital employed showed a somewhat fluctuating trend in the observed period in the both clusters. In this

context, it is essential to recall that ROA values are considered satisfactory (Fistro, 2023) if they exceed the threshold of 0.05, i.e., 5%. In 2015 and subsequently also in 2017-2020, Czech firms met this condition according to the median ROA value. In the case of Slovak firms, this condition was met throughout the period under review. Czech firms in the IT Cluster achieved the best appreciation of the invested capital in the last year evaluated, i.e., 2020. The worst value in the case of Czech companies was the ROA indicator in 2013. The average growth rate of ROA calculated as geometric mean was 4.93%. The best ROA was achieved by enterprises in the Košice IT Valley cluster in 2016. The worst value in the case of Slovak enterprises was shown by the ROA indicator in 2017. The average growth rate of ROA calculated as geometric mean was 10.54%.

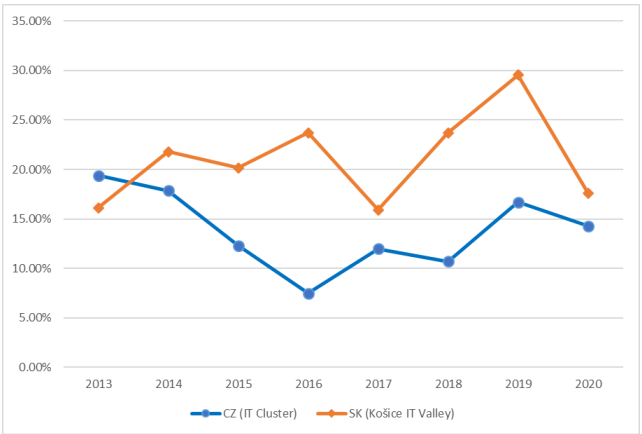
Fig. 1: Median ROA in 2013-2020 in IT Cluster and Košice IT Valley



Source: own processing

Figure 2 compares the development of the median ROE of member firms in the IT Cluster and in Košice IT Valley for 2013-2020. Figure 2 shows that firms in both cluster organizations achieved positive accounting profitability, as measured by ROE, in the years under review. From the ROE results, it is clear that in 2013, firms in the IT Cluster recorded the best ROE results in the whole period under study. According to the median, the second year Czech firms achieved relatively good results was 2014. The worst ROE for Czech firms was in 2016. The best ROE was achieved by companies in the Košice IT Valley cluster in 2019. The worst value for Slovak companies was in 2017. Figure 2 also shows that ROE fluctuated in the observed period for both cluster organizations. The average growth rate of ROE calculated as geometric mean was 13.28% for Czech enterprises and 20.63% for Slovak enterprises.

Fig. 2: Median ROE in 2013-2020 in IT Cluster and Košice IT Valley



Source: own processing

The reasons for the fluctuations in ROA and ROE are partially transparent. The economic situation in the Czech and Slovak Republics may have contributed to the changes in profitability. However, the dependence of GDP on the development of selected profitability indicators cannot be reliably verified statistically over such a short time series. It could also be due to short-term fluctuation in the industry. However, the dependence of ROE and ROA on the development of selected macroeconomic indicators cannot be verified over such a short time series. Another possible factor may be a change in the production characteristics of individual companies and other internal factors.

In the second part of the research, the creditworthiness model - Z´´ score of Altman analysis - was applied to the obtained financial data. The results for both cluster organizations are summarised in Tables 1 and 2 below. Table 1 summarizes the results for the case of the Czech IT Cluster. Firms are marked in color according to the boundaries indicated in the fifth step of the research. The green shade indicates creditworthy firms, and the grey color represents the so-called grey area, where it is impossible to determine whether a firm is creditworthy. The red shade indicates bankrupt firms. For three Czech firms, it was not possible to determine the Z´´ score due to the unavailability of financial statements in 2015. The last row shows the median Z´´ score for the whole cluster organization in a given year. If we compare the Z´´ score of firms in the IT Cluster in the initial and final year, we find that in 2020 two firms improved compared to 2013 (D3Soft and XEVOS Solutions), ten firms were rated the same, and one firm deteriorated its position (ELTODO).

Tab. 1: Results Z´´ score IT Cluster

Company name	2013	2014	2015	2016	2017	2018	2019	2020
KVADOS	5.965	7.039	6.720	6.112	6.037	5.266	5.693	2.816
ITeuro	2.659	2.363	3.513	3.749	2.959	2.849	3.330	3.503
NAM system	17.979	10.783	15.572	26.507	26.194	27.023	28.219	32.579
FULLCOM systems	6.983	7.934	N/A	7.207	5.579	4.040	6.547	4.582
D3Soft	2.131	3.753	4.185	-1.126	1.419	3.804	4.340	5.407
TECHNISERV IT	3.679	6.082	2.681	2.614	2.096	3.848	3.370	3.700
NITTA Systems	6.424	1.474	N/A	3.947	3.374	4.227	4.503	4.049
XEVOS Solutions	1.317	1.565	N/A	1.572	0.621	1.189	6.582	7.571
VÍTKOVICE IT SOLUTIONS	4.079	6.433	7.56	5.065	5.997	5.831	6.171	5.265
K2 atmitec	3.240	3.343	4.735	6.997	6.325	6.323	6.130	8.904
ELTODO	4.915	3.633	3.287	2.407	3.458	1.942	2.213	2.418
PRONIX	2.819	3.426	8.432	7.701	6.321	5.585	7.005	5.667
Tietoevry Connect Czechia	3.365	5.317	9.377	7.512	4.999	4.970	3.894	4.920
Median	**3.679**	**3.753**	**5.727**	**5.065**	**4.999**	**4.227**	**5.693**	**4.920**

Source: own processing

Table 2 summarises the results for the case of the Slovak cluster Košice IT Valley. The color coding corresponds to the coding in Table 1. The last row shows the median Z´´ score for the whole cluster organization. If we compare the Z´´ score of firms in Košice IT Valley in the initial and final year, we find that in 2020 four firms improved their position compared to 2013 (ASBIS SK, Deloitte Audit, gd - Team and Unique People), 15 firms were rated the same and one firm deteriorated its position (TORY CONSULTING).

Tab. 2: Results Z´´ score Košice IT Valley

Company name	2013	2014	2015	2016	2017	2018	2019	2020
ASBIS SK	1.617	1.678	1.506	1.603	2.762	2.574	2.248	3.151
bart.sk	9.727	10.167	8.440	9.708	12.039	12.039	12.609	13.375
Cisco Systems Slovakia	13.289	11.935	12.440	12.043	10.695	10.695	13.445	14.477
Deloitte Audit	2.066	3.315	6.216	2.46	0.950	2.182	2.719	2.812
ELCOM	8.182	11.017	15.634	13.257	15.282	14.611	12.724	16.507
ESTEN	2.908	0.276	0.064	-1.003	0.781	0.348	1.524	2.940
Fpt Slovakia	6.597	5.863	7.850	5.977	7.731	7.312	6.203	10.233
gd - Team	-1.535	-3.001	-1.235	0.056	2.262	0.980	1.770	2.379
MATSUKO	4.776	5.365	6.906	3.331	1.899	1.925	10.577	7.522
Promiseo	13.255	15.346	13.814	12.422	6.805	5.177	4.605	2.782
SAP Slovensko	7.994	6.891	6.096	6.969	8.603	8.086	7.901	9.628
Software AG Development Center Slovakia	8.970	10.285	7.334	4.550	4.725	7.560	7.930	9.111
Telegrafia	3.334	2.877	4.408	5.046	3.124	4.621	4.037	4.422
TORY CONSULTING	4.612	5.847	4.233	2.632	2.305	1.348	0.689	1.517
T-Systems Slovakia	7.015	8.811	8.449	8.175	7.525	7.352	6.695	7.734
Unique People	-0.498	-0.023	11.851	2.954	10.157	8.545	7.626	8.463
VSL Software	3.591	4.061	5.770	5.106	5.933	6.506	10.348	11.773
Median	**4.776**	**5.847**	**6.906**	**5.046**	**5.933**	**6.506**	**6.695**	**7.734**

Source: own processing

Table 3 shows the results of paired-samples t-tests for ROA and ROE in the IT Cluster, and Table 4 shows the same calculations but for Košice IT Valley. A note should be added to Table 3 that not all data were available for 2015, so here we compare 2016 with 2014.

Tab. 3: Results of t-tests for IT Cluster and ROA and ROE

ROA					ROE			
Compared Period	Difference	P-Value	H_1		Compared Period	Difference	P-Value	H_1
2013/2014	**Yes**	**0.016**	$\boldsymbol{\mu_1 < \mu_2}$		2013/2014	No	0.481	$\mu_1 \neq \mu_2$
2014/2016	No	0.746	$\mu_1 \neq \mu_2$		**2014/2016**	**Yes**	**0.032**	$\boldsymbol{\mu_1 > \mu_2}$
2016/2017	No	0.339	$\mu_1 \neq \mu_2$		2016/2017	No	0.419	$\mu_1 \neq \mu_2$
2017/2018	No	0.674	$\mu_1 \neq \mu_2$		2017/2018	No	0.316	$\mu_1 \neq \mu_2$
2018/2019	No	0.254	$\mu_1 \neq \mu_2$		2018/2019	No	0.444	$\mu_1 \neq \mu_2$
2019/2020	No	0.529	$\mu_1 \neq \mu_2$		2019/2020	No	0.747	$\mu_1 \neq \mu_2$
2013/2020	**Yes**	**0.0009**	$\boldsymbol{\mu_1 > \mu_2}$		2013/2020	No	0.380	$\mu_1 \neq \mu_2$

Source: own processing

Tab. 4: Results of t-tests for Košice IT Valley and ROA and ROE indicators

ROA					ROE			
Compared Period	Difference	P-Value	H_1		Compared Period	Difference	P-Value	H_1
2013/2014	No	0.582	$\mu_1 \neq \mu_2$		2013/2014	No	0.418	$\mu_1 \neq \mu_2$
2014/2015	No	0.545	$\mu_1 \neq \mu_2$		2014/2015	No	0.545	$\mu_1 \neq \mu_2$
2015/2016	No	0.353	$\mu_1 \neq \mu_2$		2015/2016	No	0.614	$\mu_1 \neq \mu_2$
2016/2017	No	0.457	$\mu_1 \neq \mu_2$		2016/2017	No	0.809	$\mu_1 \neq \mu_2$
2017/2018	**Yes**	**0.037**	$\boldsymbol{\mu_1 < \mu_2}$		2017/2018	No	0.186	$\mu_1 \neq \mu_2$
2018/2019	No	0.970	$\mu_1 \neq \mu_2$		2018/2019	No	0.616	$\mu_1 \neq \mu_2$
2019/2020	No	0.842	$\mu_1 \neq \mu_2$		2019/2020	No	0.913	$\mu_1 \neq \mu_2$
2013/2020	No	0.437	$\mu_1 \neq \mu_2$		2013/2020	No	0.330	$\mu_1 \neq \mu_2$

Source: own processing

From the data in Table 3, we can see that there was a statistically significant increase in ROA only between 2013/2014. If we look at the comparison between the first year of record and the last year of record (2013/2020), we can see that there was a statistically significant decrease in average ROA in 2020 compared to 2013. For ROE, there was a statistically significant decrease in 2016 compared to 2015, but no statistically significant differences were shown in other years. Table 4 shows only one statistically significant difference between the ROA values, namely in 2018, when the ROA value was higher than in 2017. No other statistically significant differences were found. It should be added to the above calculations that the ROA values 2013 for all monitored companies in the IT Cluster were below the recommended value of 0.05. Over time, an increase in the number of companies with ROA values above the recommended value can be observed, and in 2020 there are only five companies out of 14 (35.7%) below the recommended value. Five companies belonging to Košice IT Valley had ROA values below the recommended value in 2013, and in 2020 there are only 4 (23.5%).

3. Discussion

The research results confirmed the effect of cluster membership on improving financial health, as Lei and Huang (2014) reported. The improvement in the financial health of cluster member firms was also confirmed by previous research by Pelloneová (2022), which assessed the financial health of firms in cluster organizations operating in the biotechnology sector. If we look at the development of the selected indicators (ROA and ROE) in the IT Cluster, all the values found in 2013 were below the recommended value of 0.05. During the period under review, the number of companies with ROA values below the 0.05 threshold decreased. In the last reporting year, there were only five firms with ROA values below 0.05. Thus, the effect of cluster membership is primarily positive for firms. However, it is also necessary to mention the results of paired t-tests, where it was possible to show an improvement in the average value of ROA only in 2014 compared to 2013. However, when comparing the years 2020 and 2013 (initial and final observation period), a statistically significant decrease in the average value of ROA was shown. A similar situation is shown in the case of Košice IT Valley, where the number of companies that did not reach the ROA value of 0.05 in 2013 decreased in 2020. However, a

statistically significant increase was demonstrated only between 2017 and 2018. This leads to the conclusion that membership in the cluster can be beneficial in most cases for a company as an individual entity. However, the cluster as a whole does not show significant positive changes in the development of this indicator or the ROE indicator.

Conclusion

The paper deals with analyzing the financial health of the IT Cluster and Košice IT Valley companies in the reference period 2013-2020. The tool used was Altman's credit model Z´´ score in addition to ROE and ROA ratios. The first step was to analyze the development of ROE and ROA ratios of the member companies of both clusters, then to assess the financial health with the help of the aforementioned Z´´ score, and then to compare the values of ROE and ROA ratios over the years 2013-2020 for the cluster as a whole.

It can be concluded that the financial health of companies in the IT Cluster and Košice IT Valley has improved in the period 2013-2020 according to the geometric mean value. The ROA and ROE growth rate for the IT Cluster was 4.93% and 13.28%, respectively. The Košice IT Valley Cluster showed a growth rate of ROA of 10.54% and ROE of 20.63%. These findings are confirmed by the calculation of Z´´ score, which helps to identify creditworthy or bankrupt firms. In 2013, only two firms in the so-called grey zone and 11 creditworthy firms were identified in the IT Cluster. In contrast, in 2020, only one firm in the grey zone and 12 creditworthy firms were identified. In the case of Košice IT Valley, two bankrupt firms, one firm in the grey zone, and 13 creditworthy firms were identified in 2013. In 2020, no bankrupt firms were identified in the Košice IT Valley cluster, and only two firms were classified in the grey zone. The reference period of this study ends in 2020; however, the authors of the paper will continue the research to include additional years and expand the research to other industries and other European countries.

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Correlation Between GDP per Capita and Vehicle Sales in the Context of COVID-19 Pandemics

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Abstract

The wealth of the country can be measured by the GDP per capita. The sales of passanger cars and light utility vehicles are of major economic importance for the EU countries. The present parper studies if there is a correlation between the GDP per capita and the car sales in selected central European countries. This potential correlation is further studied in the context of the negative impact of the COVID-19 pandemics that occured in 2020 in the EU. The focus region for this study is the central European Union countries. They have different economical strength and react differently to external influences. In Austria the correlation measured on combined sales of passenger cars and LCVs strengthened with the start of pandemics, in Hungary there was no impact and the correlation weakened in Slovakia..

Key Words

GDP per capita, car sales, correlation, Covid-19 pandemics

JEL Classification: M21, L25, L21

Introduction

GDP per capita is calculated as a ratio of real GDP to an average population of a given year. It is a measure of economic activity and is also used as a proxy for the development in a country's material living standards. It is a limited measure of economic welfare as it does not take account of negative effects of economic activity, like environmental degradation.

The automotive industry is an important part of the EU economy, represented partly by sales of vehicles, mainly passanger cars and light utility vehicles. The importance of this part of the economy was was shown during the global economic crisis where car sales were supported by government incentives to indirectly support the car manufacturers.

As the GDP and the vehicle sales are of major importance for the economy we will further study if there is a potential link that can be shown by their correlation. The encomy of EU was impacted on a global scale by the Covid-19 pandemics. This was external negative factor with influence on most sectors of present society. This article studies the impact of the pandemics on the correlation between car sales and the GDP per capita.

It has to be mentionned that the sales of vehicles are influenced not only by the overal performance of the economy, but also by further direct and indirect factors. This means the development level of the economy, structure of its industry and infrastructure, level of urbanisation and similar macroeconomic and demographic factors. There are also specific actions taken regarding the automotive industry; incentives, taxes or emission standards. The mentionned factors are not exhaustive, however they point at the complexity of the studied subject.

1. Methods of Research

The data on the GDP per capita processed for the creation of the present paper originate from Eurostat. The data related to the volume of sold vehicles, ie passenger cars and light utility vehicles (LCVs) were extracted from the web site carsalesbase.com.

Correlation coefficient represents linear correlation between two data sets and is pricipally a normalised measurement of covariance and reaches values between −1 and 1. Positive correlation means that if the values in one array are increasing, the values in the other array increase as well. A correlation coefficient at 0 indicates no correlation. The closer the absolute value of correlation is to 0, the weaker the correlation is. Values close to -1 or 1 represent strong correlation. For the purposes of this paper the strenght of correlation is set into intervals as follows:

Tab. 1: Strenght of Correlation

Correlation type		**Value**
Strong	Positive	⟨0,75; 1⟩
Medium	Positive	⟨0,25; 0,75⟩
Weak	Positive	⟨0; 0,25⟩
No Correlation		0
Weak	Negative	⟨-0,25; 0)
Medium	Negative	⟨-0,75; -0,25)
Strong	Negative	⟨-1,00; -0,75)

Source: authors´ interpretation of MILES, J.; SHEVLIN M. (2013).

The correlation between the GPD per capita (in national currencies) and the sales of passenger cars, LCVs and their sum (number of sold units). The found correlations were apparent mainly for the passenger cars and the combined sales. For the LCVs on several ocations the correlation found was not apparent. Data for GDP per capita are shown from 1995. Tha sales of vehicles were available only from 2003 for Czech republic, Slovakia and Hungary. For Austria the data is fully available from 1996. This means that data was analysed over a period of 17 years (only for Austria this was 20 years, for other countries the data on vehicle sales was not available). Furhter analysis is done over a 10 years period prior to the Covid-19 pandemics (2019 included) and over a 10 year period including the first year of the pandemics (ending in 2020). Studied correlations The correlations

2. Results of the Research

The present paper focuses on the central region of EU represented by Austria, Czech Republic (called Czechia by the Eurostat), Slovakia and Hungary. The selection of these countries enables to monitor small and large sized markets as well as markets with various level of development. The Austrian market was not influenced by the centrally planned system, and one can observe that the sales of vehicles are specific in Hungary.

Tab. 2: Level of selected indicators in 2020 compared to 2019

Country	Passenger Cars	Light Commercial	Sales	GDP per capita
Austria	76%	84%	77%	93%
Czechia	81%	84%	81%	94%
Hungary	81%	84%	82%	96%
Slovakia	75%	75%	75%	96%

Source: Carsalesbase.com and Eurostat [online], authors´ calculation

The market of Passenger Cars was the least impacted in Hungary where it reached 0,81 of 2019 sales. This market was the most impacted in Slovakia where it reached 0,75 of 2019 sales. The sales of Light Commercial Vehicles were impacted in a similar manner in Austria, Czech republic and Hungary where they reached 0,84 of 2019 sales. This market was the most impacted in Slovakia where it reached 0,75 of 2019 sales. The total car sales (sum of passenger cars and LCVs) were the least impacted in Hungary where they reached 0,82 of 2019 sales. This market was the most impacted in Slovakia where it reached 0,75 of 2019 sales. The GDP per capita was the least impacted in Hungary and Slovakia where it reached 0,96 of its 2019 value. The GDP per capita was the most impacted in Austria where it reached 0,93 of its 2019 value. The following data show details per country.

Austria

The correlation between the GDP per capita and sales of Passenger Cars in Austria in the pre-pandemic years between 2000 and 2019 can be described as positive with medium strength with a correlation at the level of 0,63 (t-test 0). For the Light Commercial Vehicles in the same period the correlation is positive and strong with a correlation coefficient value 0,85 (t-test 0). The Total Car Sales represent a sum of Passenger Car Sales and LCV sales in Austria during the same period and have medium and positive correlation at the level of 0,73 (t-test 0).

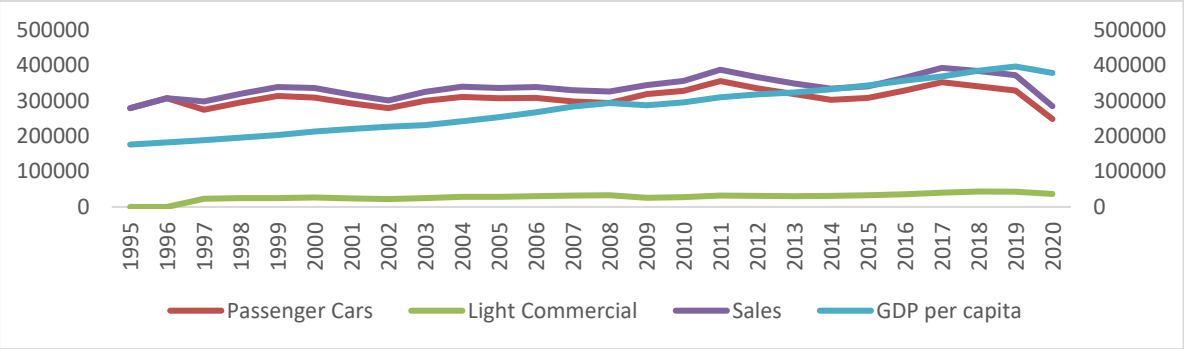
In a second step a more specific analysis of the correlation between the GDP per capita and car sales is done in the period of 10 years prior to the Covid pandemics. During this timeframe Passenger Cars had a positive correlation with medium strenght and value of 0,32 (t-test 0). The Light Commercial vehicles had a positive and strong correlation at the level of 0,95 (t-test 0,33). The combined sales of passenger cars and LCV in Austria had a overall a positive correlation with a medium strenght at the level of 0,54 (t-test 0).

A third phase of the analysis studies the correlation between sales of vehicles and the GDP per capita in a 10-year including 2020 i.e., the first year of the Covid 19 pandemics. This adjusted period shows the following results. For Passenger Cars the correlation is medium and positive at the level of 0,59 (t-test 0). Regarding the Light Commercial Vehicles, the correlation is positive and strong with value of 0,78 (t-test 0,62). Total the sum of Passenger Car sales in relationship with the GDP per capita had a positive and medium correlation with a value of 0,69 (t-test 0). Including the first year of Covid pandemics had the following impact on the correlation between car sales and GDP: Passenger Cars changed by 0,27, the Light Commercial vehicle sales by -0,17 and the combined sales of Passenger cars and LCV by 0,15.

The above shows that in Austria the overall market with vehicles shows correlation to the GDP per capita, strenghten by the external crisis. The LCVs however do not follow this

trend. The following figure shows number of sold vehicles on primary axis and value of GDP per capita in EUR on secondary axis.

Fig. 1: Car Sales and GDP per Capita in Austria



Source: Carsalesbase.com and Eurostat [online], authors´ calculation

Czech Republic

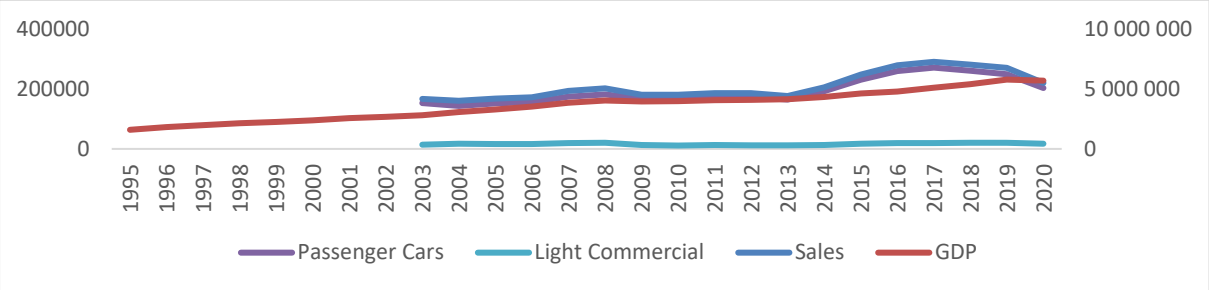
The correlation between the GDP per capita and sales of Passenger Cars in Czechia in the pre-pandemic years between 2003 and 2019 can be described as positive with strong strength with a correlation at the level of 0,9 (t-test 0). For the Light Commercial Vehicles in the same period the correlation is positive and medium with a correlation coefficient value 0,5 (t-test 0,32). The Total Car Sales represent a sum of Passenger Car Sales and LCV sales in Czechia during the same period and have strong and positive correlation at the level of 0,89 (t-test 0).

In a second step a more specific analysis of the correlation between the GDP per capita and car sales is done in the period of 10 years prior to the Covid pandemics. During this timeframe Passenger Cars had a positive correlation with strong strenght and value of 0,9 (t-test 0). The Light Commercial vehicles had a positive and strong correlation at the level of 0,95 (t-test 0,53). The combined sales of passenger cars and LCV in Czechia had a overall a positive correlation with a strong strenght at the level of 0,91 (t-test 0).

A third phase of the analysis studies the correlation between sales of vehicles and the GDP per capita in a 10-year including 2020 i.e., the first year of the Covid 19 pandemics. This adjusted period shows the following results. For Passenger Cars the correlation is strong and positive at the level of 0,83 (t-test 0). Regarding the Light Commercial Vehicles, the correlation is positive and strong with value of 0,94 (t-test 0,81). Total the sum of Passenger Car sales in relationship with the GDP per capita had a positive and strong correlation with a value of 0,84 (t-test 0). Including the first year of Covid pandemics had the following impact on the correlation between car sales and GDP: Passenger Cars changed by -0,07, the Light Commercial vehicle sales by -0,02 and the combined sales of Passenger cars and LCV by -0,07.

In Czech Republic the sales of the passenger cars and the total sales of cars had decreased correlation with the GPD per capita with the arrival of the crisis. The LCVs dont show relevant correlation.The following figure shows number of sold vehicles on primary axis and value of GDP per capita in CZK on secondary axis.

Fig. 2: Car Sales and GDP per Capita in Czech Republic



Source: Carsalesbase.com and Eurostat [online], authors´ calculation

Hungary

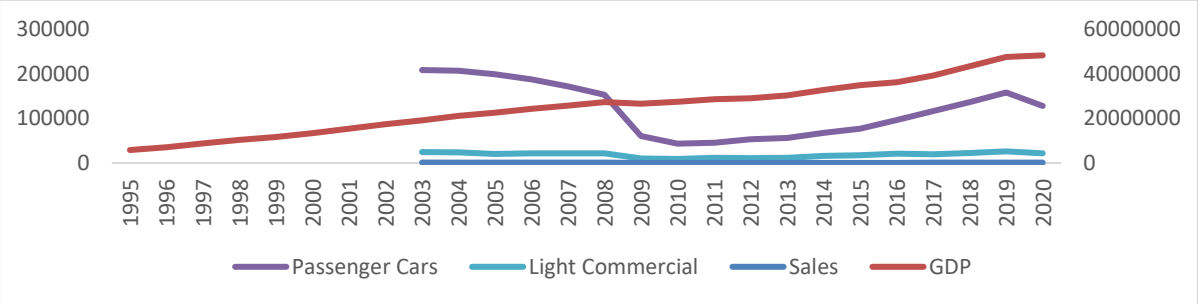
The correlation between the GDP per capita and sales of Passenger Cars in Hungary in the pre-pandemic years between 2003 and 2019 can be described as negativewith weak strength with a correlation at the level of -0,06 (t-test 0). For the Light Commercial Vehicles in the same period the correlation is positive and medium with a correlation coefficient value 0,35 (t-test 0). The Total Car Sales represent a sum of Passenger Car Sales and LCV sales in Hungary during the same period and have weak and negativecorrelation at the level of 0,03 (t-test 0).

In a second step a more specific analysis of the correlation between the GDP per capita and car sales is done in the period of 10 years prior to the Covid pandemics. During this timeframe Passenger Cars had a positive correlation with strong strenght and value of 0,99 (t-test 0). The Light Commercial vehicles had a positive and strong correlation at the level of 0,97 (t-test 0,01). The combined sales of passenger cars and LCV in Hungary had a overall a positive correlation with a strong strenght at the level of 1 (t-test 0).

A third phase of the analysis studies the correlation between sales of vehicles and the GDP per capita in a 10-year including 2020 i.e., the first year of the Covid 19 pandemics. This adjusted period shows the following results. For Passenger Cars the correlation is strong and positive at the level of 0,99 (t-test 0). Regarding the Light Commercial Vehicles, the correlation is positive and strong with value of 0,96 (t-test 0). Total the sum of Passenger Car sales in relationship with the GDP per capita had a positive and strong correlation with a value of 0,99 (t-test 0). Including the first year of Covid pandemics had the following impact on the correlation between car sales and GDP: Passenger Cars changed by 0, the Light Commercial vehicle sales by -0,01 and the combined sales of Passenger cars and LCV by 0.

The Hungarian market went through various stages in the past. The Covid-19 pandemics had however minimal impact on the correlation between the GPD per capita and the stutied indicatorsThe following figure shows number of sold vehicles on primary axis and value of GDP per capita in HUF on secondary axis.

Fig. 3: Car Sales and GDP per Capita in Hungary



Source: Carsalesbase.com and Eurostat [online], authors´ calculation

Slovakia

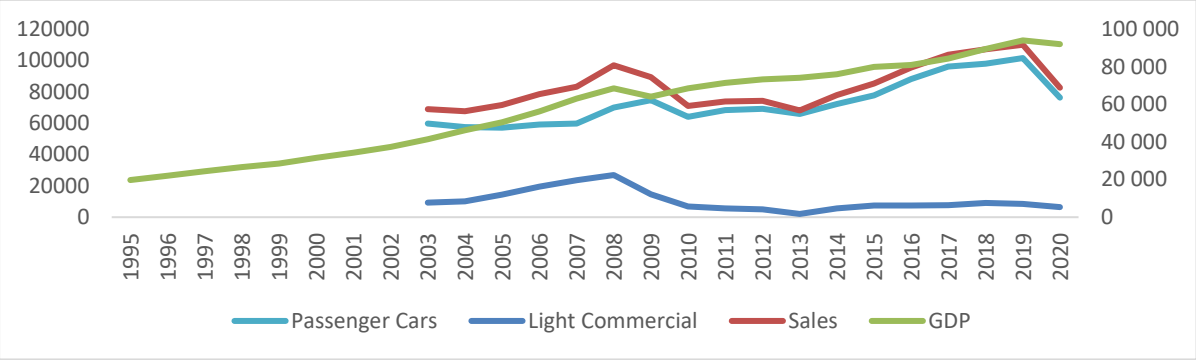
The correlation between the GDP per capita and sales of Passenger Cars in Slovakia in the pre-pandemic years between 2003 and 2019 can be described as positive with strong strength with a correlation at the level of 0,87 (t-test 0). For the Light Commercial Vehicles in the same period the correlation is negativeand medium with a correlation coefficient value 0,34 (t-test 0,33). The Total Car Sales represent a sum of Passenger Car Sales and LCV sales in Slovakia during the same period and have medium and positive correlation at the level of 0,73 (t-test 0).

In a second step a more specific analysis of the correlation between the GDP per capita and car sales is done in the period of 10 years prior to the Covid pandemics. During this timeframe Passenger Cars had a positive correlation with strong strenght and value of 0,98 (t-test 0). The Light Commercial vehicles had a positive and medium correlation at the level of 0,71 (t-test 0). The combined sales of passenger cars and LCV in Slovakia had a overall a positive correlation with a strong strenght at the level of 0,97 (t-test 0).

A third phase of the analysis studies the correlation between sales of vehicles and the GDP per capita in a 10-year including 2020 i.e., the first year of the Covid 19 pandemics. This adjusted period shows the following results. For Passenger Cars the correlation is strong and positive at the level of 0,89 (t-test 0). Regarding the Light Commercial Vehicles, the correlation is positive and strong with value of 0,8 (t-test 0). Total the sum of Passenger Car sales in relationship with the GDP per capita had a positive and strong correlation with a value of 0,89 (t-test 0). Including the first year of Covid pandemics had the following impact on the correlation between car sales and GDP: Passenger Cars changed by -0,09, the Light Commercial vehicle sales by 0,08 and the combined sales of Passenger cars and LCV by -0,08.

On the Slovak market the negative influence of the pandemics strengten the correlation of the LCV sales with teh GDP per capita, however the cases of passenger cars and the combined eales had decreased correlation with GDP per capita.The following figure shows number of sold vehicles on primary axis and value of GDP per capita in EUR on secondary axis.

Fig. 4: Car Sales and GDP per Capita in Slovakia



Source: Carsalesbase.com and Eurostat [online], authors´ calculation

3. Discussion

The analysis of the studied data shows that there is correlation between the car sales and the wealth represented by the GDP per capita. The correlation is mostly positive with the exception of Hungary in the 17 year period. The level of correlation is usually strong in the shorter term and weakens over the long period, however still maintaining a medium level strenght. The impact of the Covid-19 pandemics didn't have identical impact on the correlation between the studied indicators in each country. There impact was rather positive in Austria where in general it strengthen the correlation where as on the contrary in Slovakia the correlation was weakened. Hungary remains a specific case whit no change in correlation with or without the impact of the Covid-19 pandemics.

Tab. 3: Correlation Coefficient of Car Sales and GDP. Impact of Covid on a 10 year Correlation

period	17 years correlation (AT 20 years)			10 years correlation excluding Covid-19			10 years correlation including Covid-19			Change of Correlation on a 10year period with and without Covid-19 impact		
type	PC	LCV	Total	PC	LCV	Total	PC	LCV	Total	PC	LCV	Total
AT	0,63	0,85	0,73	0,32	0,95	0,54	0,59	0,78	0,69	*0,27*	*-0,17*	0,15
CZ	0,90	0,50	0,89	0,90	0,95	0,91	0,83	0,94	0,84	*-0,07*	*-0,02*	-0,07
HU	-0,06	0,35	-0,03	0,99	0,97	1,00	0,99	0,96	0,99	*0,00*	*-0,01*	0,00
SK	0,87	-0,34	0,73	0,98	0,71	0,97	0,89	0,80	0,89	*-0,09*	*0,08*	-0,08

Source: Carsalesbase.com and Eurostat [online], authors´ calculation

As mentionned in the introduction to this paper, there are multiple factors impacting the sales of passenger cars and light commercial vehicles. One could argue that the passenger cars might be more sensitive to the overal performance of the economy : in case of a crisis, the households might postpone consumption. There is however a possiblity of spare capital or governemt incentives to support consumers or bussiness sales. The LCVs might be subject to fleet renewal, general need duet to the structure of the economy.

Conclusion

Here is a text of the conclusion. References should be presented in the text in its respective place according to the APA Style® of referencing, page numbers are not used in in-text citations.

Acknowledgment

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Application of VAR Model to Determine Sustainability of Short-Term Rental Accommodation

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Abstract
Platforms like Airbnb have fundamentally reshaped the hospitality sector as we have known it. With its distinctive model, short-term rentals (STR) have gained significant popularity among tourists and property owners alike. As the popularity of STR continues to grow, questions arise regarding its implications for sustainable tourism. In this paper, we investigate the impact of short-term rental accommodation on residential housing prices in the centre of Prague by employing an econometric analysis of time series. For this purpose, we apply the vector autoregressive (VAR) model. In the modelling, we use data on the numbers and locations of Airbnb listings alongside data on the average housing price per square meter. Other variables did not prove to be statistically significant in the equations. Firstly, the variables need to be tested for stationarity. Based on the detection of non-stationarity in the time series, the data are then transformed using the first differences. Finally, the variables are suitable for the estimation of their parameters. Subsequently, we present an impulse response analysis and plot a forecast. The prediction is then subject to the ex-post comparison, which visualises how the prognosis of the VAR model correlates with the real values.

Key Words
Airbnb, sharing economy, housing market, real estate price, tourism

JEL Classification: C32, E37, R31

Introduction

The advent of online home-sharing has revolutionized the way individuals seek accommodation while travelling. Among the many cities that have witnessed the rapid growth and integration of the short-term rental (STR) phenomenon, Prague, the capital of the Czech Republic, has become an intriguing case study. As the popularity of STR continues to rise after the mitigation of the Covid-19 pandemic, questions arise regarding the implications for its sustainability.

The sharing economy in the housing market concerning Prague has arisen in just a few studies so far. Their focus was concentrating on tax revenues (Ključnikov et al., 2020), tax evasion (Ključnikov et al., 2018), and the occupation rate of STRs (Krajčík et al., 2019). Certain foreign authors have begun to also investigate the impact of STR on residential housing prices. Most of the foreign authors focus on the US market, for example, New York City (Sheppard and Udell, 2018), Boston (Horn and Merante, 2017), Los Angeles County (Koster et al., 2021), and even a sample of 40 cities (Barron et al., 2021). There is also a couple of authors setting similar objectives in regard to the circumstances in European cities, for example, Barcelona (Segú, 2018), Lisbon and Porto (Franco and Santos, 2021). In

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the context of Prague, this topic has not been covered yet. Addressing this research gap may be useful not only for the municipal administration but also for the stakeholders of the sharing economy, investors, or the public community.

In this paper, we will employ data on the numbers and locations of Airbnb listings to estimate the impact of short-term rental accommodation on the housing prices directly in the city's central district, i.e. Prague 1. Hopefully, fulfilling this objective will enable us to better navigate in the sustainability of tourism in Prague.

1. Methods of Research

The following chapter presents a description of our data and methods. It is divided into two subchapters. Firstly, in the data description, variables are introduced and commented on. Subsequently, our empirical techniques are laid out in the second subchapter.

1.1 Data description

In this section, we introduce the data used for modelling of our seven variables. The first two described variables are the essence of this paper - the housing prices and Airbnb listings are the basis for fulfilling our pre-established objective, to evaluate the impact of STR accommodation on the housing price in the city district of Prague 1. The remaining five variables are designated to help us explain the residual component in modelling of the housing price.

Airbnb listings

The Airbnb dataset was obtained from Inside Airbnb, a watchdog website selling data scraped directly from Airbnb's website during past years. Our dataset regarding Prague ranges from January 2018 up to September 2021. The files contain monthly information on the location, property type, price, host, and review history of all listings.

It should be also noted that five observations were missing from this time series (02/2018, 07/2020, 08/2020, 09/2020, 05/2021). The obstacle had to be solved by applying interpolation of moving averages.

Properties listed in the dataset were then filtered based on five criteria:

- **Location** – To filter out listings located in other city districts except Prague 1
- **Property type** - To filter out private rooms, shared rooms, and hotel rooms
- **Number of reviews** – To filter out listings with historically zero reviews
- **Last review** – To filter out listings which received their last review more than 3 months ago
- **Reviews per month** – To filter out listings which were receiving only 0.5 reviews per month in the past

The other variables employed in the modelling are described in Tab. 1. It presents their designations in the model, a short description, the source of acquisition, the periodicity, and the length of the time series.

Tab. 1: Description of the variables

Name	Description	Source	Periodicity	Time series
Airbnb	Airbnb listings	Inside Airbnb	Monthly	01/2018-09/2021
Price	Average housing price per 1 m^2	RealityMIX	Monthly	01/2016-07/2022
Mortgage rate	Interest rate of new mortgages	Kurzy.cz	Monthly	01/2004-05/2022
Construction	Construction of new dwellings	CZSO	Monthly	01/2016-12/2021
Inhabitants	The number of inhabitants	CZSO	Quarterly	01/2011-03/2021
Hotel rooms	The number of hotel rooms	CZSO	Yearly	2012-2021
Covid	Covid-19 pandemic	N/A	Monthly	Dummy variable

1.2 Methodological framework

In the ensuing subchapter, we introduce the empirical techniques applied in our subsequent modelling of the average residential housing price per square meter in the centre of Prague.

Firstly, to determine the presence of a unit root in our variables, the augmented Dickey-Fuller test (ADF) is used at the 5% significance level (Dickey and Fuller, 1981). The result of the ADF test is a test statistic that is found in negative values. For comparison with other values, the smallest value of the test statistic is significant. In this case, this is the strongest confirmation of the rejection of the hypothesis of the unit root presence at the given level of significance. Based on the detection of non-stationarity in the time series, the data are then transformed using the first differences. After repeating the unit root test in the time series, it is found that the hypothesis of the occurrence of a unit root is rejected. Therefore, the data are suitable for the estimation of the VAR model (Sims, 1980) as represented in Formula 1.

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + e_t \quad (1)$$

Lastly, the Granger causality method (Granger, 1969) is used in the analysis of the improvement of the time series prediction within the monitored variables. It identifies whether one time series is useful in forecasting another via seeking the direction of causality between the variables.

This procedure is repeated multiple times, each time for a different combination of our variables. The variables *Price* and *Airbnb* have to be used in every equation, because they are the basis for fulfilling our pre-established objective, to evaluate the impact of STR accommodation on the housing prices in the city district of Prague 1. The remaining five variables are designated to help us explain the residual component in modelling of the *Price*.

2. Results of the Research

The following chapter presents the results of our econometric modelling. It is divided into two subchapters. Firstly, the unit root tests are introduced; secondly, the results of our VAR model.

2.1 Unit root test

As our first test, we run the augmented Dicky-Fuller (ADF) to check all our time series for stationarity at 5% level of significance (see Tab. 2). The results show signs of non-stationarity in levels for all variables except *Construction* (this can be explained by the variable essentially already being the first difference of the total number of dwellings in the district). *Inhabitants* and *Covid* can be considered stationary at a 10% level of significance. After adjusting our variables by conversion into first differences, it is evident that the stationarity was achieved for all the remaining ones except *Inhabitants* for which its p-value on the contrary increased.

Tab. 2: Augmented Dicky-Fuller p-value results

	Levels		**First differences**	
	Intercept	**With a trend**	**Intercept**	**With a trend**
Price	0.4119	0.0001	1.9191e-08	2.122e-07
Airbnb	0.8558	0.6876	6.856e-06	7.192e-05
Mortgage rate	0.1612	0.7298	0.01347	0.08329
Construction	0.038	0.0342	-	-
Inhabitants	0.0979	0.1817	0.6496	0.9359
Hotel rooms	0.615	0.8257	6.141e-09	5.997e-08
Covid	0.0955	0.3031	1.21e-08	1.694e-07

Source: authors' calculations in Gretl

After testing for stationarity, we ran 50 different modelling scenarios each with a different combination of variables to, in the end, find out that none of the other variables was able to improve the explanatory value of the model when added next to *Price* and *Airbnb*.

2.2 VAR model

By applying information criteria on variables *d_Price* and *d_Airbnb*, we obtain a recommendation for lag order 1 from the Bayesian information criterion and the result of lag order 13 from the Akaike information criterion alongside the Hannan-Quin information criterion. While our information criteria suggest either 13 lags (AIC, HQC) or 1 lag (BIC), such kind of model, however, does not pass optimally the Granger causality test. By reducing the number of lags from 13 downwards, we can decrease its p-value for the last lag from 0.5346 down to 0.0026 at 11 lags. By choosing this model, we arrive at the most statistically significant equation.

The resulting model has 8 variables with statistically significant parameters – three at 1% level, four at 5% level, and one at 10% level. Specifically, the model has three significant lagged *d_Price* variables, four significant lagged *d_Airbnb* variables, and a significant constant. The same goes also for the p-value of the whole equation which is significant at 1% level. Likewise, all three Granger causality p-values are significant at 1% level too (see Tab. 3), meaning the *d_Price* is substantially explained by 11 lags of *d_Airbnb* as well as its own 11 lags. Furthermore, both the determination coefficient and also its adjusted form exhibit high values. Regarding econometric verification, the model successfully passes all the tests, meaning there is no evidence of autocorrelation, heteroscedasticity, and normality of residuals, although the last one is just slightly below 5% level of significance.

On the other hand, the economic verification may be seen as questionable – one half of the *d_Airbnb* parameters is positive and the other half is negative, while statistically significant are mostly the negative ones. Therefore, these results are not consistent with the assumption that the number of STR listings should have a positive causal effect on the housing prices.

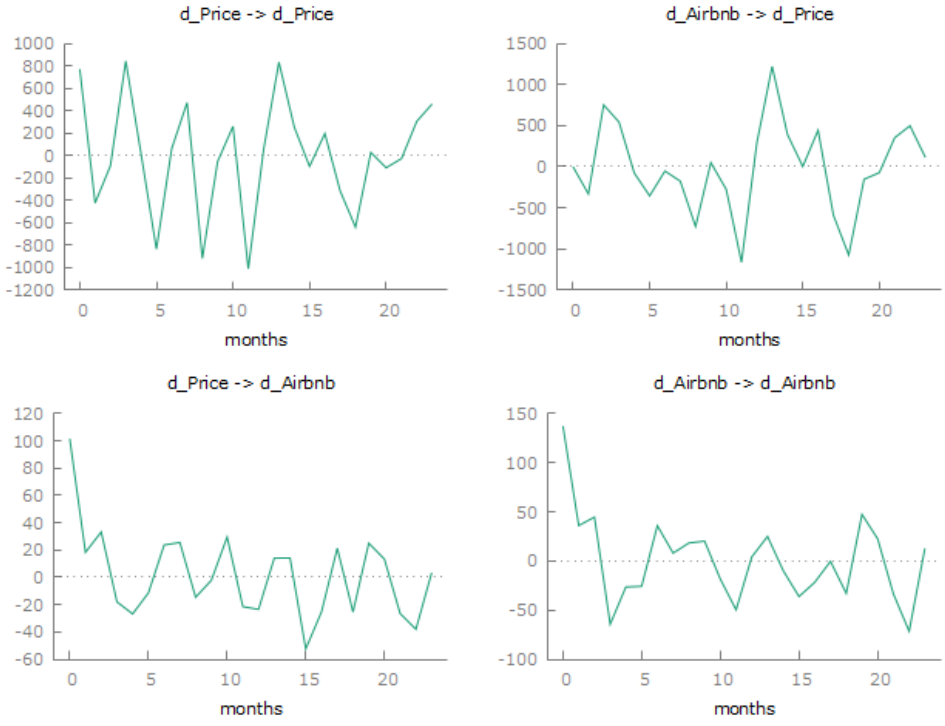
Tab. 3: Specifications of the model

Determination coefficient	0.934673
Adjusted determination coefficient	0.790955
F test	6.503495
P-value	0.002050
Granger causality p-value for *d_Price*	0.0016
Granger causality p-value for *d_Airbnb*	0.0032
Granger causality p-value for 11th lag	0.0026
Autocorrelation test	0.1857
Heteroscedasticity test	0.3379
Normality test	0.0491

Source: authors' calculations in Gretl

One of VAR model's outputs is an impulse response chart (see Fig. 1). It demonstrates that the interactions between these two markets are rather unstable. Particularly in the case of *d_Airbnb* reaction to the shocks in both markets, we can see that after 5 months the oscillation is getting closer to the equilibrium. Nonetheless, it does not achieve full stabilisation during the 24-month period demonstrated in the figure.

Fig. 1: Impulse response of the model



Source: authors' calculations in Gretl

VAR model also estimates a forecast for the next 12 months of the monthly differences in housing prices (see Fig. 2). Specifically, it predicts to continue in its oscillation while dropping in January 2022 by approximately the same value as in July 2021. Interestingly,

we can now retrospectively assess the validity of its prediction by ex-post comparison. Indeed, the monthly differences were positive at first in the rest of 2021 (although less than predicted) and then dropped to negative values in January 2022, however, not as much as in July 2021. The volatility of real housing prices per square meter up to July 2022 can be seen for comparison in the Discussion.

Fig. 2: Forecast of the model

Source: authors' calculations in Gretl

3. Discussion

In the Results, we encountered several phenomena opposing our previous expectations. Firstly, we hypothesised five more variables to have a potential for inclusion in our modelling. These variables are *Mortgage rate*, *Construction*, *Inhabitants*, *Hotel rooms*, and *Covid*. None of them, however, helped to improve the model's explanatory value after being included in any combination.

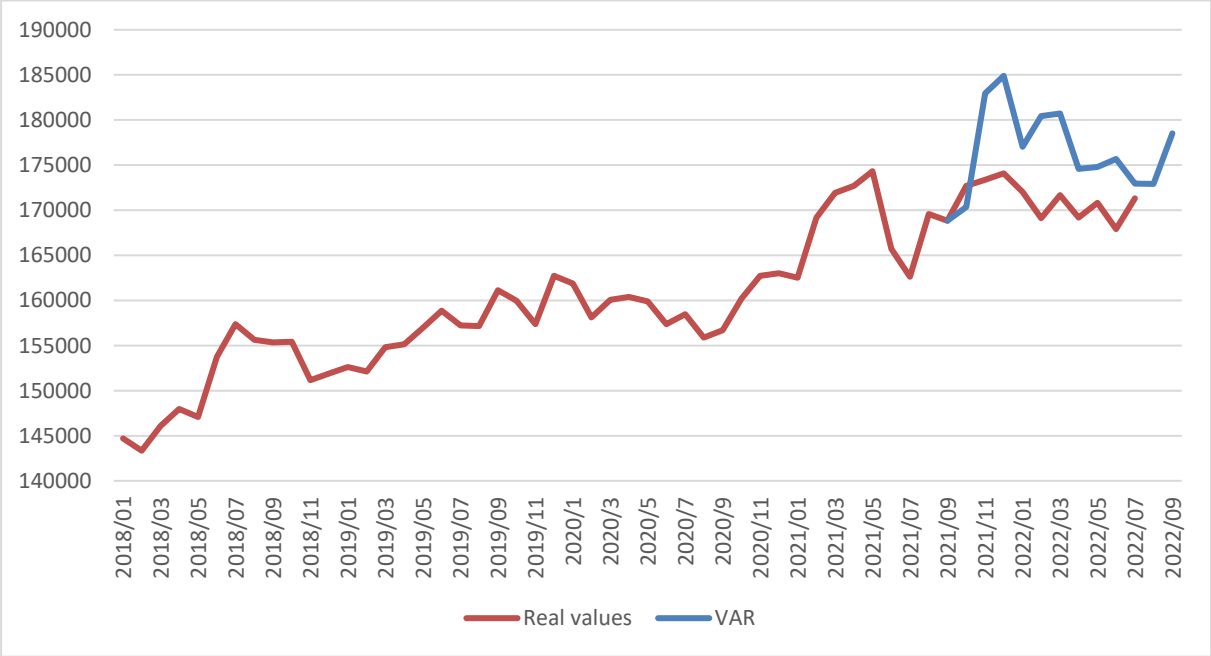
One of the possible explanations for the insignificance of the *Mortgage rate* variable could be that, in the observed period of time, its progress did not exhibit enough remarkably high values. The insignificance of the *Construction* is arguably not that surprising, since the investigated city district is not suitable for the extensive construction of new dwellings. The number of *Inhabitants* is a delicate matter which even though can partially represent the demand for dwellings, there could be more optimal ways to scheme it. The *Hotel rooms* are a difficultly included variable mostly because there are no more detailed available data than just merely yearly periods. The dummy variable for *Covid* also did not achieve statistical significance in any of the models. This might be connected to its prior formulation based on the requisite for stationarity, due to which the periods indicating

the presence of Covid-19 were limited to only the months from March 2020 to June 2020, i.e. the first wave of the pandemic.

Regarding the economic verification of the model, we can discuss our result with Biagi (2016). They found that increased tourism activity leads to increased housing prices in certain Italian cities, but in other cities, increased tourism activity decreases housing prices. The negative effect of tourism on housing prices is found primarily in small cities where marine tourism predominates. However, although this is an interesting revelation, it can be hardly attributed to our analysed city. A location characterised as "a small city where marine tourism predominates" has very little in common with the centre of Prague.

Lastly, if we plot the chart of the real housing prices together with the forecast of our model, we can ex-post compare its reliability (see Fig. 3). The prognosis of the VAR model is plotted by converting its monthly differences based on the value from September 2021, i.e. the last value applied in the modelling. It is visible that the prediction manages to explain the real values somewhat closely. Apart from the model largely overestimating the second period of its prediction, the subsequent values are in fact in a decent correlation with the real values of our housing prices per square meter. The reliability of the model's forecast can be adversely influenced, for example, by the shortened dummy variable for Covid-19.

Fig. 3: Comparison of the forecast with the real housing prices



Source: authors' calculations in Gretl

Conclusion

This paper investigated the impact of short-term rental accommodation on the average housing price per square meter in Prague 1. The study explores the role of Airbnb in relation to the sustainability of tourism in our urban environment. It presents a perspective on the home-sharing platform from the viewpoint of an econometric analysis of time series. Finally, the results of the analysis are discussed and presented in a broader context.

The research is limited by several factors. Firstly, five observations were missing from the time series of Airbnb listings. This obstacle had to be solved by applying interpolation of moving averages. Furthermore, none of our five auxiliary variables has proven to be statistically significant in the modelling. Lastly, it should be considered if some of the other methods utilised in the current literature would not be more beneficial for modelling Prague's housing prices in regard to our objective. Further follow-up research may broaden the scope to additional city districts or the whole municipality.

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Effective Creativity Against Banner Blindness

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Abstract
This research study titled "Effective Creativity against Banner Blindness" aims to investigate the factors that significantly influence the attention of Internet users toward banner ads. By observing Internet users during their natural online browsing behavior, we discovered that factors such as colors, text, and element layout have a negligible influence. However, a crucial finding of this study is that the user's current needs or interests play a significant role in capturing their attention. Consequently, recognizing that Internet users are primarily influenced by whether an advertisement aligns with their everyday needs or goods is the primary outcome of this study. Furthermore, this research provides insights into strategies to combat banner blindness by presenting relevant ads to the right user at the right time and place.

Key Words

Banner blindness, banner ads, creativity, internet users, current need, interest, user selective, critical factors

JEL Classification: M3

Introduction

The ubiquitous nature of online advertising has made banner ads commonplace for internet users in today's digital environment. However, a growing body of literature in recent years has highlighted a phenomenon known as "banner blindness," whereby Internet users do not perceive or consciously process advertising banners. This phenomenon poses significant challenges for advertisers and marketers trying to capture the attention of their target audience and achieve desired advertising results.

The prevalence of banner blindness can be attributed to various factors, including the sheer volume of ads that users encounter during their online activities. The sheer volume of banner ads and their often distracting nature has led users to develop mechanisms to filter out or ignore these promotional messages. As a result, advertisers face the daunting task of devising strategies to break this attention barrier and effectively engage users.

Understanding the root causes of banner blindness is essential for developing effective countermeasures. Earlier research endeavors have scrutinized ad congestion, information inundation, and recurrent exposure as potential enablers of banner blindness. Nonetheless, recent scholarly investigations have begun illuminating alternative methodologies to tackle this difficulty, emphasizing seizing users' attention by providing contextually pertinent advertisements that promptly cater to users' immediate requisites and inclinations.

Several past studies have delved into this phenomenon. For instance, Smith et al. (2015) explored how the placement and design of ads affect user attention and subsequently contribute to banner blindness. Similarly, Johnson's research in 2018 investigated the role of ad fatigue resulting from repetitive exposure, shedding light on its correlation with users' propensity to overlook banner ads. Furthermore, the study conducted by Lee and Chen (2020) extended the understanding by examining how cognitive overload due to excessive information impacts users' ability to notice and engage with banner ads.

This research study aims to delve into the area of effective advertising strategies aimed at overcoming banner blindness and capturing the attention of Internet users. Specifically, we seek to explore the role of contextual relevance and personalization in increasing awareness of online advertising. By exploring these dimensions, we aim to contribute to the existing literature and provide advertisers and marketers with helpful information to optimize their advertising campaigns.

We use a comprehensive methodology involving user tracking, data analysis, and user feedback to achieve these research objectives. By tracking participants' online activities and analyzing their interactions with different banner ads, we can gain valuable insights into the factors influencing attention-grabbing behavior. We also seek to collect qualitative data through user feedback, which allows us to explore users' impressions and preferences regarding banner ads and their perceived relevance.

The importance of this research lies in its potential to inform advertising practices and strategies in the digital sphere. By uncovering effective methods for capturing users' attention and mitigating banner blindness, advertisers can increase the effectiveness of their campaigns, leading to better user engagement and higher advertising results. Ultimately, the findings of this research effort contribute to an academic understanding of online advertising and offer practical implications for advertisers trying to navigate the complex landscape of banner blindness.

Literature review

It is essential to understand banner blindness. The banner blindness recording by Tuch et al. (2012) defines it as: "Banner blindness is the phenomenon that users selectively ignore banner-like information, even if it contains information relevant to their current task." On the other hand, Weinreich et al. (2008) see the definition as banner blindness refers to the tendency of web users to ignore banner advertisements while scanning a web page.

Stemming from the abundance, intrusiveness, and often irrelevant nature of banner advertisements, users have developed the ability to consciously or subconsciously ignore them. The concept of banner blindness was first recognized by Benway and Lane (1998), who observed users' tendency to overlook banner-like elements on web pages. Subsequent research by Goldfarb and Tucker (2011) delved into the impact of ad clutter on user attention, revealing a reduction in engagement due to excessive ads. Further exploration into the role of design and placement was undertaken by Fok and Sun (2015), emphasizing the significance of strategic positioning and practical innovation in capturing users' gaze. Koo et al. (2019) extended this understanding by investigating the influence of ad size and location on user perception, corroborating the importance of optimal ad placement.

Recent studies have illuminated novel approaches to address banner blindness, focusing on enhancing the relevance and interactivity of ads. Nguyen et al. (2022) ventured into the realm of AI-driven personalization, demonstrating that tailored ads aligned with users' preferences and browsing history resulted in heightened user engagement and diminished blindness. Williams and Jackson (2019) explored the integration of native advertising, finding that ads seamlessly embedded within the platform's content garnered heightened attention and interaction. In pursuit of innovation, Chen et al. (2021) investigated the potential of dynamic and interactive ads, which proved more adept at sustaining user attention and engagement.

A fresh perspective emerged with the study by Lee et al. (2023), which employed neurocognitive measures to delve into banner blindness. Their research harnessed eye-tracking data combined with neural responses, revealing insights into users' subconscious attention allocation and yielding valuable insights for designing more effective ad strategies.

1. Methods of Research

This study used a methodological approach that examined and monitored Internet users' natural browsing behavior. Informed consent was obtained from participants who readily agreed to have their Internet activities monitored. The aim was to gain insight into the specific advertisements that captured their attention and remained in their memory and explore the underlying reasons for such responses with a questionnaire's help. The research aimed to determine whether the advertisement's color scheme, the text contained in the ad, or another factor has a significant influence.

With the help of the non-probability chain sampling method, respondents were selected according to judgment. Twelve selected respondents participated in the research and shared the login questionnaire further. Ä total of 69 respondents participated in the study in this way. Respondents were exposed to various advertisements in a natural online environment, and their interactions with them were recorded using observation. Based on the analysis of observation data, it was found that the monitored factors, color, and text do not significantly affect the interaction with the advertisement. Based on these outputs, a questionnaire survey and an in-depth interview with the respondents were conducted. It was revealed that the respondents' individual needs and interests significantly influence interest in advertising and interaction with advertising.

The questionnaire collected demographic data and explored participants' experiences with banner ads, including what elements caught their attention. She focused on the effect of contextual relevance on attention, delved into emotional responses to ads, and gathered strategies to combat banner blindness. It measured the prevalence of banner blindness and how participants perceived the value of advertising. A comprehensive questionnaire provided information on factors influencing user attention, including relevance and emotional triggers, contributing valuable data for study implications.

To this end, a comprehensive tracking system was implemented to monitor users' activities on their devices during their standard internet navigation. The tracking system recorded their movements on different websites and their interactions with different types and themes of ads. This monitoring phase lasted 90 minutes, exposing participants to banner creatives and ads.

Following the monitoring phase, participants provided feedback regarding their impressions of the banner ads they encountered. During the movement of the respondents in the online environment, various advertisements were displayed, and it was evaluated which of these advertisements and their variants the respondents responded to. In the second phase, respondents were asked why they responded to selected advertisements.

Subsequent data analysis used statistical methods to assess each factor's impact on capturing Internet users' attention. Through the use of these analytical techniques, a deeper understanding of the underlying dynamics and relationships within the data was achieved.

The data were retrospectively statistically analyzed using regression analysis, which confirmed that neither color nor text had a significant effect ($p > 0.05$) and current needs and interests had a significant impact ($p < 0.05$).

This research study applied a rigorous and systematic approach combining active monitoring of Internet users' activities, questioning, and robust statistical analysis. Such an approach allows us to explore the critical factors contributing to attention-grabbing in online advertising, contributing to the body of knowledge in the field.

2. Results of the Research

This study reveals that visual aspects, including color and text, have a minimal impact on capturing the attention of internet users. In contrast, our findings revealed that the overriding needs or interests of the user are the deciding factor. Thus, the immediate result of this investigation suggests that Internet users judge the relevance of advertising content based on their current needs or interests.

In online advertising, various studies have examined the effectiveness of different design elements on banner advertisements, such as color schemes, typography, and layout composition. However, our research shows that these factors have a negligible effect on capturing the attention of Internet users. Despite the potential for visually striking elements to initially catch users' eyes, their impact on sustained attention and engagement appears minimal in the context of banner blindness.

Our study highlights the critical role that users' current needs or interests play in determining their response to advertising content. Internet users are sensitive to ads that match their immediate demands or capture their current interests. This finding is consistent with previous research on relevance-based filtering, which suggests that users use cognitive mechanisms to selectively process information that is considered personally relevant or related to their current goals.

For this research, we carefully selected, using the method of probabilistic chain selection, a diverse sample of 69 internet users to ensure representation from various demographic

backgrounds and online behaviors. Over one month, we diligently tracked their Internet activities, capturing a comprehensive view of their online experiences. Following this monitoring period, we conducted a structured survey to determine their impressions and awareness of banner advertisements.

Analyzing the data obtained from our sample, we uncovered noteworthy insights regarding the prevalence of banner blindness among Internet users. Our findings revealed that a substantial majority, comprising 80 % of the participants, reported no recollection or notice of any banner ads during the entire observation period. This staggering percentage indicates the pervasive nature of banner blindness and the challenges advertisers face in effectively capturing users' attention.

Further examination of the survey responses indicated that a modest portion of users, accounting for 15 % of the sample, acknowledged the presence of a solitary ad during their online engagements. This group represents individuals who overcame banner blindness and noticed at least one advertisement amidst the sea of online content. Conversely, a mere 5 % of the participants recognized multiple ads, signifying a minority subgroup with heightened attentiveness to banner advertisements.

Regarding the critical factors, the questionnaire found that:

Contextual Relevance and User Needs:

An overwhelming majority of participants (approximately 80%) emphasized that banner ads aligned with their immediate needs or interests significantly captured their attention.

The study underscores the pivotal role of contextual relevance in overcoming the challenge of banner blindness.

Visual Aspects and Design:

Contrary to common assumptions, visual elements like color and text had minimal impact on capturing attention.

While visually creative elements might catch initial glances, their sustained influence is limited in the context of banner blindness.

Emotional Engagement:

Approximately 50% of participants acknowledged that emotionally resonant banner ads, stirring curiosity or interest, contributed to capturing their attention.

Emotional engagement appeared tied to the ad content's alignment with users' aspirations and desires.

Strategies to Combat Banner Blindness:

A substantial proportion (over 70%) of participants highlighted the need for relevant ad delivery to address banner blindness effectively.

Personalized content, timing, and placement were recommended strategies to engage users amidst the online clutter.

Prevalence of Banner Blindness:

A striking 80% of respondents reported no recollection or awareness of banner ads during the observation period. A smaller segment (15%) overcame banner blindness and noticed one ad, while an even smaller portion (5%) recognized multiple ads.

The statistical interpretation of our data strongly supports the assumption that a significant majority of Internet users experience banner blindness, leading to an overlooked or disregarded perception of banner ads. The high percentage of users failing to notice any ads, coupled with the limited proportions of individuals seeing one or multiple ads, substantiates the prevalence of this phenomenon in the online advertising landscape.

These findings hold profound implications for advertisers seeking to optimize their strategies in the face of banner blindness. Traditional approaches relying solely on creative elements like color, text, and layout may yield less effectiveness in capturing users' attention. Instead, targeting users based on their needs, interests, and online behaviors becomes imperative. By delivering contextually relevant and personalized content, advertisers can enhance their chances of breaking through the banner blindness barrier and engaging users effectively.

Moreover, the observed data highlights the importance of continuously refining advertising strategies to address the challenge of banner blindness. Advertisers must leverage advanced technologies and analytical tools to gather actionable user behavior, preferences, and interactions insights. Such insights can enable the development of tailored advertising campaigns that align with users' immediate needs and interests, increasing the likelihood of capturing their attention.

It is important to note that while our research implies the prevalence of banner blindness among Internet users, it is not without limitations. The sample size and duration of the study may impact the generalizability of the findings to the broader population of Internet users. Additionally, the self-reporting nature of the survey responses introduces the possibility of recall bias or subjective interpretations. Future research endeavors should consider addressing these limitations and further explore the factors contributing to banner blindness, such as ad positioning, ad format, and user interface design, to enhance our understanding of this complex phenomenon.

In conclusion, our study substantiates the assumption that most Internet users suffer from banner blindness, resulting in the non-notice or disregard of banner advertisements. These findings emphasize the need for advertisers to adopt innovative strategies that go beyond traditional creative elements, focusing on targeted and personalized approaches. By effectively addressing banner blindness, advertisers can optimize their advertising efforts, enhance user engagement, and ultimately achieve their marketing objectives in the digital realm.

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3. Discussion

The results of this study highlight the critical importance of addressing Internet users' current needs and interests as a key strategy for overcoming the widespread problem of banner blindness. Our research shows that capturing and retaining users' attention in Internet advertising requires a targeted and personalized approach, where ads are tailored to match the user's immediate situation and preferences. By being aware of and responding to specific user needs, advertisers can create a more meaningful and engaging advertising experience that circumvents the phenomenon of banner blindness.

The traditional emphasis on creative elements such as color, text, and layout within ad design has long been a focus for marketers. However, our findings challenge entrenched perceptions by revealing that these creative aspects have less impact on attention-grabbing than the ad's contextual relevance. Although color, text, and layout undoubtedly contribute to the overall aesthetic appeal of an ad, their influence pales in comparison to the user's current frame of mind and personal interests. Contextual relevance assumes that ads perceived as directly applicable and relevant to the user's current situation are more likely to engage and hold the user's attention. If an ad responds to a user's immediate needs, wants, or current interests, it is more likely to break through the barriers of banner blindness and resonate with the user on a deeper level.

Marketers must deeply understand their target audience, preferences, and online behavior to achieve contextual relevance. This understanding can be gained through comprehensive data analysis and user segmentation, allowing marketers to effectively identify and target specific user segments with tailored and timely advertising. Advanced targeting techniques and technologies further enhance the accuracy and effectiveness of an advertising campaign, ensuring that the right ad reaches the right user at the right time and place. In addition, introducing advanced technologies such as machine learning and artificial intelligence enables real-time analysis of user data, enabling dynamic and adaptive ad delivery. By continuously tracking and analyzing user behavior, advertisers can adjust their advertising strategies in real time and optimize the relevance and impact of their ads based on evolving user needs and interests.

Although the findings of this research highlight the importance of contextual relevance, it is essential to note that creative elements still have a role to play in advertising. Visual aesthetics and design can contribute to an ad's overall perception and appeal, reinforcing its message and increasing its memorability. However, their impact should be considered with contextual relevance, prioritizing delivering targeted and personalized content that resonates with users.

Our research implies for the future that focusing on Internet users' current needs and interests is essential to combat banner blindness effectively. The findings suggest that while still relevant, creative elements should be subordinated to contextual relevance in ad design. By adopting a user-centered and personalized approach, advertisers can deliver ads relevant to users' immediate needs and interests, capturing and retaining their attention. These findings contribute to the academic understanding of online advertising and offer practical implications for marketers seeking to optimize their advertising strategies in the context of banner blindness.

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Conclusion

This research study aimed to investigate the effectiveness of creative strategies in mitigating the phenomenon of banner blindness. The primary objective was to identify the key factors that play a crucial role in capturing the attention of Internet users amidst the overwhelming presence of online advertising. Another outcome of this study was identifying approaches to circumvent banner blindness by delivering ads tailored to individual users' specific needs and interests, presented at the appropriate time and in the appropriate context.

A comprehensive investigation of user behavior and preferences was conducted to achieve these research objectives. Study participants readily agreed to have their online activities tracked, which allowed for collecting rich and detailed data regarding their natural browsing patterns. This data included users' interactions with various advertising formats, including banner creatives, on different sites and platforms.

Following the observation phase, participants engaged in a post-activity evaluation to gather their impressions and recollections of the ads they encountered. Using a questionnaire filled with open-ended questions, the researchers sought to gain in-depth insights into the ads that managed to capture users' attention and spark lasting interest. This questioning facilitated the honest expression of participants' perspectives and experiences.

Subsequently, the data collected was subjected to rigorous analysis using advanced statistical methodologies. These analytical techniques allowed us to evaluate the influence of each factor on the engagement of Internet users' attention.

The research results underscore the importance of tailoring ads to match Internet users' immediate needs and interests. By tailoring to users' specific preferences and desires, advertisers can effectively overcome the pervasive phenomenon of banner blindness. The study further highlights the importance of delivering ads to the intended recipient at the optimal time and in the most relevant context as a strategic approach to combat banner blindness.

Overall, this research effort represents a rigorous scientific investigation with comprehensive user behavior analysis, questioning, and robust statistical methodologies. The findings contribute to the professional discourse on effective advertising strategies and provide valuable insights for marketers and practition

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Fostering Employee Sustainability: Competencies Formation for a Resilient Business Environment

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Abstract

One of the foremost challenges companies face is a cultivation of a sustainable mindset among the organization itself and its employees. This research paper aims to address this challenge by proposing a sustainability competency model that organizations can implement to bridge the existing sustainability gap in the development of their employees. The paper explores the concept of sustainable competencies within the business environment. By conducting a comprehensive literature review and synthesizing findings from multiple surveys, this study seeks to identify the critical competencies prevalent in diverse industries. The primary objective is to gain insights into the competencies that can be fostered through organizational training and development programs. The research draws on three primary surveys: the "Future of Jobs Report" by the World Economic Forum, the "Global Green Skills Report" by LinkedIn, and the "Global Workforce Hopes and Fears Survey" by PricewaterhouseCoopers (PwC). The proposed sustainability competency model offers a systematic approach to integrate sustainability principles and practices. The research findings and competency model will be further used for subsequent primary research. The model will be tested through semi-structured interviews within automotive companies to assess its effectiveness in fostering sustainability competencies among employees. These insights will contribute to validating and refining the model for driving sustainable practices in the industry. By incorporating these competencies into employee development plans, organizations can effectively evaluate the acquisition and application of sustainability skills. This research contributes to the knowledge on sustainable competencies and their significance in driving organizational success in a rapidly changing world.

Key Words

sustainable behaviour, skills, workforce development, model, industry

JEL Classification: M12, M53

INTRODUCTION

The challenges stemming from global circumstances, such as the escalating threat of global warming, the escalation of greenhouse gas emissions, evolving customer expectations, and other related factors, exert a significant impact on the imperative to cultivate and apply these competencies across diverse sectors (Kacprzak et al., 2017; Skarbale et al., 2021). This paper aims to underscore the significance of sustainable competencies within the backdrop of these global conditions and elucidate their pivotal role in attaining long-term success and sustainable development of employees nowadays. The primary goal of this paper is to ascertain the sustainable competencies exhibited by employees within the business environment. Currently, most environmentally friendly initiatives, such as sustainable supply chain, carbon business offsetting and sustainable employee engagement, primarily originate from external sources rather than businesses (Frey et al., 2023). Consequently, the adoption of sustainable initiatives appears to be

forced and unnatural. Many companies are incorporating sustainability into their overall strategies at a macro level (Keay and Iqbal, 2019). However, only a fraction of these organizations is effectively integrating a sustainable mindset from an internal perspective, encompassing employee behaviour, activities, and attitudes. The research identifies a significant research gap in the formation of a sustainable competencies structure within the business environment. Previous studies have primarily focused on specific competences of employees, without considering the broader context of the issue (Eberz et al. 2023; Moreno et al. 2021). The proposed sustainable competency model aims to address this gap by providing a comprehensive understanding of the role of sustainability across various proficiency standards. By doing so, the model seeks to offer a more holistic approach to developing sustainable competencies among employees, taking into account the multifaceted aspects of sustainability within organizations.

1. METHODS OF RESEARCH

Drawing upon a comprehensive review of relevant studies and prior research endeavours, this investigation will offer a systematic overview of the critical competencies in diverse industries. Deeper analysis will be conducted to identify the primary competencies that can be nurtured through organizational training and development programs. By examining and synthesizing existing literature, this study aims to provide valuable insights into cultivating sustainable competencies, thereby contributing to the body of knowledge in this field. This approach will facilitate a deeper exploration of the skills and knowledge required to address the challenges and capitalize on the opportunities in nowadays rapidly evolving business landscape. This study will rely on findings from three primary surveys to accomplish the aforementioned objective and establish a foundation for the subsequent competency analysis. The first survey, titled "Future of Jobs Report," was conducted by representatives of the World Economic Forum between 2022 and 2023. This report provides a comprehensive overview of job trends and projections from 2023 to 2027. The survey encompassed a diverse sample of 803 organizations operating in 45 markets, representing 27 different industries. The survey covered more than 11.3 million workers across the regions mentioned above. By leveraging the insights gleaned from this report, this study aims to gain a deeper understanding of the contextual factors and dynamics that predominantly shape the development of sustainable competencies among employees within the industries under examination (Battista et al., 2023). Another significant study, the "Global Green Skills Report," was conducted by LinkedIn in 2022. This study aimed to examine the transition towards a circular economy and the evolving attitudes of employees towards developing green competencies and skills. It covered a wide range of developed and transition economies, spanning over 25 countries. The third survey under analysis is the "Global Workforce Hopes and Fears Survey," conducted by PricewaterhouseCoopers (PwC) in 2022. This study delved into employees' perspectives on personal fulfilment, their meaning from their work, and the importance of environmental, social, and governance (ESG) factors within their respective organizations. The survey encompassed responses from 52,000 workers across 44 countries, providing valuable insights into the expectations and aspirations of the global workforce (PwC, 2022). The combined insights from analyzed studies will be a robust basis for the subsequent comparative analysis of competencies within different business contexts.

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2. RESULTS OF THE RESEARCH

As companies today face tremendous pressure to adopt sustainable practices within their business environments, the role of current employees as catalysts for accepting these practices becomes increasingly crucial. The "Future of Jobs" report highlights the significance of macro trends and their influence on the current business landscape. Over the decades, the involvement of macro trends and their impact on employee competence formation has become indispensable (World Economic Forum, 2016; World Economic Forum, 2018; World Economic Forum, 2020). Job creation and changes in employee roles 3 are significantly influenced and driven by the green transition of businesses and the implementation of ESG standards (Battista et al., 2023). According to the "Future of Jobs" report findings, more than 80.6% of surveyed organizations consider ESG standards as still developing, exerting a strong influence on the future description of employee roles. Furthermore, 67.5% of organizations surveyed reported that consumers are becoming increasingly vocal about environmental issues, while 65.1% affirmed the necessity for climate-change-induced investments to adapt company operations. According to the report, these macro trends will positively impact the creation of new job opportunities, accounting for 35.2% of the influence. Among the macro trends, investments to facilitate the green transition of businesses were identified as the most influential, resulting in 52.2%. Furthermore, the report also investigated the significance of environmental stewardship skills within the surveyed organizations. The findings revealed that there has been a notable increase in the importance of this role at work, with a 43% increase compared to previously observed periods. It indicates that companies are emphasising environmental stewardship skills as essential attributes for employees. These findings emphasize the growing recognition of the importance of sustainable practices and the need for employees to possess the necessary competencies to address these challenges. According to Cozzi and Motherway (2021), the process of green job transition shall create 30 million job roles in accordance to environmental standards. The findings mentioned above align with another survey conducted by LinkedIn in 2022. According to this report, current workers need to acquire upskilling to facilitate the green transition within their job activities. It is crucial for organizations today to support these workers and bridge the gap in sustainable skills to ensure the inclusion of such skills in the skillset of future generations. Consequently, it is visible to identify additional significant factors that influence the development of sustainable competencies across companies. The Global Green Skills Report further reveals that sustainable employee competencies are increasing annually. However, it highlights a concerning trend where the demand for green skills is expected to surpass the available supply. The report indicates that job postings requiring sustainable skills grew by 8%, whereas the proportion of potential employees with a green and sustainable attitude increased by only 6% during the same period. These findings underline the urgency for organizations to address the skills gap and invest in upskilling, reskilling, and training programs to meet the growing demand for sustainable competencies. This assertion is supported by a study conducted by PricewaterhouseCoopers, which reveals that environmental issues and climate goals are more considered to company strategy than to be part of individual performance goals and development path (PwC, 2022). Based on researched factors which are mainly influencing sustainable development of employees it is possible to explore in detail studies which analyzed sustainable competencies across different researches. Many scholars made an effort to identify a 4 scope of sustainable competencies. The table 1 demonstrates competence frameworks that were published between 2014 and 2023, corresponding the comparison of results in different countries (see Tab. 1).

Tab. 1: Competencies framework based on previous researches

Author and Year	Study Title	Observed Competencies	Methodology
Menoyo and Novo (2014)	Sustainability competence training: a strategy for improving employability in sustainable societies	System and critical thinking with regards to socio-economic area; Understanding of the financial / economic systems and its connection with a sustainability; Anticipatory thinking with regards to nature sources consumption and associated problems; Social commitment and alternative attitude to sustainable lifestyle; Ethical commitment and identification of nature value, lifestyle, socioenvironmental consequences and individual contribution to global changes	Literature review and analysis of secondary data
Sokulski et. al (2018)	Competencies for sustainability: A proposed method for the analysis of their interrelationships	Development and application of technologies that promote carbon neutrality; Development of sewage treatment technology; Developing and applying lifecycle assessment methodologies; Extraction of natural resources in a sustainable way; Innovation and maintaining growth and profitability; Business development with regards to sustainability	Literature review with adjusted case study
Eizaguirre et. al (2019)	Defining Sustainability Core Competencies in Business and Management Studies	Commitment to the local sociocultural environment; Commitment to preserving the environment; Social responsibility and citizenship; Regard and respect for diversity and multiculturalism; Ethical commitment	Questionnaire and data analysis
Moreno et. al (2021)	Study of the Presence of Sustainability Competencies in Teacher Training in Mathematics Education	Critical, contextualization of knowledge through interrelating social, economic and environmental issues at local and global level; Sustainable use of resources and in the prevention of negative impacts on the nature and social environment; Participation in community process that promote sustainability Apply ethical principles related to sustainability values in behaviour	Primary data analysis
Eberz et. al (2023)	Taking the Lead into Sustainability: Decision Makers'Competencies for a Greener Future	Ability to analyze complex systems across primary domains (society, environment, economy); Ability to analyze and evaluate imagination about the future related to sustainability problem solving framework; Ability to design, apply, reconcile and negotiate sustainability values, principles and goals; Action and oriented ability towards sustainable strategies; Interpersonal ability to motivate and facilitate sustainability problem solving	Secondary data analysis and interviews
Bianchi et al. (2022)	GreenComp – The European sustainability competence framework	Valuing sustainability; Supporting fairness; Promoting nature; Systems thinking; Critical thinking; Problem framing; Future literacy; Adaptability; Exploratory thinking; Political agency; Collective action; Individual initiative	Mixed method research process
Silvius and Schipper (2014)	Sustainability in Project Management Competencies: Analyzing the Competence Gap of Project Managers	System thinking to analyze and understand the problem complexity; Anticipatory and ability to develop visions of possible future with regards to sustainability issues; Normative understanding of justice, equity, social and ecological integrity; Strategic ability to design and implement interventions of sustainability	Comparison analysis and literature review

Source: authors' own elaboration

According to the "Future of Jobs" report, the role of environmental stewardship has shown the most significant increase in importance among business development professionals, with a net growth of 21% compared to previous research periods. This finding highlights the growing recognition of the need for sustainability considerations in the field of business development. Many companies are actively hiring new employees for business development positions to drive innovation in technologies and processes and professionals' attitudes towards current trends. Considering the above reasons, there has

been developed in the paper a competency model for business development roles and positions (see Tab.2). However, due to the complexity of the competencies involved, it is evident that this competency model can also be applied to other related business areas. This competency model was developed based on a comprehensive literature review and secondary data analysis from the previously mentioned research studies. The primary input and foundation for creating the model was Table 1, which provided an overview of sustainability competencies identified in various educational and business domains. By utilizing this competency model, organizations can effectively identify and cultivate the necessary skills and attributes required for business professionals and related roles. The model serves as a valuable framework for aligning recruitment, training, and performance evaluation processes with the sustainability goals and requirements of the organization. It enables businesses to nurture a workforce that is equipped to navigate the challenges and opportunities of sustainable development in today's rapidly evolving global landscape. The competency model for business positions comprises four primary components. The initial section entails a compilation of employee sustainability competencies specifically designed for the business environment. By leveraging these competencies, contemporary companies can extend the integration of sustainable concepts beyond their organizational strategies and delve deeper into employee activities. The second part of the model elucidates the meaning and essence of each competency, aiming to enhance comprehension of the associated activities and future objectives. The third part delineates the utilization of each competency across three distinct levels: junior, senior, and executive. This division of competencies based on proficiency standards serves to determine the corresponding responsibilities of each involved employee, irrespective of their hierarchical position. The final component of the model pertains to the evidence type. Its principal objective is to verify and reflect each competency within the employee development path plans and standards. By employing the suggested methods, modern organizations can effectively monitor the acquisition and application of each competency. Simultaneously, before implementing the competency model, existing companies need to assist their employees in acquiring specific knowledge and skills that can bridge the sustainability gap within their development paths. Therefore, the successful integration of sustainability competencies relies heavily on training activities. Organizations that intend to leverage a competency model must proactively develop supportive sustainability courses and activities for their employees. These training initiatives should primarily be aligned with the proposed proficiency standards. Organizations can enhance their employees' capacity to effectively apply sustainability competencies within their roles and responsibilities by providing such training. Equipping employees with sustainability knowledge and skills enables them to actively contribute to eco-friendly practices, innovative solutions, and responsible decision-making. This results in reduced resource consumption, improved waste management, and the adoption of greener technologies and processes.

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Tab. 2: Sustainability competency model for Business Positions

Sustainability Competencies	Description	Proficiency Standard			Evidence Type
		Junior	Senior	Executive	
Comprehensive Socio-Economic Understanding and Environmental Consciousness	*Knowledge of financial and economic systems and their interplay with sustainability *Anticipatory mindset regarding the consumption of natural resources and the associated challenges *Socially committed and alternative approach towards embracing sustainable lifestyle	*Demonstrates basic knowledge about financial and economic systems, including sustainability consequences *Demonstrates basic understanding of sustainability challenges *Participates in discussions and contribute inputs to sustainable practices	*Demonstrates solid understanding of financial and economic systems with regards to sustainability concepts * Seeks out innovative solutions and strategies to address sustainability issues *Educate others about sustainability principles	*Demonstrates extensive knowledge about financial and economic systems with regards to sustainability concepts *Exhibits vision and proactive mindset in addressing sustainability issues *Collaboration with stakeholders to achieve sustainable outcomes	Reflection of individuals
Advancement of Sustainable Technologies	*Developing and / or implementing technologies that foster carbon neutrality and designing innovative solutions for sewage treatment *Applying robust sustainability methodologies for lifecycle assessments *Skilful extraction of natural resources in an environmentally sustainable manner	*Supports the development and implementation of sustainable technologies under supervision *Demonstrates a basic understanding of lifecycle assessment and connection to sustainable methods	*Assess the environmental impact of projects *Collaborate with cross-functional teams to integrate sustainability into technology and trends development	*Leads innovative solutions of implementation sustainable technologies and trends *Lead and develop resources management strategies at industry level * Influences industry standards and policies to achieve sustainable goals	Portfolios of individuals
Social and Ethical Responsibility	*Unwavering social commitment and embraces alternative attitudes towards sustainable lifestyles *Exemplifies social responsibility and active citizenship *Respectful regard for diversity and multiculturalism	*Understanding of social responsibility and its importance in personal and professional contexts *Actively engages in initiatives that promote sustainable and inclusive practices	*Advocates for sustainable practices and encourages others to embrace alternative attitudes towards sustainability *Collaborates with diverse stakeholders to develop and implement CSR initiatives	*Embeds social responsibility and sustainable practices into the organization's culture and strategic vision	Reflection of individuals and interviews
Interdisciplinary Problem-Solving	*Proficiency in critically contextualizing knowledge by interconnecting social, economic, and environmental issues at local and global levels *Skilful management of resources to ensure sustainable utilization and prevent negative impacts on nature and the social environment	*Begins to apply basic strategies for resource utilization in a sustainable manner, under supervision *Demonstrates awareness of the importance of sustainable resource management	*Effectively manages resources to ensure sustainable utilization and minimize negative impacts on nature and the social environment *Applies advanced strategies and methodologies for sustainable resource management	*Advocates for sustainable practices at local, national, and global levels, driving systemic change *Demonstrates exceptional ability to critically contextualize knowledge	Portfolios of individuals and performance review
Holistic Sustainable Thinking and Action	*Demonstrates systems thinking to analyze and comprehend the complexity of sustainability problems *Comprehensive understanding of justice, equity, social integrity, and ecological balance	*Demonstrates the ability to apply systems thinking to analyze and comprehend the complexity of sustainability problems	*Applies systems thinking effectively to analyze and address complex sustainability problems	*Demonstrates exceptional systems thinking skills to analyze and address complex sustainability problems at a strategic level	Case Studies and Examinations
Strategic Sustainability Leadership	*Forward-thinking approach to envisioning possible futures in relation to sustainability issues *Strategic acumen in designing and implementing interventions to drive sustainable practices	*Shows an awareness of emerging trends and challenges in sustainability and their potential impacts *Contributes ideas and insights to support sustainable practices within their scope of work	*Proactively identifies emerging trends and challenges, and assesses their implications for sustainability strategies *Collaborates with cross-functional teams to develop and execute sustainable initiatives	*Anticipates and responds to emerging trends, risks, and opportunities to drive sustainable practices at an organizational and industry level *Influences and engages stakeholders in sustainable practices	Performance assessments

Source: authors' own elaboration

Based on the literature review and secondary data analysis, the table 2 shows identified key sustainable competencies in the context of the competency-based model in context of the proficiency standard.

3. DISCUSSION

In the present day, the importance of competencies of sustainability in the business environment is increasing significantly. However, this shift's driving force is not primarily from the companies themselves. Employees within organizations and the direct customers are playing a crucial role in shaping the adoption of sustainable practices. Given these circumstances, the development and conceptualization of sustainability competencies among employees are of utmost importance for fostering a sustainable mindset within organizations. The proposed competency model allows industries to embrace sustainability trends at different proficiency levels. Additionally, it enables all employees to play a critical role in ensuring that industry processes align with sustainability goals and strategies. By incorporating sustainability competencies, businesses can deepen their environmental consciousness and perception integration. While many organizations have already incorporated sustainable goals into their strategies, it is essential to integrate sustainability into employees' day-to-day work activities fully. Results presented in the paper are limited to the secondary data only. It uses a sample, although an extensive survey of secondary data is used, the authors do not confirm their propositions with primary data. This limits the interpretation of the results but gives the authors room for further investigation. The analysis of secondary data and observations from foreign researchers reveal a notable and ongoing growth in the development of sustainability topics. The research papers examined confirm that both current company employees and their subsequent customers are exerting pressure on contemporary businesses to integrate sustainability into their day-to-day operations within society. This trend underscores the increasing significance of sustainability as a crucial aspect of aligning business practices with the values and expectations of their employees and customers alike.

CONCLUSION

The proposed competency model offers numerous advantages to current businesses in meeting the demands of both employees and customers. Hence, organisations must include a sustainable perspective when determining employee competencies. This can be followed by organizing of specialized training courses that introduce employees to sustainable concepts and help them better understand the operational details of sustainability. Even individuals, who may not actively prioritize sustainability goals, are still impacted by their environment, relationships, work, and market dynamics, which are influenced by sustainability-related attitudes and practices. For these reasons, companies must go beyond superficial sustainability strategies and fully engage their employees in sustainability performance. By integrating sustainability into employee development programs, companies can actively empower their workforce to contribute to sustainable practices within and outside the organization. This holistic approach benefits the organisation and contributes to a broader societal shift towards a more sustainable and responsible approach to business and life. The proposed competency model will be tested through semi-structured interviews within the industry. Indeed, the insights gained from the research and the semi-structured interviews with automotive companies will play a vital role in validating and refining the model.

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Development of the Office Space Prices on the Czech Market

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Abstract

The price developments in the commercial real estate market can affect the financial stability of countries, particularly through the level of lending by companies operating in this area. In the literature, research can be found dealing mainly with residential real estate, while commercial real estate stands rather in the background. The aim of this paper is to analyse the price development of the office space (CRECVI index) in the Czech market between years 2005 to 2022.

As part of the cointegration analysis, an ADL model is constructed to describe how commercial real estate prices respond to changes in selected macroeconomic indicators. The results of the analysis show that office space prices are mainly influenced by the evolution of gross domestic product, unemployment and the level of inflation and interest rates.

Key Words

Cointegration analysis, CRECVI index, ADL model, commercial real estate

JEL Classification: C51, F63

Introduction

The property market has been going through major fluctuations in recent years, first brought about by the COVID-19 pandemic, followed by a sharp rise in property prices, which was quickly replaced by a period of high interest rates and recession. High inflation rates are also causing rising construction and energy costs. For many companies in need of warehouses, office space or production halls, it may be more profitable to lease these spaces on a long-term basis. The commercial property market is therefore currently stagnant, and investors are waiting for commercial property prices to fall.

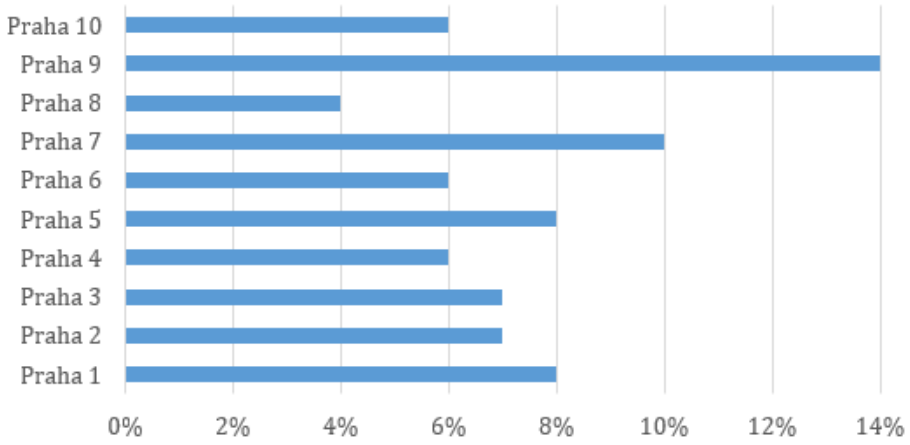
The description and modelling of office space real estate prices can be a useful tool to understand the dynamics of this market. The real estate transactions monitored focus on the main sector of the market, which represents only the most lucrative properties. Thus, the rest of the market, which does not meet the standard of prime real estate, is not included in the analysis. However, the advantage of looking only at prime property is comparability with other countries. These analyses therefore include mainly capital cities and other large cities.

1. Development of the Prague office market

The COVID-19 pandemic has caused hard times for the office market. However, this market soon stabilized and vacancy rates began to slowly decline. At the end of 2022, the vacancy rate in Prague will reach 7.7%, equivalent to 293,600 sqm. In Q1 2023, the Prague office vacancy rate decreased to 7.5%, the lowest since the end of 2020. By district, the

highest vacancy rates were in Prague 4 (56,400 sqm) and Prague 5 (52,100 sqm). By the end of 2022, vacancy rates in Prague 4 and Prague 9 decreased significantly. On the other hand, Prague 7 and Prague 1 recorded the largest increase, mainly due to new speculative construction. The vacancy rates in each urban area are shown in Figure 1.

Fig. 1: Vacancy rate in Prague as of Q1/2023



Source: authors' own calculations, data from (JLL, 2023)

The total volume of modern office space in Prague reached more than 3.85 million sqm as of Q1 2023, with four office buildings completed in two projects - Port7 in Prague 7 and Red Court in Prague 8. Savills Research (2023)

Since the second half of 2022, no construction of office buildings has started in Prague, and the area of offices under construction is thus decreasing. At the end of the first quarter of 2023, a total of 15 projects with a leasable area of around 145,000 sqm were under construction, of which 45% were already contracted. (JLL, 2023)

Information on individual properties is presented in Table 1.

Tab. 1: Basic statistic characteristics in the sample of nominal and real NDHI

Property	Completion	Size (sq m)
Hagibor	Q1 2024	28 900
Metalica & Legatica	Q3 2023	27 300
Masaryčka	Q3 2023	22 100
Roztyly Plaza	Q4 2023	21 700
E-Factory (1st phase)	Q1 2024	10 000

Source: authors' calculations, data from (JLL, 2023)

2. Methods of Research

For the purposes of this analysis, commercial real estate is defined as real estate that is used exclusively for business purposes. The commercial real estate market consists primarily of the following segments: office buildings, industrial and warehouse buildings, retail space and hotels. The cointegration analysis in this article will focus specifically on the office market.

As stated by Arlt (2007), cointegration is one way of classifying economic time series, where time series are divided into short memory and long memory series. Time series cointegration was first studied in the early 1980s. C. W. J. Granger.

This method is based on the problem of integrated processes, which was already addressed by G. Box and G. Jenkins.

According to Arlt (2003), when modeling multivariate economic time series, it is useful to distinguish between short-run and long-run relationships, because short-run relationships between time series exist only in a relatively short peri-period and weaken over time. These short-term relationships occur in non-stationary time series that are characterized by short memory. The second type of relationships are long-term in nature and persist over time.

Long-term relationships between time series are closely related to the concept of equilibrium, which can be understood as a steady state. The system is continuously attracted to this equilibrium state. However, the system is subject to shocks and is never directly in equilibrium, but may be in a long-term equilibrium towards which it converges over time. A time series is in long-run equilibrium if there is no divergence in the long run. Therefore, an analysis of the long-run relationship between time series can only be performed for non-stationary time series that share a common stochastic trend. These time series are then considered to be cointegrated. Arlt (2002)

According to Brooks (2008), when time series have different trend directions, a condition known as apparent regression arises in the analysis of the relationship. Apparent regression is considered to be a situation where there are time series that are unrelated. However, using the least squares method, it is possible to obtain statistically significant estimates of the parameters of the regression function. Thus, the index of determination, t-tests and F-test will indicate the appropriateness of using the model. Thus, the time series cointegration test also serves as an indicator of true and apparent regression.

Testing for cointegration in univariate models can be based on testing the stationarity of the residuals. The residuals required for testing are estimated by the least squares method, where one series is treated as the explanatory variable and the other series as the explained variables. This is based on a regression model of the form:

$$Y_t = \beta X_t + a_t \tag{1}$$

For this testing, mainly the Augmented Dickey-Fuller test (ADF test) is used. It tests the hypothesis that time series are not cointegrated, i.e. that the unsystematic component is of type I(1). In this case, it is an apparent regression. If the ADF test shows that the residuals are stationary, this is a true cointegrating regression.

If the non-systematic component of the model represents white noise, a simple linear regression is sufficient to capture the relationships. If autocorrelation of the non-systematic component is evident, a lagged explanatory variable model, the autoregressive distributed lag (ADL) model, is used.

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In the diagnostic check of the model, according to Arlt (2002), it is necessary to test whether the nonsystematic component exhibits normality, homoskedasticity, and is autocorrelated.

To assess the normality of the unsystematic component, the Jarque-Bera test is used, which is based on simultaneous testing of skewness and bias of the unsystematic component. The ARCH ("AutoRegressive Conditional Heteroskedasticity") effect is tested to test the homoskedasticity of the unsystematic component of the model. This test consists in creating an artificial regression where the explanatory variable is the square of the residuals and the explanatory variable is the square of the residuals in lag q.

According to Pagan (2009), the Breusch-Godfrey LM test can be used to assess the autocorrelation of the unsystematic component. This test verifies the serial dependence of the random components in the model, with the null hypothesis stating that there is no autocorrelation in the model. The test consists of creating an artificial variable where the explanatory variable is at, the explanatory variables are *at-1, ..., at-p* and the explanatory variables of the model are $y = ßX + a_t$.

After identifying the cointegrated relationship between the variables, we can use the Autoregressive Distributed Lag (ADL) model. Pagan (2009). The model has the form ADL(1,1)

$$Y_t = c + a_1 Y_{t-1} + \beta 1 X_t + \beta 2 X_{t-1} + a_t \quad (2)$$

3. Data

CRECVI data are not publicly available. For the purposes of this analysis, they were provided by the consultancy Cushman & Wakefield. Other selected indicators were obtained from the Czech Statistical Office and the Czech National Bank's time series database.

The C&W CRECVI (Commercial Real Estate Capital Value Index) is compiled by the consultancy Cushman & Wakefield. The index is limited to the Czech Republic and shows year-on-year changes in the capital value of a commercial real estate portfolio (prime Prague offices, shopping centres and logistics parks). The index is based on quarterly "prime rents" and "prime yields" for selected commercial real estate markets and starts in 2005. The index starts from Q1 2015 (i.e. Q1 2015 = 100). The resulting index is then the average of the index values across sectors and locations. Development of the office space index is provided in Figure 2.

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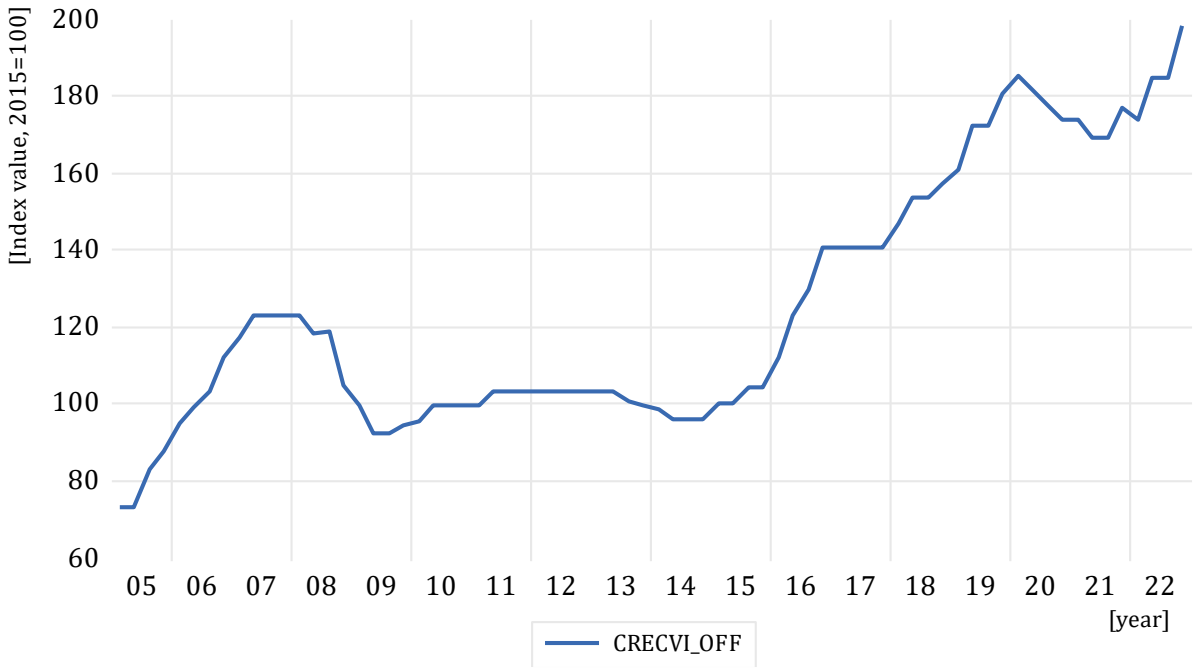
Fig. 2: Development of the CRECVI – office space, 2005-2022.



Source: authors' calculations in EViews 13, data from Cushman & Wakefield

The cointegration analysis is based on quarterly data for the period I/2005 - IV/2022 of the CRECVI index for office space. In addition to the CRECVI index, it also includes the macroeconomic variables listed below:

- GDP (GDP);

- Consumer Price Index (CPI);

- Interest rate for commercial real estate (INTRST_RATE);

- unemployment (UNEMPL).

These variables were used to model the short- and long-term effects on the commercial real estate capital value index, which is the explanatory variable.

4. Results of the Research

Time series modelling was performed in EViews 13. With the exception of the explanatory variable CRECVI, all time series showed seasonality. The C-X13 ARIMA method was chosen to identify the seasonal component and then to adjust the time series. After seasonal adjustment, the time series are denoted by the ending SA in the analysis.

Based on the results of the augmented Dickey-Fuller unit root test, the time series are non-stationary, type I(1). The model residuals obtained from the linear regression are stationary. The unit root test confirmed that the time series are cointegrated.

The statistically significant ADL model is presented in Table 2.

Tab. 2: ADL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CRECVI_OFF(-1)	0,859156	0,043733	19,64552	0,0000
CPI_SA	-0,826541	0,175878	-4,699511	0,0000
GDP_SA	7,62E-05	1,44E-05	5,311782	0,0000
INTRST_RATE_SA(-1)	0,985431	0,392263	2,512168	0,0145
UNEMPL_SA(-2)	1,944811	0,519196	3,745812	0,0004

Source: authors' calculations in EViews 13

After fitting the ADL model, diagnostic tests were performed and the results are presented in Table 3.

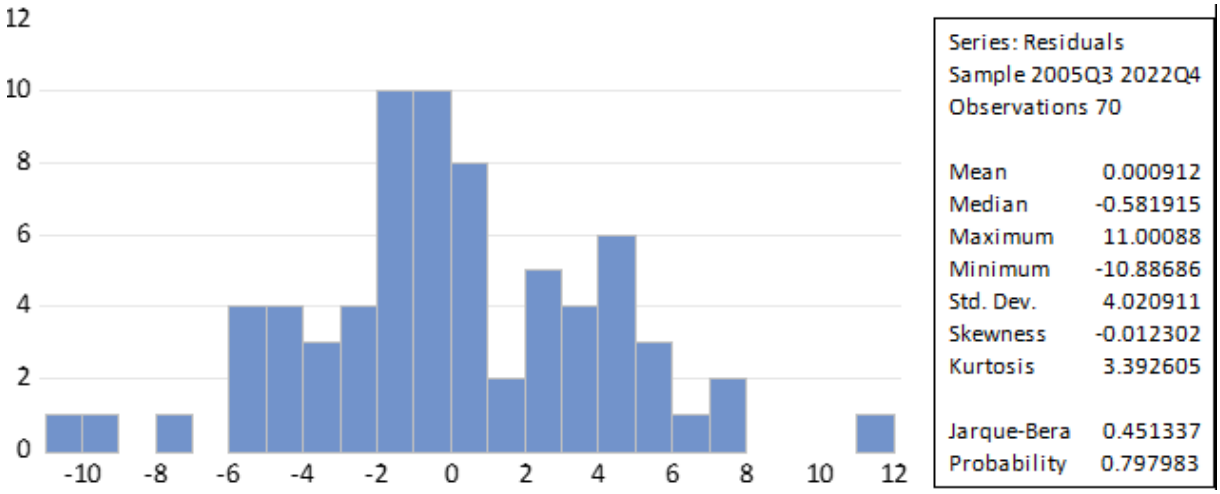
Tab. 3: Diagnostic tests

Model diagnostics	Stat.	Prob.
R^2	0,984715	-
Durbin-Watson Stat.	1,960565	-
Breusch-Godfrey	1,690213	0,2548
Jarque-Bera	0,451337	0,7979
ARCH	0,360880	0,5500

Source: authors' calculations in EViews 13

A correlogram was used to show the progression of ACF and PACF, which did not show autocorrelation. The ARCH test shows that the non-systematic component of the model is homoskedastic. Furthermore, in validating the fit of the model, the Breusch-Godfrey test was performed, which shows that the non-systematic component of the model is not autocorrelated. To test the normality of the model, the Jarque-Bera test was used, according to which the non-systematic component of the model is normally distributed. Detailed statistical testing information is provided in Figure 3.

Fig. 3: The Jarque-Bera normality test of the unsystematic component.



Source: authors' calculations in EViews 13

The resulting ADL model passed the diagnostic check and can be written as follows:

$$\widehat{CRECVI\_OFF_t} = 0{,}859156\ CRECVI\_OFF_{t-1} - 0{,}826541\ CPI\_SA_t + 7{,}62E-05\ GDP\_SA_t + 0{,}985431\ INTRST\_RATE\_SA_{t-1} + 1{,}944811\ UNEMPL\_SA_{t-2} \quad (3)$$

According to the resulting model, the commercial real estate index at time t depends on its value at time t-1. The equation shows that at time t, office prices are influenced by the consumer price index and gross domestic product. The interest rate variable then depends on the commercial real estate price of office space at time *t-1* and the unemployment rate at time *t-2*.

According to the model, gross domestic product has an inversely proportional effect on commercial real estate prices for office space. With lag t-1, real estate prices are directly proportionally affected by interest rates on commercial real estate mortgage loans. The consumer price index came out statistically significant with an inversely proportional effect, suggesting that mortgage interest rates fall as inflation falls. Low interest rates increase the demand for real estate, which leads to rising house prices in the absence of supply. Unemployment rates affect commercial office property prices with a *t-2* lag and this effect is directly proportional.

Conclusion

The paper analyses the cointegration relationship between the office space prices on the Czech market and selected macroeconomic aggregates. An ADL model is constructed to describe how office space prices react to changes in the economy. The results of the analysis show that office prices are mainly influenced by changes in gross domestic product, unemployment, and the level of inflation and interest rates.

Further research in this area could focus on analysis during the COVID pandemic. A further extension of this research could also be building an error correction model or comparison the evolution of the commercial real estate index across EU countries.

Acknowledgment

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Generation Z as Employees in Public Pharmacies in Germany – Difficulties for the Health Care System in the Area of Pharmaceutical Supply due to the Absence of Skilled Workers

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Abstract

Generation Z is the workforce generation for the next 20 years and poses a problem for some industries. One of these is the pharmaceutical sector of pharmacies, which performs the important task of providing medicines and related advice. The shortage of skilled workers in pharmacies is not a new problem and was already recognised in the 1990s, but due to the generative characteristics of the members of Generation Z, it poses a new challenge.

Pharmacies need the next generation and must also adapt to demands of Generation Z, which, however, does not seem ready for this in many areas due to the structure and processes of pharmacy services. Pharmacies have undergone some changes in their areas of service delivery and some have already gone relatively far digital and are planning with part-time models. Nevertheless, there is still a shortage, which shows that pharmacy is not a preferred career field of the generation. For the personnel management of pharmacies, it is necessary to find the parameters that appeal to the representatives of the generation and adapt them to the personnel search. In this paper, the Big Five personality traits and the behavioural economics of Generation Z will be compared with the requirements of the pharmacy profession in order to determine some parameters.

Keywords

Human Resources Strategy, Public Pharmacies, Generation Z, Recruitment, Big Five, Behaivioural Economics

JEL classification: C21, R13

Introduction

Research in various disciplines is concerned with the shaping of generations and their values, value concepts and life plans. In this context, three generations have emerged for the field of HR work, which are repeatedly brought into focus and compared. Generations X, Y and Z, as they are usually classified, exhibit differences in these personality traits (Armutat, 2018, p. 37; Heldenbrand, 2021), which prove difficult for companies to grasp when recruiting personnel. This results in different requirements for life plans that affect both the private and professional spheres. Generation Z, as digital natives and certain personality traits, seem to make things particularly difficult for employers here. Some sectors are particularly affected here, which includes retail, which includes pharmacies. What makes Generation Z so difficult for the public pharmacy sector, so that jobs remain unfilled and succession planning for business closures increasingly leads to the permanent closure of pharmacies? On the one hand, this question will be pursued through

literature-based research findings and a pharmacy-typical requirements profile for the employee in the form of a comparison of a profile of the public pharmacy with the profile of Generation Z.

1. Relevance

In 2023, the number of public outlets selling medicines fell below 18,000, a 40-year low. This is a worrying development for public health, as the supply and quality of advice is increasingly dwindling. Many reasons are cited in this context. Demographic change, the lack of profitability of pharmacies in certain areas, too much regulation and savings in performance-based remuneration. However, an equally important reason can be seen in staffing levels, which partly correlates with the aforementioned causes, but also represents a fundamental problem for the existence of pharmacies in isolation from them. This is especially true for salaried pharmacists, who as skilled workers represent a bottleneck profession in Germany (Bundesagentur für Arbeit, 2022, p. 14). The current new generation of workers is not willing to enter the specialist profession of pharmacist and reasons must be sought for this. Two hypotheses were put forward for this purpose.

Hypothesis 1: Generation Z is hostile to the profession of pharmacist due to their expectations of professional life.

Hypothesis 2: Pharmacies are not compatible with Generation Z in their structures and processes.

2. Methodology

Generation Z has become a widespread focus of research and studies have been conducted to determine the personality traits that define this generation. Some studies examined the so-called Big Five (e.g. Stelling, 2023; Marhadi and Hendarman, 2020), which are based on the traits of conscientiousness, agreeableness, neuroticism, openness to experience and extraversion, as well as the respective opposing traits (Myers, 2014, p. 574). Extraversion means an energetic approach towards the social and material world. Agreeableness implies a prosocial and communal orientation towards others. Conscientiousness describes socially acceptable impulses that facilitate task and goal-directed behaviour. Neuroticism shows individuals emotional stability and general temper. Openness to Experience can be described as depth, originality, and complexity of mental and experiential life of an individual (Marhadi and Hendarman, 2020) . From these studies, a portfolio can be created that determines the typical characteristics of Generation Z that can be adapted to career expectations. The understanding of the abstract term 'Big Five' is derived from the individual factors identified in the developmental history of psychology that make up a personality in a strong framework. Big Five thus represent five dimensions of personality, which in psychological research are determined to be determinant for the formed character and the actions associated with it (Stelling, 2023). The basis for the focus on five elements that help to comprehensively determine personality emerged from Allport's research in the early 20th century. He distanced himself from Freudian psychoanalysis, which had dominated until then, by using the behaviour of individuals as a means of identifying personality traits (Marhadi and Hendarman, 2020). A personal trait follows this approach: "[...]

behavioural or dispositional pattern typical of a particular individual, expressed in the way he or she feels and acts; may be recorded by questionnaires designed to elicit self-evaluation and other-evaluation." (Myers, 2014, p. 569). In addition to the Big Five, Behavioural Economics are also included in Munkes and Schmid's study, which are derived by combining economic and psychological elements. They can also be anchored in behavioural types in generations and reveal preferences in lifestyle that can also be applied to career choice and fit to a profession. They are therefore not only applicable to marketing, but to every area of life that requires decisions. The approach deliberately separates itself from the classical theory of rational choice, which has been considered too static in research (Spindler, 2020; Bauer and Wätjen, 2021). It also involves weighing up which employer, for example, best suits one's own ideas. According to the study by Munkes and Schmid [2019], the Big Five and 'Behavioural Economics' should be used to compare the requirements of Generation Z for their own profession with those for the profession of pharmacist.

3. Generation Z

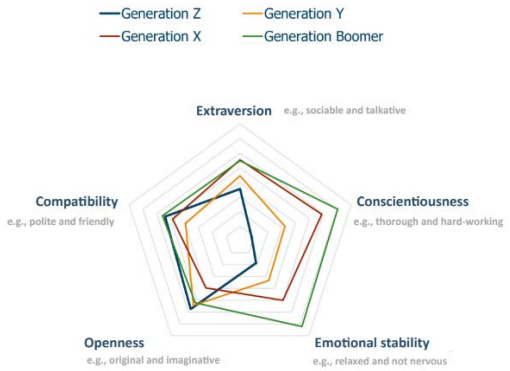
Generation Z has already entered the world of work with the first cohorts from 1995 onwards or will enter working life in the near future. As of 2022, the generation comprises about 11 million people in Germany, of whom about 1/3 have entered or are entering working life (Rapp and Réthy-Jensen, 2023). Like all other generations, this generation has been shaped by its immediate environment, which favours certain overarching patterns of behaviour. Often these emerge:

a) Often as an only child in the family with overprotective parental care (Salleh et al., 2017; Brademan and Piorr, 2018; Hass, 2021).
b) Numerous opportunities for mobility in education, work and private life through travel, study abroad and international work opportunities. Cultural and social diversity is part of everyday life (Holopainen/Suslova, 2019, p. 3).
c) Highest demands on jobs, high material demands (Brademann and Piorr, 2018).
d) The first generation to grow up in a completely digital and high-tech world→ is also referred to as the social media generation. (Waffenschmidt, 2018; Holopainen/Suslova, 2019, p. 2).
e) Influenced by an affinity for technology and digitalisation in everyday life,→ also transfers to the expectations of the professional environment (Wulf et al., 2020, p. 8).

More than previous generations, Generation Z is not focused on a long-term commitment to a single company in their professional lives. They are considered the first generation to orient most of their information gathering towards the internet and to absorb and pass on opinions via social media. However, Generation Z is said to have some deficits in their social behaviour, which also affect their professional life and career choice. However, it must be put into perspective here that the fields of work in studies often revolve around office work and rarely involve retail (including Waffenschmidt, 2018; Brademann and Priorr; Schultz, 2021). Here it has been found that face-to-face communication in teams is seen as very important. How this plays out with customers is not discussed in most studies. However, this would be very important in retail pharmacies, for example, as communication with customers is a cornerstone of services. In 2019, Munkes and Schmid from the Gesellschaft für innovative Marktforschung (Society for Innovative Market Research) conducted a survey of test persons from the four generations of baby boomers as well as generations X, Y and Z in the area of personality. The breakdown of the cohorts was as follows. **Generation Z** up to 24 years (n=685); Generation **Y** 25-39 years (n=740); Generation **X** 40-54 years (n=652); **Generation Baby Boomer** older than 55 years

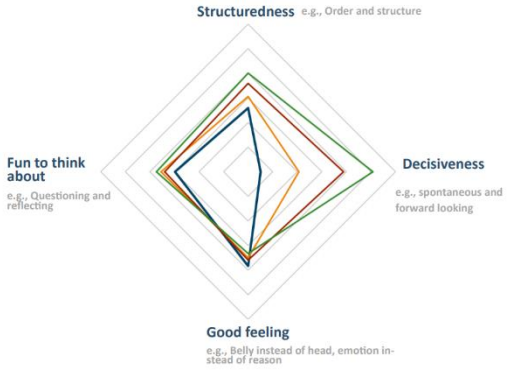
(n=740). When comparing the generations in the area of personality dimensions and values, the following results were obtained. The spider web diagrams are scaled in such a way that they show a low level of expression [1] from the inside and increasingly pronounced personality characteristics further out.

Figure 1. Generative differences of the Big Five personality dimensions



Scource: Munkes &Schmid, 2019, p. 10

Figure 2. Generative differences in behavioural economics



Scource: Munkes &Schmid, 2019, p. 14

The results listed here show that Generation Z clearly stands out from its predecessors in many parameters and can thus demonstrate a uniqueness just like the other generations. What is striking here is the already strongly pronounced spectrum of differences to the predecessor Generation Y. But what about the fit with the profession of pharmacist?

4. Results

For the comparison made here, the most important general majority characteristics of Generation Z from the Big Five and Behavioural Economics, which are also scientifically recognised as valid, are contrasted with the demands on the pharmacy profession in the pharmacy. This is contrasted with the demands on the pharmacy profession that come from both the legislator and the necessary demands on customers and other employees. Here, work is also being done to ensure that soft skills for pharmacists are increasingly included in the curriculae according to the Bologna framework at university, which should also prepare them for the profession of (self-employed) pharmacist (EPSA, 2016).

Pharmacists need specific skills to adequately communicate their expertise, empower patients and thereby optimise the daily use of medicines (Laven et al., 2018). Therefor pharmacists need to know the rules of their job well but they also depend on talking to clients to build a successful career, dealing well with clients require excellent soft skills like communication skills, relationship skills etc. Soft skills would include: communicating effectively, problem solving, time management, conflict management, leadership, and work ethics (Al Abed, 2016). Based on this, own experiences from many years of working as a manager were also implemented, which are used as a selection criterion for personnel selection.

Table 1: Comparison table – Part 1

Generation Z/Pharmacy Parameter	Attitude of Generation Z	Requirements for the profession of pharmacist
Extraversion	Low pronounced	High demands, as customer contact is usually face-to-face and makes high demands
Compatibility	Very well pronounced	High demand, as customers perceive courtesy and friendliness in retail pharmacies as a positive indicator.
Openness	Is moderately pronounced	Not often required as new methods or areas of work are rarely added.
Conscientiousness	Not very pronounced	High demands in counselling (communication (cf. extraversion)), medication safety etc.
Reward and reward expectation	Strong expression	In most pharmacies only conditionally possible via tariff
Structuredness	Rather low pronounced	Required in pharmacies due to the small team structures and the variety of tasks performed
Ability to make decisions	Poorly pronounced	Absolutely necessary for pharmacists, as responsibility is imposed on the pharmacist in everyday work→ Makes final decisions regarding medication in the interest of the customer/patient→ Must also sometimes act against the opinion of a doctor
Attitude private life/profession	Strongly pronounced in the sense of a strict separation of private life and work.	Pharmacists are obliged to work full-time, even if they are salaried, if there are not enough staff available→ Emergency services and weekend shifts are compulsory

Table 1: Comparison table – Part 2

Generation Z/Pharmacy Parameter	Attitude of Generation Z	Requirements for the profession of pharmacist
Setting Place of work	Expressed in terms of independence of time and place of work	Pharmacists are obliged to exercise their profession on site in the pharmacy→ Home office not possible
Setting Technology/Digitisation	Very affine and as a user very skilled and willing to learn→ Career decisions are also made according to the degree of digitisation of companies	Digitisation in pharmacies is not equally developed across the entire sector→ Many pharmacies have a low level of digitisation

A comparison of expectations and attitudes towards the profession shows that Generation Z lacks either the competences or the affinities for most of the requirements. The red fields mark the problem areas, blue is considered negligible and green fields determine a high benefit for the pharmacies. Competences are therefore a factor that pharmacies have to help build up and pass on to new staff as experiential knowledge. Expectations can only be met to a certain extent and require adjustments to working hours and staff deployment. The discussion will refer back to the results.

5. Discussion

Work, motivation and job satisfaction are inextricably linked and cause behaviour - regardless of generation - when they are fulfilled or not. "Employees invest their lifetime in a company; with all their ideas, with all their energy and ultimately not infrequently also with their lifeblood. But when does investment make sense?" (Meyer/Dietz, 2019, p. 66) The characteristics that make up this sense and promote motivation and satisfaction are perceived differently by the generations. In the Big Five, four out of five parameters are shown to be poorly compatible with pharmacy work. This already makes it difficult for pharmacies to build up a certain attractiveness in the personal behavioural characteristics. Likewise, the two factors of structuredness and decision-making ability are important basic requirements in pharmacies, but the majority of the generation is poor at these. For Generation Z, for example, it is evident that work is an important area of life, but that it should be strictly separated from private life. Flexibility, work-life balance and independence from the place of work have become important determinants that determine the search for work. Presence in the pharmacy with a licensed pharmacist is subject to legal obligation and thus non-negotiable. This eliminates the home office factor and other independent workplaces where services can be provided. Flexibility is a factor that pharmacies can offer to Generation Z staff if there is a sufficient number of equally qualified staff sharing the presence. As seen, this is becoming increasingly difficult and can only be ensured with appropriate part-time contracts and working models. This would theoretically require the hiring of two pharmacists in the lowest denominator for every full pharmacist position. Putting this in direct relation to salary expectations, these

are designed in the range to specialist pharmacists, who now have to be paid above the pay scale to address within this parameter (Schultz, 2021, p. 12). An important benefit that pharmacies can have from Generation Z is digitalisation. What pharmacies can use as a driver for recruitment is the will to digitalise and the use of modern technologies needed in this field of work (Holopainen/Suslova, 2019, p. 25). Generation Z has a high affinity for this in their career choice and can be addressed in many requirements through involvement in development. The differences between pharmacy and the generation seem large in comparison, but they are not insurmountable.

Conclusion

The situation of pharmacies will not change in a short time. This can definitely be stated, because the profession of pharmacist does not meet the expectations of Generation Z in only a few areas. It must be noted, however, that the characteristics that were examined are not generalisable factors that apply to all generation participants. However, they do correspond to a majority and will be more difficult to recruit for certain occupational groups in the demographic development with fewer and fewer people per generation from Y onwards. Efforts are being called for to change this state of affairs. For example, in 2021, the Federal Association of Pharmacy Students in Germany e.V. demands that the study places as well as the study locations should be expanded (BPhD, 2021). An expansion is questionable insofar as the number of admitted graduates increases slightly, but does not bring about a change in the shortage in pharmacies. So nothing can be done about the quantity alone to bring about a solution. Generation Z is going into other professions - including pharmacy. However, the field of pharmacy and the areas of work will continue to change against the background of developments in the health care system. This can offer stronger incentives for Generation Z, which include variety, flexibility, digitalisation and ownership of the areas. Pharmacies need a transformation towards more digitalisation here, even if there are still reservations so far. If pharmacies succeed in further driving the transformation towards digitalisation and in marketing the profession of pharmacist as a helping profession in terms of personnel, then it is possible to win Generation Z back for the professional field.

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Non Provision of Training and Sustainability: Small-Sized Companies in the EU Context

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Abstract

Investing in human capital is one of the critical decisions of a company. The company's competitiveness and organisational, social and environmental sustainability is influenced by corporate training. This paper explores the relationship between sustainability and the non-provision of employee training in enterprises. The introduced topic is based on a systematic literature review and a secondary data analysis of Continuing Vocational Training Survey (CVTS), which provides comparable data from 29 European countries in reference years 2005, 2010, 2015 and 2020 with a net sample of 113,000 enterprises. The paper focuses on small enterprises with 10 to 49 employees, representing over 20 million people in more than 1.3 million European business units. Recently aggregated data illustrate the European companies' attitude to corporate training and its barriers. Once the main obstacles to employee training are identified and removed, an organisation can increase the training and development of its employees. The more training and development activities is provided, the more it impacts its competitiveness and the company's sustainability. This paper examines the EUs small enterprises, emphasising specific situations in the last decade in the Czech Republic. It brings a new attitude to the connection between corporate training in small companies in the EU and sustainability.

Key Words

Small-sized enterprises, training barriers, vocational training, sustainability

JEL Classification: M12; M53; 015

Introduction

Sustainability has been becoming up-to-date and an increasingly important research topic due to various global phenomena such as climate change, poverty, and social inequalities. In this paper, sustainability is understood broadly as a systematic approach and strategy of a company that affects both economic growth and has an environmental and social impact (Bergman et al., 2017).The United Nations has set out 17 Sustainable Development Goals (SDGs) to reach by 2030 (United Nations, 2023). These goals recommend and encourage life-long learning, developing opportunities for all, and economic growth linked to business behaviour. The concept of sustainable development (SD) generally refers to achieving a balance among the environmental, economic, and social pillars of sustainability, where training is one of the important aspects of the social pillar (Murphy, 2017).

Many authors prove that corporate learning positively impacts sustainability (Ambasz et al., 2023; Alvarez-Gutierrez et al., 2022; Brandi et al., 2022; Yusoff et al., 2019; Bergman et al., 2017). Furthermore, organisational learning and employee training is crucial for sustainability (Ambasz et al., 2023; Hermelingmeier and von Wirth, 2021). One of th

theoretical approaches used in the literature is the model of resource-based view (RBV) theory. This theory incorporates both capabilities and resources that are essential in attaining sustained competitive advantage and superior performance (Bilan et al., 2020; Battisti & Deakins, 2017). RBV theory suggests that organizational learning can significantly explain the relationship between leadership styles that is organizational resource and firms sustainability (Barney, 1991). Corporate training affects the performance of a company (Alipour et al., 2009; Bafaneli and Setibi, 2015). These investments are directly linked to the individual, so it is difficult to determine their return (Assi and Raju, 2020; Becker, 1993). However, authors have documented the positive impact of these investments on firm performance, both financially and non-financially (Lee, 2016).

The nature of firms also varies according to their size, e.g., the number of employees. Specific characteristics of small and medium-sized enterprises (SMEs) are their size, turnover, flexibility and looser and flatter organisational structure. SMEs play an essential role in world economies and also in Europe. In 2022, more than 23 million SMEs were registered in the European Union (EUROSTAT, 2023b). This group can be divided into three categories according to the number of employees. The largest group of SMEs comprises micro-enterprises with fewer than ten employees. These are enterprises where know-how is often owner-managed. Establishing and positioning the enterprise in the market environment is essential at this stage. Once the number of employees of the enterprise increases, it is already a small enterprise. A small enterprise employs between 10 and 49 people. Europe's second-largest group of enterprises is growing slowly (EUROSTAT, 2023b). In 2020, 1,282,211 small enterprises were registered in the European Union, employing more than 25 million employees (EUROSTAT, 2023a).

For small businesses, there is already a need for more organisation of work, division of duties and delegation of responsibilities. However, this also requires other competencies such as management, communication, problem-solving, etc. This also brings to the fore the importance of employee training and development. Maršíková et al. (2019) reported that using data from five European countries, around half of the SMEs that participated in their 2018 survey confirmed that they provide some training to employees, mainly through seminars, workshops and consultancy. However, this is often more of a haphazard practice. They consider the training of their employees to be essential (Maršíková et al. 2019). However, some companies are not yet investing in their human capital at this stage. With high competition and constant change, they are forced to watch their costs, invest in different parts of their business, and often forget to invest in the training and development of their employees. Often, formal training resources are limited in small enterprises, as well as the systematic approach can be missing (Tuul and Bing, 2019). In the long run, this can result in a weakened market position, performance loss, ability to respond to change and lower sustainability. Lack of time, high cost of training, low employee motivation, underestimation of training outcomes, part-time workers and high turnover rate are among the major problems affecting SMEs' training involvement (Yahya et al., 2012). For this reason, it is necessary to focus on small companies and why they are not providing employee training.

1. Methods of Research

There are several international surveys on adult learning and development. The Continuous Vocational Training Survey (CTVS) belongs to the largest survey in the EU

with a focus on corporate training. Eurostat has coordinated CVTS in all countries of the European Union and other contracting countries in Europe regularly every five years since 1992. The CVTS regularly surveys companies with ten or more employees on how they plan employee training and development activities. The questionnaires are mandatorily collected from companies based on a European Union regulation. In 2020, 113,000 enterprises participated in the survey. Almost all NACE sectors are covered. The data are audited and statistically evaluated, and since the reference year 2005, they can also be statistically compared on most indicators. The results from the reference year 2020 for all countries were recently published in November 2022. Therefore, the CVTS survey was chosen to analyse the data and complement the literature search in the introduction to answer the research questions.

This paper focuses on the perspective of the European Union as a whole and the Czech Republic as an example of a specific country. The Czech Republic is one of the countries with the highest proportion of companies that provide corporate training to their employees. In particular, by using the method of organised training, it ranks first among the countries studied in 2020. The reference year 2020 was specific to the worldwide COVID pandemic, so the data from 2015 are compared too. Each company can mark more than one reason for non-providing employee training. The subsequent literature review and secondary data analysis based on descriptive statistical methods showed that taking a closer look at small companies is necessary. The following two questions were essential for this article:

1. Is there a relationship between corporate sustainability and not providing employee training and development activities?
2. What barriers are to training and development in small EU enterprises?

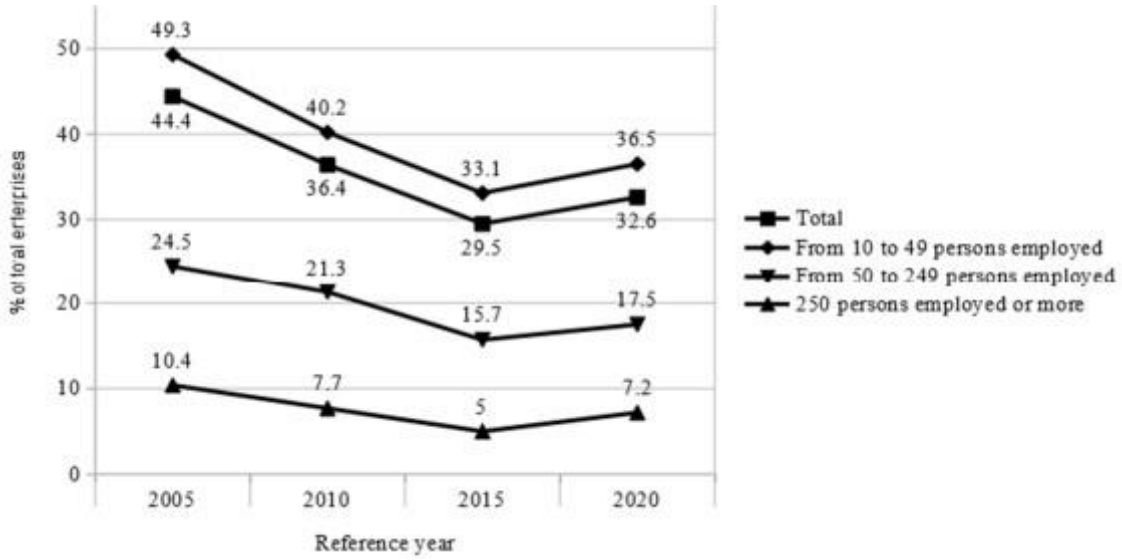
2. Results of the Research

The literature research revealed that corporate training positively influences sustainability (Alvarez-Gutierrez et al., 2022; Bergman et al., 2017). So reversely, non-provision of training can impact sustainability in the EU companies. Understanding these aspects can improve corporate sustainability (Bergman et al., 2017). The continuously collected data in the CVTS European survey allows us to identify corporate training trends in the EU in the last decade and reasons why corporate training is not provided.

Figure 1 shows the number of companies that do not provide any development activity for their employees. The division by the number of employees demonstrates that small enterprises significantly influence this non-provision trend. The overall share of companies in the European Union that did not provide planned corporate training was 32.6% in 2020, while the share of small enterprises with between 10 and 49 employees was 36.5%. In the case of medium-sized firms in 2020, it was 17.5% and only 7.2% of large firms. However, the situation in 2020 was affected by the global Coronavirus pandemic (OECD, 2021). In the previous CVTS survey in 2015, the case was more encouraging. By then, the number of companies not providing training had steadily declined. In 2015, only 29.5% of European firms provided no development activity - 33.1% of small companies, 15.7% of medium-sized companies and only 5% of large companies. Figure 1 clearly shows that developments mainly influence the trend in small enterprises with 10 to 49 employees. In the Czech Republic, non-training is significantly

better. In 2020 only 14.1% of all Czech companies did not provide training (16.3% of small enterprises, 7.1% of medium-sized firms, and 1.3% of large companies).

Fig. 1: Percentage of enterprises in EU Member States that do NOT provide any development activities for their employees, by enterprise size, in 2005-2020

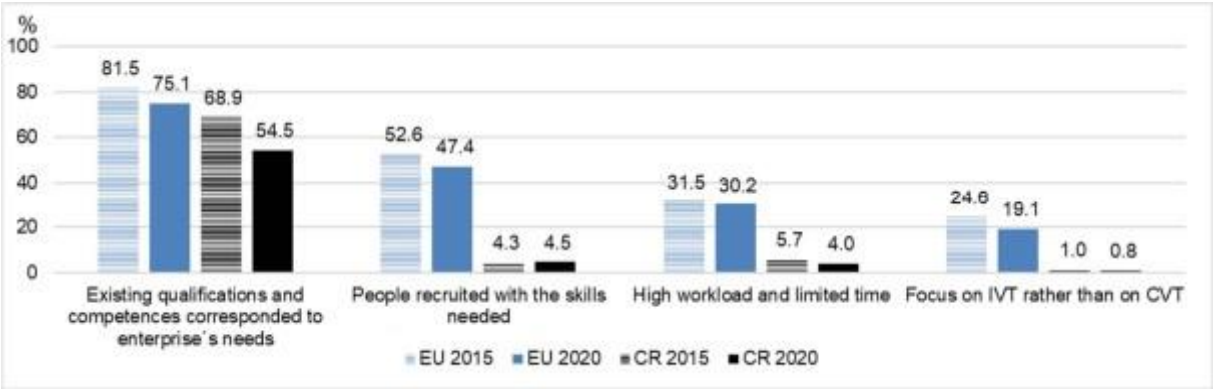


Source: authors' own, data from CVTS (2005, 2010, 2015, 2020)

The reasons why small companies do not provide any planned training and development of employees illustrate in Figure 2, which represents the obstacles resulting from the internal situation in a company. The most obvious reason is the assumption that the company's existing competencies, skills and qualifications are relevant to the organisation's current needs. In 2020, 75.1% of small businesses in the EU cited this reason, compared to 81.5% in 2015. Above half of the Czech small businesses (54.5%) quote this reason. The second most frequently cited barrier for not training employees is that new knowledge is gained by hiring new employees. In the European Union, 47.4% of small businesses gave this reason in 2020, 5.2% less than in 2015. However, Czech small enterprises do not see this as a barrier to employee corporate training. Only 4.5% of small Czech companies were aware of this reason in 2020, similarly in 2015 (4.3%).

Regarding the barrier referred to workload and lack of time, there is quite a discrepancy between European and Czech small enterprises. In Czech small companies, 4% perceived this barrier in 2020, compared to 30.2% of European companies. Looking at initial vocational training (IVT) in companies is also interesting. IVT illustrates a formal education programme provided in an educational institution and partly in a company (CTVS, 2023). 19.1% of small EU businesses preferred this strategy to corporate training in 2020. In contrast, only 0.8% of small businesses in the Czech Republic cite this reason.

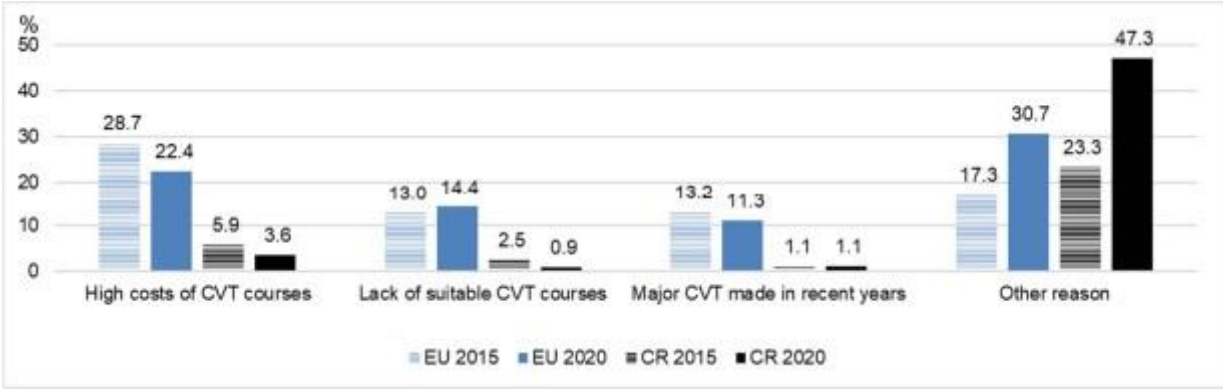
Fig. 2: Internal reasons - the percentage of small enterprises in EU Member States and the Czech Republic that DO NOT provide any development activity for their employees in 2015 and 2020



Source: author's own; based on CVTS (2015, 2020)

Figure 3 shows why small firms do not provide their employees with any training or development activities due to external or other factors. According to the literature search, high costs are a significant barrier in small enterprises (Maršíková et al., 2019). This reason was important for 22.4% of European small enterprises in 2020 (compared to 28.7% in 2015). The situation is visibly different in the case of small Czech companies. Only 3.6% of small Czech companies gave the reason for high costs in 2020 (5.9% in 2015). The reason for the absence of a suitable course was mentioned by 14.4% of small EU businesses (an increase of 1.1%), in contrast to 0.9% of Czech small enterprises (a decline of 1.4%).

Fig. 3: External reasons - the percentage of small enterprises in EU Member States and the Czech Republic that DO NOT provide any development activity for their employees in 2015 and 2020



Source: author's own; based on CVTS (2015, 2020)

A similar situation is illustrated because training has already been provided in previous years. In 2020, 11.3% of European firms mentioned it, compared to 1.1% of small Czech firms. Companies could also give another reason, which declares almost 30.7% of European and 47.3% of Czech firms.

3. Discussion

The literature research revealed that employee training contributes to the

company's long-term corporate sustainability and competitiveness. These findings were analysed with European companies' practical experience from the corporate training perspective. As shown by the development in the last decades, the number of European companies that do not provide any development activities for their employees has decreased from 2005 to 2015 by 14.9%. The post-2019 period has been specifically influenced by the global Covid-19 pandemic (OECD, 2021). Thus, the proportion of non-training organisations increased slightly by 3.1% in 2020. The specific situation of small businesses significantly influences this trend. As the literature review revealed, there are limited resources and often also a need for a systematic approach to corporate learning in small enterprises. However, this can affect competitiveness and sustainability in the long term.

The second research question about barriers to corporate training addresses how to prevent this. Understanding these aspects can improve corporate sustainability (Bergman et al., 2017). According to the analysis of data from the CVTS pan-European survey over the last decade, the main obstacle identified among European companies is that they perceive the level of competencies of their employees as sufficient and need no employee training. In 2020, 75.1% of European small businesses and 54.5% of Czech small businesses identified this barrier. In the survey, companies could identify multiple causes. Almost half of European small businesses (47.4%) prefer hiring new employees to training their current employees, reflecting small businesses' growth potential.

Contrary to the literature, the cost barrier is perceived by fewer European small firms, 22.4% in 2020, compared to 28.7% in 2015. Czech small firms, however, perceive the cost barrier only marginally (3.6% in 2020). Almost a third of European firms do not provide training due to the high workload and lack of time, but this is not the case for Czech firms. 47.3% of Czech and 30.7% of European companies mentioned other reasons for non-providing corporate training that create a further research gap.

Limitation

However, it is also necessary to consider the limitations of this study, which analyse only secondary data from one European survey. It gives the space for further development of the explored topic. Additional literature review, qualitative research, pilot testing and quantitative data analysis is planned to be done as the next step in the current authors´ research.

Conclusion

Various authors prove a positive impact of employee training on corporate sustainability. Non-providing training can also influence the sustainability and competitiveness of EU companies. Based on the Continuous Vocational Training Survey CVTS with 113,000 enterprises net sample, this paper examines the practical situation of providing and non-providing employee training in the EU. It reveals that many European enterprises, especially small businesses, do not provide any development activity to their activities. This situation may have implications for sustainability. However, it is important to note, that the topic needs to be examined not only in the context of quantity, but it is crucial to link it to a specific sustainability objective in a company's strategy, to identify specific training topics

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and focus also on the quality of the individual training. Hence the article also looks at the reasons for the non-provision of employee training in small EU enterprises. Despite the limitation of the analysis of a CVTS survey, this paper provides another opportunity for further exploration of training in the context of sustainability. More research can follow on barriers and opportunities to increase employee training concerning competitiveness and sustainability.

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The Destiny of Globalisation and the Fate of Climate Protection

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Abstract

The study addresses the question of the future of the circular economy after the economic shocks brought about by the COVID-19 disease pandemic and the energy crisis linked to the war in Ukraine and other phenomena. It is based on the hypothesis that global climate agreements are closely linked to deepening globalisation. The latter is identified here as the most significant economic trend of the late twentieth and first two decades of the twenty-first century. The working hypothesis is that if pandemics and energy crises mark the end of further globalisation or even begin a process of deglobalisation, this could very well threaten the future of climate agreements and the withdrawal of many countries from their commitments. At the same time, the climate agreements are one of the cornerstones of the promotion of the circular economy in developed countries, since it is the commitments made under these agreements (currently, the Paris Agreements in particular) that underpin legislative action to promote the circular economy. At the same time, globalisation is defined as a primarily economic process, the essence of which is to maximise the exploitation of comparative and absolute advantages, in other words, to maximise the efficiency of cooperative links. This means that if the hypothesis formulated is fulfilled, the deglobalisation process must necessarily imply a reduction in the overall efficiency achieved globally. At the same time, the study formulates the hypothesis that the reduction in global pressure to implement the circular economy will be largely substituted by national and regional pressures. However, these will not be motivated by efforts to prevent climate change, but by the need to reduce dependence on global logistics and on the supply of raw materials and components or intermediate goods from countries with unstable access to their own geopolitical objectives for strategic reasons.

Key Words

climate change, COVID-19, energy crisis, globalisation, pandemics

JEL Classification: F62, F64, Q54

Introduction

The basic question of this thesis is: How will the economic and, as a consequence, social, societal and geopolitical crises of recent years affect the processes of introducing and strengthening the circular economy in developed countries?

The study does not set out to answer the question in its entirety, firstly because of the scale of the study, and secondly because the time since the crises in question has been too short and the available statistical data do not provide sufficient support for firm conclusions. The aim of the study is therefore to open up the debate in general terms and to raise some questions for further research.

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1. Premises and Hypothesis

The work is based on the following premises.

Firstly, the promotion of the circular economy rests on two pillars. The first is market-based and exists historically. Circularity is promoted when it is the most efficient and economically advantageous solution for business entities. The second can be called regulatory and, although it also has historical roots, it is now primarily the result of social order (social paradigm) and the outcome of political decision-making processes. The first case is merely registered as a fact in the study, the second is the basic matter of investigation.

Second: Since the second half of the 1990s, the main driving force behind the promotion of the circular economy has been global activity aimed at reducing the impact of human activity on climate change. That is, the fight against so-called global warming. This has gradually resulted in a series of international agreements aimed primarily at reducing emissions of risky greenhouse gases.

Thirdly, these agreements were based primarily on the will of the political representations of the developed countries, and their general acceptance by other countries was linked to globalisation. Globalisation (in its modern form in the second half of the twentieth century and the first decades of the twenty-first century) is primarily an economic process that has brought economic benefits to all the countries involved. However, it must be stressed that in many respects the distribution of benefits has been uneven.

Fourth: Although globalization is an objective process whose essence is to maximize the exploitation of comparative and absolute advantages, its course is dependent on political decisions. This essentially means that economically powerful countries can, through their political decisions, influence which other countries will be allowed to participate in globalisation and thus benefit from it and which will not. Thus, participation in globalisation agreements has been a consequence of the (legitimate) fear on the part of many countries that failure to respect climate agreements would be sanctioned by limiting such a country's access to globalisation benefits.

Fifth: Globalization processes were significantly disrupted at the beginning of the third decade of the twenty-first century by the advent of two crises. The first was the pandemic crisis triggered by the spread of the COVID-19 disease (2020-2021), and the second was the energy crisis associated with a significant inflationary wave and linked in geopolitical and ultimately economic terms to the war in Ukraine (2021-2023).

Sixth: Both crises have brought globalisation into question. The pandemic crisis showed the vulnerability of global logistics and relativised the advantage of admittedly very efficient but geographically extensive production chains. The energy crisis, in turn, proved that globalisation is based on trust that states do not use their comparative or absolute advantages to advance geopolitical objectives (and if they do, they do so within certain limits within bilateral or supranational agreements, but do not use disproportionate means to advance their objectives). When the Russian Federation participated in the machinations of the price of natural gas and tried to use the dependence of the developed countries on this raw material as a weapon to advance geopolitical objectives, a new element was introduced into the globalisation formula. Until now, the globalisation

formula has been based on maximising the use of comparative and absolute advantages in relation to logistics and other transaction costs. The development of the years 2021 to 2023 has shown that the strategic risk aspect must also be calculated into it.

Seventh: The two crises have therefore raised new questions about strategic security and opened up the issue of its valuation and the mechanism for including it in calculations of the effectiveness of cooperative links.

Eighth: Globalisation has thus come under a double threat. The first is real, as the pandemic crisis has shown the possibility of a real logistics stoppage, especially over long distances. The second is potential, as the energy crisis has demonstrated the potential for economic blackmail of developed countries by suppliers of raw materials or semi-finished goods or components. It has therefore reopened the debate on the extent to which the maximum free movement of goods, services, people and capital (which is the true basis of globalisation) is possible in an environment where there is a state or states with inherent geopolitical objectives in the economic environment.

From these premises, the following conclusion was drawn:

One of the responses to the war in Ukraine and the energy crisis in the developed countries will be to increase pressure on them to reduce their dependence on supplies of raw materials, components and semi-finished products from other countries, especially those where their geopolitical interests can be assumed to outweigh their economic interests.

On the basis of the chain of considerations described above, it is possible to build a hypothesis: There is likely to be a weakening of the globally agreed pressures for the introduction of a circular economy (in fact, climate protection by reducing greenhouse gas emissions is only ever possible by increasing the share of renewable energy sources, which almost invariably means a strengthening of circularity). However, this does not necessarily mean an overall weakening of the circular economy, since the counter to this trend will be an increase in pressure on circularity at national and regional level. However, this pressure will be directed not only towards strengthening the circular energy economy, but also towards increased recycling, greater material savings and also towards extending the functionality or durability of products.

It can therefore be tentatively concluded that there is a potential for a reduction in international pressure to avoid greenhouse gas emissions, i.e. to combat global warming, on the one hand, but at the same time there is a presumption that this 'fall-out' from pressure on circularity will be replaced by other pressures, motivated by the reduced strategic dependence of developed countries on demonstrably or even potentially unreliable supplier countries.

2. Analysis of the First Three Premises

As mentioned earlier, for some of these assumptions, it is not possible to examine the truth at the moment, because relevant statistical data are not yet available. For others, examination of the truth is not possible as a matter of principle because they are statements of opinion that cannot be proven by standard scientific procedures. Nevertheless, it will be useful in the next part of the reflection on the future of

globalisation to dwell on some of these assumptions and to discuss (if only very briefly, given the length of the study) their explanations and argumentative support.

The first, second and third premises speak of linking the promotion of the circular economy to globalisation. In this passage, we will talk about combating climate change rather than circularity, as this is the primary concern of most of the global agreements reached. However, as is clear from the principle of the matter, reducing greenhouse gas emissions is quite necessarily linked to the introduction of circular practices. This can be very aptly demonstrated by the replacement of fossil fuels by renewable sources. The same is true of energy savings, the promotion of electromobility and other mechanisms that are used to meet the commitments made. However, we will leave aside discussions on whether all these mechanisms are in fact effective and rational, since the assessment of these detailed areas is not the subject of this paper and, moreover, it is not an economic issue.

It is necessary to begin the analysis by noting that the history of global institutions is not a long one for a number of reasons that do not need to be analysed in any great depth. They span roughly a hundred years. In response to the failure of the Great War, the first truly global organisation was the League of Nations in 1920. But its influence on the development of the planet was very partial. Indeed, it was brought to an end by the Second World War, and the organisation's main aim was to prevent just such a clash.

Even the successor organisation, the League of Nations (UN), founded in 1945, has not played a significant role in preventing war. However, it does bring together 193 states, and within it there are a number of diverse organisations and institutions carrying out global activities. Among the economically oriented ones, the World Bank (WB), the International Monetary Fund (IMF) and the International Finance Corporation (IFC) are just a few. Similarly, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO) and the International Atomic Energy Agency (IAEA), among others, are active in non-economic areas. The influence of these institutions in their respective fields of activity is considerable and, it can be said, often quite crucial in their respective sectors. In a very simplistic way, it could be said that while the influence of the UN in what we would call geopolitical and strategic areas is not very significant even after the end of the Cold War, in the economic, social and cultural spheres, it is indeed possible to speak of a largely significant and global influence. There is a certain asymmetry that is essential to the mechanisms for adopting climate transnational agreements.

Indeed, UN soil became the basic playground of environmental and ecological discussions when the United Nations Environment Programme (UNEP) was established in 1972 as an institution aimed at setting common rules for environmental protection. It, along with another UN organisation, the World Meteorological Organization (WMO), established the scientific advisory body, the Intergovernmental Panel on Climate Change (IPCC), in 1988. As a scientific think tank, it is the IPCC that has been a critical technical driver in the conception and enforcement of global climate agreements. The key outputs of the Panel are the extensive publications of the Assessment Reports. (IPCC 2023) These are summaries and analyses of scientific papers on specified topics that have been published in relevant sources since the previous Report. It is worth noting that the IPCC currently has more members (195) than the UN itself (193).

The United Nations Framework Convention on Climate Change (UNFCCC) was agreed in May 1992 and subsequently signed at the Earth Summit in Rio de Janeiro in June of that year. However, it ultimately contained no emission limits or other binding targets. Although a number of developed countries planned to push for more specific wording, only a general framework agreement proved to be viable. It was eventually ratified by 196 countries, plus the European Union as a whole (MZP 1992).

(Only really as an aside, any IPCC or UNFCCC meetings would not be the "most global" event: Qualification for the last football World Cup involved 206 national teams, although Great Britain, for example, quadrupled in the form of England, Scotland, Northern Ireland and Wales.)

The above-mentioned declaratory documents, which did not imply any specific tasks for the participants, were accepted relatively easily. A considerably more difficult situation arose in the following years, when the advanced states (mainly European) attempted to enforce truly regulatory conventions. Thus the Kyoto Protocol, which was signed by 83 states in December 1997, did not really come into force until early 2005. The delay was caused by the considerable difficulties in determining the technical specifications of the Protocol (the mere method of converting the various greenhouse gases into a unit of carbon dioxide equivalent was a major issue). A number of states therefore delayed ratification. In addition, other countries ratified the document but later withdrew from it (Canada) or signed but never ratified it (USA). In total, 192 states participated in the negotiations on the Protocol. Its validity was later extended because the document could not be replaced by a new one, mainly due to the collapse of the negotiations in Copenhagen (2009).

However, constant pressure from developed countries has led to a gradual expansion of the number of states willing to discuss specific restrictions. In fact, there were already some interesting coincidences during the ratification processes of the Kyoto Protocol, such as the key ratification of the Protocol by the Russian Federation in 2004 and the virtually simultaneous change in the European Union's position on the admission of the Russian Federation to the World Trade Organization (WTO). The EU's receptivity enabled Russia to be admitted as a full member of the WHO (2012) after a subsequent eight-year process of gradual harmonisation. Indeed, China's accession to the same organisation (2001) was also accompanied by a change in the country's attitude towards nature protection and international regulation of greenhouse gas emissions.

The Kyoto Protocol, which was enforced with great difficulty, was replaced by the Paris Agreement. It was adopted on 12 December 2015, signed on 22 April 2016 by a total of 177 UNFCCC member states. It entered into force by meeting the conditions (number of ratifications linked to pollution share) as early as 4 November 2016. By February 2021, the document had 195 signatures (194 states plus the European Union as an institution), at which time 190 countries representing together about 90 per cent of the emissions concerned had ratified it.

The shift in globality from the Kyoto Protocol to the Paris Agreements is thus evident. However, there is one more important element than the number of signatories to the document: whereas the Kyoto Protocol gave specific tasks to only a minority of participating states, exclusively developed countries, the Paris Agreement is much more comprehensive in this respect and defines conditions for developing countries as well. However, and this should be seen as very significant, it also means a total of USD 100

billion a year for developing countries, provided by developed countries to support infrastructure investment in non-fossil energy and other areas. Without this fund, the agreement would undoubtedly not have been possible.

Another aspect of the situation is certainly worth considering. At the same time, the General Agreement on Tariffs and Trade (GATT) was gradually being transformed into the World Trade Organisation (WTO). Whereas the GATT was a set of agreements where it was possible to achieve a number of exceptions or to disregard certain provisions, the WTO is an organisation in the true sense of the word. Above all, the Marrakech negotiations in 1994, where the establishment of the WTO was agreed, also saw the anchoring and use of the so-called single undertaking. This subsequently enabled the United States and the developed countries to push forward progress in the areas of services, intellectual property protection and, later, environmental protection. In the meantime, the then 125 countries represented has increased to 164 plus more than twenty countries at various stages of association. Very simplistically, but nevertheless essentially correct, the rule for all members is to accept all commitments (and thus reap the full benefits of membership) or to accept none.

The benefit to developing countries (excluding the BRICS) from their full participation in international trade is estimated at over half a trillion dollars a year for the third decade of the century. (WTO 2023) This is an extremely important item in their GDP generation.

It could thus be summarised that the gradual globalisation of agreements has been accompanied, firstly, by the expansion of the WTO as a key globalising institution, and, in a partial way, by a redistribution of funds from developed to developing countries to support their willingness and, indeed, their ability to engage in emission reductions. However, as we shall see below, the future fate of globalisation is problematic for various reasons. If the importance of international trade to the wealth of other countries (outside the developed world) declines, will this not also mean a decline in the willingness of these countries to pursue climate protection agreements?

3. The Nature of Globalisation (Premises 4 to 7)

The fourth premise concerns the very nature of globalisation, the fifth and sixth the pandemic and energy crises and their relationship to globalisation. The seventh premise then states that the result is the rediscovery of risks that seemed buried with the Cold War.

First, it is necessary to stress the substantive ambiguity of the concept of globalization. It is a highly structured phenomenon with an almost infinite number of manifestations and an absolute surface area of application. It is clearly not possible, precisely because of its very general use, to define it in a standard and reasonably concise way. This often leads to misunderstandings and has a number of other consequences.

Perhaps the most common manifestation of the generality of globalisation is the dichotomy in the assessment of its consequences. This is often manifested by acknowledging the positive economic impacts of the process and noting the negative social or cultural impacts. This is not to say that the opposite assessment is not also common. This is a great confusion, for what is really being said by giving globalisation the credit for growth and the blame for (incidentally) increasing inequality? In essence,

nothing more complex than that the development of the world in the last decades has brought about an economic upsurge and, at the same time, a widening of social differences and social contradictions. In this view, then, the constant use of the term globalisation is really just a cover-up of the fact that almost elementary processes are being described which are not in themselves surprising. This is not to say that globalisation does not have a content of its own - but a discussion of this issue would be extensive and clearly beyond the scope of this paper. For more on the topic, see, for example, Kislinger et al (2023, pp. 87-97).

For the purpose of this paper, however, at least a few comments on the issue are necessary.

The contradictory approach described above would already be found, for example, in McLuhan (1964), who of course does not yet use the term globalisation as such (he does, however, introduce the term global village). His shrinking of the world implies economic bonuses but significant cultural and social minuses. His approach can be described most as cultural anthropology. However, it was Levitt (1983) who came up with the term globalization itself when he tried to describe the economic development of the 1970s. The concept of globalization was thus formulated as an economic concept, although it was subsequently usurped by many other disciplines before economics could define it more precisely. But even these have not been concerned with any more specific definition of the term, which together has led to the fact that now, although science as a whole uses the term globalisation frequently and intensively, it is in fact with a not very clear idea of what the word actually means. Different disciplines have their own practices and practices in relation to globalisation. Hence, the mutual misunderstanding and contradiction between the vision of globalization as a social process, on which more, for example, Ferguson (1992), Robertson (1995), Panayotou (2000), Teeple (2000), Robertson and White (2007), Steger (2010), Scott (2013), or Ritzer and Dean (2019), and questions of globalization as an economic mechanism, for which we can mention, for example, the works of Shangquan (2000), Cainelli et al. (2012), Coulibaly et al. (2018), Fang et al. (2022).

There have, of course, been attempts to bridge these conceptual and factual contradictions and also to explain the anti-globalization backlash, which is in fact difficult for the economic community to understand, since the macroeconomic view necessarily sees primarily the overall and fully demonstrable benefits of globalization. However, the result has often been somewhat trivial and quite general formulations according to which globalisation can be understood as a deepening, widening and acceleration of global relations in all aspects of social life. (Held et al., 2000) The financial crisis of 2007-2009, which unquestionably marked the first really serious shake-up of globalization (however much we might also refer to 9/11), gave a significant impetus to the debate. The efforts of Stiglitz (2017), who analyzed the approach to globalization from the position of its fundamentally positive perception, should certainly be mentioned in this regard, while Piketty (2014) may serve as an example from the rather opposite camp.

Thus, we can summarize the research so far by saying that the term globalization is usually used to denote a completely general process, which in fact has no defined content. (It is no coincidence that Bělohradský (2002) classified this word among "instant disposable contexts".) Realistically, then, globalization is necessarily parceled out into individual fields, and the substance, structure, and mechanisms of these disciplinary globalizations are not only not the same, but not even related, or even similar in most

cases. Of course, it is not possible to prevent, for example, the term globalisation being used in the field of cultural studies, but it should at least be distinguished in which context the term occurs at one time or another. For cultural globalisation is unquestionably something very different from economic globalisation. So, if (for example) at some point in a discussion in the field of psychology we talk about the impact of globalisation on the individual, what do we mean by that? The effects of greater competition in the labour market or the effects of cultural globalisation manifested by (among other things) the abandonment in a given region of traditional relationships and values? Both of these phenomena are clearly autonomous.

Inaccuracies happen at the level of common parlance, at the level of the media and at the level of science. Conceptualisation of the concept is not possible, desambiguation seems to be impossible. It is obvious that the most significant element that unites the various phenomena mentioned is the fact that they take place on a global scale.

This makes it all the more important to ask what the true nature of globalisation actually is.

The basic answer is that it is economic and that all other uses of the term are derivative and, in fact, often confusing.

So let us try to give some brief and concise definition of globalisation, emphasising that it is economic globalisation and that it is the cornerstone of all other global efforts.

As a first source of definition, Wallerstein's (2000, 2013) approach is useful, which actually articulates in psychological terms the notion of capitalism as a system that seeks to maximize profit at all times and in all circumstances. This then leads to the thesis that capitalism will necessarily penetrate all parts of the world, i.e. that it will become global. The neo-Marxist Wallerstein links this to the process of the beginning of the end of capitalism as a system, but this is no longer relevant for the subsequent definition.

To this can be added a second source of definition, which is the ideas of Smith (1776) and Ricardo (1817) and their theories of comparative and absolute advantage. For what mechanisms does capital use to maximize profit? The basic answer is cost minimization, since this is the most general (thus excluding monopolization) way to maximize profit in a market environment. The use of comparative and absolute advantage is, if we choose a sufficiently broad optic, an efficient way to reduce costs. After all, this explains the mutual benefit of foreign trade.

In essence, by simply combining these two now aged thought models, we get a short and snappy definition of globalisation. It says that globalisation is the maximisation of efforts to exploit the potential of comparative and absolute advantages. It would undoubtedly be necessary to elaborate this thesis more thoroughly and to analyse a number of contexts and circumstances, but there is no room for that here. Nevertheless, it is appropriate for the purpose of this thesis to develop it at least partially.

It is inevitable that the potential for comparative and absolute advantages is a variable quantity and that it changes continuously depending on a number of circumstances (e.g. availability of labour, wage levels, but also the level of environmental legislation and the costliness of imposed regulations). The three circumstances need to be formulated separately.

The first is technological change. Technological change does not so much affect the quantity of exploitable potential in principle as it has a fundamental effect on the distribution of comparative and absolute advantage, by shifting it to where it occurs in such concentration and importance that it overwhelms the other elements constituting these advantages (including the organisation of work).

The second element is logistics, logistics availability and logistics costs. Let us imagine a market in which there is some theoretical potential for exploiting comparative and absolute advantages. What makes the potential a truly efficient option are logistics costs and logistics availability. The lower the logistics costs, the higher the volume of comparative and absolute advantages that can actually be exploited. As mentioned, the availability of logistics is also important, where the relationship is then in the form of a direct proportion (the more available, the higher).

If it is true that logistics is getting better and cheaper, and if it is true that technical progress is in principle constant, it should also be true that new comparative and absolute advantages will always be created. This will also mean that business operators (provided that there is political space for this without barriers and artificial cost increases) will continuously seek opportunities to exploit advantages and thus increase their profits. This is precisely the natural pressure to strengthen globalisation.

Hence the third element that needs to be introduced into the globalisation equation. This is restrictive measures. Whether at interstate level or even nationally, there are a number of different measures that are real restrictions on trade and therefore, in effect, always slow down or even stop globalisation. Again, there is an inverse proportionality. The less regulation, the greater the globalisation trend. Simply put, if there are zero regulations, no additional costs will be incurred and the exploitation of potential will be maximised.

At the same time, positive developments in all three areas do not necessarily result in deeper globalisation in the true sense of the word. If, for example (this is a theoretical model), technological progress leads to a leap in automation and robotisation in a particular part of the economic world, this will mean a redistribution of comparative and absolute advantage, but it may not (although it may) lead to greater globalisation. For at some point the shift of advantage will hit the limits imposed by logistics and regulation, and the impact of agency on globalisation in the true sense of the word will be determined precisely when the technological effect is eliminated by other effects.

The 2020-2021 pandemic crisis has attacked logistics. If the availability of logistics is zero, then there will be a zero state of globalisation. Such an extreme is of course impossible, but the pandemic years have shown the vulnerability of globalised production chains.

The energy crisis and the war in Ukraine have shown that it is easy to imagine a situation in which there will be a sharp increase in restrictions and the costs of restrictions. However, sanctions mechanisms and trade bans are only one outcome of the 2021-2023 crisis. The more significant one is the return of strategic risk issues to the whole thinking about trade cooperation, global trade, the free movement of goods, services, capital and people, and other elements of globalisation.

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4. Premise Eight: Threats of Globalization

From the previous seven premises, at least in outline, an eighth is drawn, which formulates the idea of the threat of globalisation. This too has a certain deeper background of thought.

Let us say, at least formally, that globalisation is not really tied to capitalism or socialism, nor is it really causally related to any conceivable political order. One need only recall that the so-called socialist camp has been rather desperate to deepen the international division of labour and exploit comparative advantages within its framework. However, in addition to the desperately inefficient logistics, this necessarily alluded to the impossibility of grafting the theory of comparative advantage onto the tree of directive economic management. However, perhaps in response to Fukuyama (1991), who linked globalisation to liberal democracy, it was given a clear ideological label. It follows then that although discussions of globalization should be primarily economic, sociological or psychological, and probably philosophical, they are turning into ideological and political discussions. However, as is well known, the ideological and political debate is not about truth, i.e. bringing scientific arguments and facts, but it is about persuasiveness.

The ideologisation of globalisation is one of the dangers it faces as a process - the reason being that in ideological terms, globalisation is seen as a willed and controlled process. In the ideological logic of such a position, then, if a process is directed, there may necessarily be a possibility of prohibiting it. Thus, there are increasingly strong demands for globalisation to be regulated, harnessed, directed, planned or outright restricted and made impossible by restrictions. It is no coincidence that in many cases such demands refer, for example, to Huntington (1996). The idea of opposing civilizations (cultural circuits) raises the need to protect the economic interests of one's own circle.

Unquestionably, the pandemic and developments of 2021 and beyond have played into this interpretation, and it is clear that strategic risks have become an important element in the further thinking of governments as they attempt to direct the development of their countries.

Let us look first at the pandemic side of things. It has been mentioned that the main feature of this crisis has been the collapse of logistics.

However, as we know from the developments after the pandemic, that is, after 2020-2021, the resumption of foreign trade has happened relatively quickly. We could measure the consequences of the stoppage of global chains by, for example, the fall in GDP, but we will now use a slightly different method. By the end of 2020, global debt had reached $226 trillion (256 per cent of global GDP). This represented a whopping 28 to 29 percentage points (debt-to-GDP ratio) growth year-on-year. Of course, we could say (quite correctly, technically) that this jump was primarily due to government spending to keep economies going, i.e. that this was an absolutely extraordinary situation. This is true. However, what is this "keeping economies going"? Here is a very simplistic, but actually true, answer: governments and economies as a whole have been paying for losses through debt that have arisen in no small part from the halt in global processes. For while local economic systems did in fact slow down, they did not stop in the true sense of the word - the energy sector was functioning, as was the production of food and consumer goods in general (although there was also retrenchment here), but if we think about the whole situation

honestly, it is indisputable that a very significant part of the economic damage was necessarily attributable to global exchange.

In fact, the fact that global foreign trade in goods (WTO data) actually fell by a relatively small 9.2 per cent in 2020 does not change this. Services, of course, fared much worse (27 per cent), but that is not so important. In 2021, there was an undeniable recovery (growth of almost eleven percent), which even led to breaking the records of the pre-pandemic period. It should be stressed, however, that this is data at current prices; physical volumes are, of course, something else. Growth then slowed to 2.7 per cent in 2022. Expectations for the next period are rather reserved with explicitly below-average growth.

However, the overall data for 2021 and 2022 show that the evolution of foreign trade as such has not undergone a change that would be fundamental. At least not in terms of monetary volumes and global data. Indeed, its decline has been even lower in percentage terms than during the 2008-2009 financial crisis. What is clear, however, is that post-crisis growth has slowed down, which, compared to the 'golden days of globalisation', can be described as really poor. And then there is the creeping but still very noticeable structural change.

For example, transatlantic trade (i.e. with the US) has turned out to be the fastest growing segment of EU trade in regional terms, already exceeding the pre-pandemic level by ten percent in 2021. In contrast, other trade routes have lagged behind in terms of dynamics. The second phenomenon was the partial shift of EU external trade inside the Union as such, i.e. into trade between EU countries.

It can be argued that the reasons are strategic. The shock to producers at the sudden disruption of long-established logistics and production chains has raised questions about how safe it is for a business to exhibit a high degree of dependence on intercontinental logistics.

Above all, it seems quite significant that the real saving grace for trade and the overall economic situation was that there was at least a partial recovery in economic activity and demand growth in the second half of 2020, with the pandemic condition allowing for a relaxation of regulatory measures. Indeed, the WTO's initial estimates of the decline in foreign trade, based on the first few months of the year, had been for a more than 30 per cent annual decline. That this did not happen was mainly due to the fact that the pandemic situation eased in the second half of the year.

The pandemic crisis was followed by the energy crisis and then by the Russian Federation's attack on Ukraine. It is certainly not necessary to describe and recall these events, especially since what is important from our point of view is of a general nature rather than of a detailed nature.

Retrospective analyses of the energy commodities market, primarily gas, have shown that as early as at least 2021, but probably throughout the previous decade, smaller traders controlled covertly by the Russian state giant Gazprom have been influencing pricing on the energy exchange. At first, they were consistently artificially depressed, only to be linked by the combined business tactics of the traders and Gazprom, leading to an extraordinary surge after mid-2021. The destabilisation of the market was already then quite probably linked to the attack on Ukraine in February 2022. Analyses have concluded

that the Russian Federation decided to use European dependence on natural gas as a weapon to discourage European states from supporting Ukraine (Deyermond 2022).

This is probably the biggest blow to globalisation that could be dealt in the modern world. If the developed countries accept the interpretation that they have been long and systematically brought into a state of dependency by being allowed to reap the many benefits of access to a partner's relatively cheap raw materials, it also means, of course, that the developed countries have willingly gone along with the game. For without them this would not have been possible. The liberalisation of energy markets, which has undoubtedly brought extraordinary benefits to consumers, has opened up space for manipulative long-term supplier influence. This brings back into play the debate about the possibilities of liberal economies coexisting with economies that are in various forms state-directed (however this state domination may be artfully disguised).

The fundamental question facing developed countries is therefore: If it may have happened in the energy market that the dependence created by free trade has been abused by a partner, in what other areas and with which partners is something similar happening? There have already been studies on the quite substantial dependence of Europe and, to some extent, of the United States on Chinese products and technologies in the automotive sector. In response to these findings, European countries, and to an even greater extent the United States, have created extraordinary incentives for research and development in the field of renewable energy and electromobility. This is to help eliminate the outflow of technological superiority from developed countries.

In other words, advanced liberal countries have made a conscious decision to engage in a considerable amount of government intervention. What this means in effect, as strong as such a conclusion may seem, is that they have chosen to limit globalisation in a given sector. For in a standard market environment, the distribution of technological change should in principle follow the distribution of profits. The profit generated is the basis for funding science and research, and the results of this activity should be a function of the investment made.

Globalisation is therefore threatened on two fronts. On the one hand, it is clear that excessively long and logistically demanding chains carry risks, despite the fact that they may otherwise be highly efficient. On the other hand, it is equally clear that in a world where there are relevant economic powers ready to use their economic potential to promote geopolitical objectives, it is not possible to have completely free international trade without barriers and restrictions.

5. Discussion of Conclusions and Hypotheses

In the introduction of the paper, the following hypothesis was formulated: although globalisation, as an important precondition for global climate agreements, is likely to fall into crisis and stagnation or even reverse movement, the overall level of circularity and the implementation of a circular economy will not be reduced by this. The Paris Agreements may not be deepened and the fight against climate change intensified, but the pressure to promote circularity within developed countries will be all the greater. As mentioned at the beginning of the study, this paper does not aim to confirm the hypothesis, as the necessary data are not available to do so. However, in the following section we will try to define some topics suitable for further discussion of the hypothesis.

As a basic support for the hypothesis, the following thesis has been formulated: business actors in developed countries and political representations in developed countries will draw certain conclusions from the pandemic and the energy crisis. Some of these conclusions will be enforced directly by business actors, and some will be enforced at the level of policy decisions targeting and influencing the economies of these countries.

There will be a general pressure to shorten logistics chains, as these have proven to be very risky. Expert discussion on this potential response by private actors is already underway, and analyses by specialist companies referring to some specific cases show this (108 Agency 2023, Freedom 2021 and others).

Similarly, there is already an undeniable debate about the steps taken by governments of developed countries towards greater diversification of supply and, in general, towards ensuring a completely new level of strategic security. The example of natural gas probably does not need to be given too much in this regard, as it is a well-known fact. What is less widely known is the large-scale changes in the policies of developed countries, for example, in the area of resource extraction and the facilitation and acceleration of the decision-making processes involved. However, even these have already been sufficiently covered by the general media.

In March 2023, the European Commission adopted a package of proposals to reform the provision of raw materials to the EU economies. Among other things, it calls, for example, for a reduction in the possibility of starting the extraction of strategic raw materials to no more than two years after the application. In addition, a number of very diverse objectives are set, ranging from the financing of strategic supplies to the forced diversification of supplies from third countries. The document also sets out major milestones for the recycling of strategic raw materials (EU 2023).

It is thus clear that one of the reactions to the war in Ukraine and the energy crisis will be to increase the pressure within the developed countries to reduce their dependence on supplies of raw materials, components and semi-finished products from other countries, especially those where their geopolitical interests can be assumed to outweigh their economic interests. Although such countries are not explicitly named. It should be noted, however, that strategic raw materials are only one of the areas for which legislation is already in place or is currently being drafted. Others are the already mentioned automotive industry, but also pharmaceuticals and a number of special products needed in the health sector, new attention is being paid to the food industry and, of course, one cannot ignore the entirely new interest in the issue of military production (including the supply of alloys and materials needed for this production). In parallel, there are discussions on the strategic security of computer and information systems and, for example, a new definition of security for cracking encryption is being developed.

So, although it may not be obvious at first sight, changes have been initiated in developed countries (as it is not really just the European Union) that will affect, to a greater or lesser extent, virtually all important areas of the economy.

Summary

By its economic nature, globalisation implies minimalist government intervention in the economy, especially in international trade. It is ultimately based on the assumption that the growing interdependence of countries will never be exploited politically, let alone

militarily. However, if such abuse begins to occur, then a new element of strategic risk enters the model of exploiting comparative and absolute advantages in relation to logistics and other transaction costs defined above.

Strategic risks necessarily imply costs higher than the previous ones. If we accept the thesis that the principle of globalisation is to maximise efficiency gains (exploiting comparative and absolute advantages, i.e. reducing costs), then any model that assumes that globalisation is limited for strategic reasons must imply increased costs. Clearly, developed countries are trying to counter this by emphasising technological change, which undoubtedly includes an emphasis on increased recycling and other shifts towards a circular economy.

However, the future implications of the changes are far from clear at this time. It is not certain to what extent diversification and strengthening of strategic security will be technically successful, and it is not at all clear whether investments in science and research will really bring acceptable solutions for electromobility.

What is certain, however, is that the changes initiated by the pandemic and the energy crisis will be far-reaching and will affect the lives of everyone in the developed countries to some extent.

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