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IMPACT OF FOREIGN DIRECT INVESTMENT ON ECONOMIC GROWTH IN THE ZILINA REGION

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Abstract:
Research background: Foreign direct investment (FDI) is usually considered as a factor that can positively influence the economy growth, but not just directly through accumulation of the capital, job opportunities, and increase of export, but also through technological improvement.
Purpose of the article: Many studies have focused on the verification of the relationship of FDI and economic growth, therefore, this article is also aimed at the verification of the impact of FDI on the economic growth of a selected region of the Slovak Republic – Zilina Region – measured by the value of the gross domestic product (GDP) created in this region, labour productivity and unemployment.
Methods: The analysis uses data gathered from the Statistical Office of the Slovak Republic and the National Bank of Slovakia through the years 2008-2019. The verification of the impact of FDI on economic growth is provided by correlation and regression analysis using the independent variable represented by foreign direct investment that came into the Zilina Region and the dependent variable represented by the value of the gross domestic product (expressing economic growth) of the Zilina region, the labour productivity per employed person (reflecting the efficiency of selected resource consumption) and the unemployment rate.
Findings & Value Added: The results of the analysis confirm that FDI have a strong influence on economic growth as well as other indicators in this region; therefore, it is necessary to prepare policies that can enhance the arrival of other foreign investors into this region.

Keywords: foreign direct investment; economic growth; region; Zilina Region; Slovak Republic

JEL Classification: E22; F21; F63; R11

1. Introduction

It is generally accepted that foreign direct investments (FDI) represent an important driver of economic development in emerging as well as developed countries (Nguyen et al., 2019; Vo et al., 2019). They are beneficial not only to the host companies that receive foreign capital as an external source of funding, but also to other businesses, entire regions, and the national economy. Significant positive effects of FDI may appear, especially when foreign investors reinvest the profit gained in further development in the host country. FDIs are most closely associated with economic growth expressed by the growth of gross domestic product (GDP).

OECD (2023) defines FDI as cross-border investment carried out by an investor resident in one economy establishing a lasting interest in and a significant degree of influence over an enterprise resident in another economy. Evidence of such a relationship is ownership of at least 10% of the voting power in an enterprise abroad. FDI is essential for international economic integration because it enhances stable and long-lasting links between economies and promotes international trade through access to foreign markets.

The way in which FDI impacts host countries has long been discussed. FDI represents an important channel for transferring tangible assets as well as intangible assets such as technology, innovative product design, marketing proficiency, managerial skills, or knowledge (Simionescu, 2016; Boghean and State, 2015; Osei and Kim, 2020; Sufyan et al., 2023). The literature on this topic frequently looks at the effects of FDI in driving economic development in host countries. Chen and Zhou (2023) state that in addition to direct economic impacts on the productivity of businesses receiving foreign investment, foreign investors influence host countries' economic activities also indirectly, which is mainly reflected in productivity increases in domestic (local) businesses and establishment of new businesses. Spillover effects inextricably linked to FDI take many different forms. Ben Hamida and Piscitello (2013) distinguish particularly spillover effects related to more efficient use of existing technology and resources or an assimilation of foreign technologies, as well as resulting from introduction of new know-how to local businesses (e.g., demonstrating new technologies and training employees who later work for local businesses). Typical channels of horizontal and vertical spillovers are imitation (copying new technologies), labour mobility (hiring trained workers and managers from foreign-owned companies), competition, backward and forward links with domestic businesses (technology transfers to domestic suppliers or customers in the production chain), exposure to international trade or R&D activities (Ben Hamida and Piscitello, 2013; Hanousek et al., 2011).

The positive effect on economic growth is ensured by spillover effects and productivity improvement (including labour productivity), although empirical studies on the relationship between FDI and economic growth showed ambiguous results. Few studies found little or no evidence that FDI contributes to economic growth. On the contrary, economic growth attracts more FDI inflows, i.e., rapid GDP growth creates new investment opportunities in the host country. The correlation between FDI inflows into host countries and their economic development is influenced by many determinants, such as human capital, knowledge, trade openness, host country policies and environment, macroeconomic stability, level of economic and financial sector development, spillovers of technology and knowledge, innovation transfer, and others (Osei and Kim, 2020; Sokhanvar, 2019; Simionescu, 2016; Abbes et al., 2015; Encinas-Ferrer and Villegas-Zermeno, 2015; Pegkas, 2015). Similarly, Darmo et al. (2020) claim that FDI inflow is determined by several factors; among the most significant are the level of economic performance, most often expressed through GDP per capita and the level of unemployment. However, it is not evident whether the positive development of economic performance affects FDI inflows, or vice versa, inflows of FDI affect the level of economic

performance. This means that these macroeconomic indicators are variables that mutually influence them. The results in the Slovak Republic in the period of 1995-2018 revealed that the change in GDP and unemployment rate had an impact on the change in FDI inflows, and thus the causality goes from the GDP and unemployment rate to FDI inflows. Their development may influence investors' decision making on the allocation of investment in the Slovak Republic because stability of the economy is perceived positively by foreign investors, who consider the country as a potential location for foreign investments.

In contrast to the positive relationship mentioned above between FDI and economic growth for cross-country data, a negative relationship was found. Jyun-Yi and Chih-Chiang (2008) identified no relationship between FDI and economic growth for 62 countries over the 1975-2000 period. Similarly, Lyroudi et al. (2004) found no impact of FDI on economic growth in emerging markets during 1995–1998.

The interdependencies between the FDI and the labour market-related aspects are an important topic in the literature concerned with the study of the FDI. Most studies report that foreign direct investments decrease the unemployment rate (Bakkalci and Argin, 2013; Karlsson et al., 2009; Ajaga and Nunnekamp, 2009, etc.), the obtained results have not yet fully clarified the linkages between these two phenomena. However, the interdependencies between foreign direct investment and the unemployment rate vary significantly from country to country. They depend on the structure of the economy, the type of foreign direct investment received, as well as on the time period, which is investigated (the structure of an economy can change significantly over a long period of time, and also the typology of the received foreign direct investment can change significantly over longer periods of time) (Strat et al., 2015). In contrast, there are a significant number of studies that report no causal relation among these two phenomena (Aktar and Ozturk, 2009; Rizvi and Nishat, 2009).

2. Methodology

The main aim of the article is to investigate the relationship between foreign direct investment invested in the Zilina Region and the value of the gross domestic product created in this region, labour productivity, and the unemployment rate. As we wanted to work with more relevant data, we have decided to analyse a longer period – years 2008-2019. For this analysis, secondary data were used from two main sources – the Statistical Office of the Slovak Republic and the National Bank of Slovakia. The first institution provides information on the gross domestic product created in the Slovak Republic and particular regions, including the Zilina region as well as data on labour productivity and the unemployment rate. The National Bank of Slovakia focuses (among other areas) on the analysis of foreign direct investment – coming to Slovakia and flowing from Slovakia abroad, at the regional level. Data considering the situation in the Zilina region were analysed. As Bewick et al. (2003) explain, the most used techniques for investigating the relationship between two quantitative variables are correlation and linear regression. Correlation quantifies the strength of the linear relationship between a pair of variables, whereas regression expresses the relationship in the form of an equation. As the aim of this paper is to empirically analyse the impact of foreign direct investment (FDI) on the economic development of the Zilina region, the analysis will be conducted using correlation and regression analysis techniques to examine the relationship between the level of FDI (as an independent variable) and several dependent variables (i.e., GDP, labour productivity, and unemployment rate) within the region. Correlation analysis will be used to determine whether there is a relationship between the variables, while regression analysis will help investigate cause-and-effect relationships. The Pearson correlation coefficient will be calculated to

measure the dependence between the FDI level (X) as the independent variable and the GDP level, labour productivity and unemployment rate (Y) as the dependent variables. In general, the correlation coefficient is given by the following equation:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}, \quad (1)$$

where $\bar{x}$ is the mean of the x values,

$\bar{y}$ is the mean of the y values.

The value of r always lies between -1 and +1. A value of the correlation coefficient close to +1 indicates a strong positive linear relationship (i.e., one variable increases with the other), and a value close to -1 indicates a strong negative linear relationship (i.e., one variable decreases as the other increases). A value close to 0 indicates that there is no linear relationship; however, there could be a non-linear relationship between the variables (Obilor and Amadi, 2018). Additionally, the regression coefficient will indicate the degree of change in the dependent variables for a one-unit change in the independent variable.

3. Results

The Zilina region is located in the northwestern part of the Slovak Republic and serves as a significant international crossroad that connects the transport networks of Slovakia, the Czech Republic and Poland. The capital city of Zilina acts as the main transportation hub, offering easy access to the surrounding towns and districts. With an area of 6,809 square kilometres, the Zilina region ranks as the third largest region in Slovakia, covering 13.9% of the country's territory. This region can be classified as an industrial region with significant potential for development, making it highly attractive to foreign investors. Its advantageous location near industrial zones in neighbouring countries such as the Czech Republic and Poland contributes to its appeal. The region holds importance as an economic hub offering abundant employment opportunities. In 2021, 51.3% of the economically active population resided in the region, with an economic activity rate of 61.3%. The employment rate was 76.3%, while the unemployment rate reached 4.9%. The average nominal monthly wage amounted to 1,308 euros, which was 6.9% lower than the national average (Statistical Office of the Slovak Republic, 2021).

In 2019, the industrial sector employed 31.20% of the region's workforce, representing the highest share among all economic activities. Compared to other regions, the construction sector has a strong position in the Zilina region, contributing 13% of annual turnover and employing 5.90% of the workforce in the construction industry. Significant employment opportunities are also found in the wholesale and retail trade sector, which represents 14.20% of the region's workforce, and the transportation and storage sector, employing 5.70% of the workforce.

The next table presents an overview of the value of foreign direct investment invested in Zilina region during the period 2008-2019, which includes equity participation, reinvested earnings, and other capital together with information about its changes over time in absolute and relative measures (Table 1).

Based on the data presented in the Tab. 1, it can be confirmed that the FDI flowing into the Zilina region experienced a significant increase of 125% in 2019 compared to 2008. Although there was a slight decrease in FDI during a two-year period, it was not substantial. In particular, in the last three years of the analysed period, there was a relatively substantial increase in FDI in the Zilina region. This confirms that Zilina region stands out for its high attractiveness to

Table 1: Foreign direct investment in Zilina region in 2008-2019

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
FDI value (thousand €)	2,195,419	2,078,715	2,283,702	2,701,659	2,687,683	2,721,812
Absolute changes in FDI	-	- 116,704	204,987	417,957	- 13,976	34,129
FDI growth / decline (%)	-	- 5.32	9.86	18.30	- 0.52	1.27
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
FDI value (thousand €)	2,722,713	3,051,147	3,082,535	3,517,650	3,999,453	4,956,302
Absolute changes in FDI	901	328,434	31,388	435,115	481,803	956,849
FDI growth / decline (%)	0.03	12.06	1.03	14.12	13.70	23.92

Source: National Bank of Slovakia

foreign investors. Its advantageous geographical location, close to industrial centres in the Czech Republic and Poland, along with a strong manufacturing base, competitive wages, and previous significant investments in the automotive industry, continues to attract new foreign direct investments. In addition, these investments exceed the national average and are focused on research and development.

Gross domestic product (GDP) serves as an indicator of a nation's economic health and its growth. It quantifies the monetary value of all goods and services produced within a country during a specific time frame. The next table provides the GDP levels in the Zilina region from 2008 to 2019 together with absolute and relative changes over the analysed period (Table 2).

Table 2: Gross domestic product in Zilina region in 2008-2019

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
GDP (thousand €)	7,632,116	7,107,850	7,838,425	7,923,107	8,159,010	8,130,848
Absolute changes in GDP	-	- 524,266	730,575	84,682	235,903	- 28,162
GDP growth / decline (%)	-	- 6.87	10.28	1.08	2.98	- 0.35
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
GDP (thousand €)	8,498,880	8,977,874	8,979,529	9,238,639	9,812,267	10,701,495
Absolute changes in GDP	368,032	478,994	1,655	259,110	573,628	889,228
GDP growth / decline (%)	4.53	5.64	0.02	2.89	6.21	9.06

Source: Statistical Office of the Slovak Republic

Based on the data from Tab. 2, we can confirm that the situation in the Zilina region developed relatively positively during the observed period. There were only two years when GDP experienced a decline, namely in 2009 and 2013. By 2019, the generated GDP had already reached 140% of the GDP value from 2008. Throughout the observed period, there was alternating growth, with either a slight increase (0.02% in 2010 compared to the previous year) or a significant increase (10.28% in 2010 compared to the previous year) being recorded. The next figure presents the development of the value of foreign direct investment and gross domestic product in Zilina region during the years 2008-2019 (Figure 1).

Both curves in Figure 1 consistently show an upward trend throughout the period, indicating a direct correlation between the two variables. The figure demonstrates that as foreign direct investments increase, so does the value of created GDP, providing confirmation of the theoretical research regarding the impact of FDI on economic growth.

However, it is important to emphasize that statistical analysis is necessary to provide more specific information about this relationship. The next table contains values of the Pearson correlation coefficient and regression coefficient (Table 3).

According to the Pearson correlation coefficient in the Table 3, there is a significant and positive linear relationship between the level of FDI (PZI) and the level of GDP. This is evident from the high correlation coefficient value of 0.9741. The Pearson correlation coefficient value indicates that as the FDI level increases, the GDP also increases. Furthermore, the regression coefficient, b1, shows that a 1,000 euro increase in FDI annually results in an average GDP volume increase of 1,194.23 euros.

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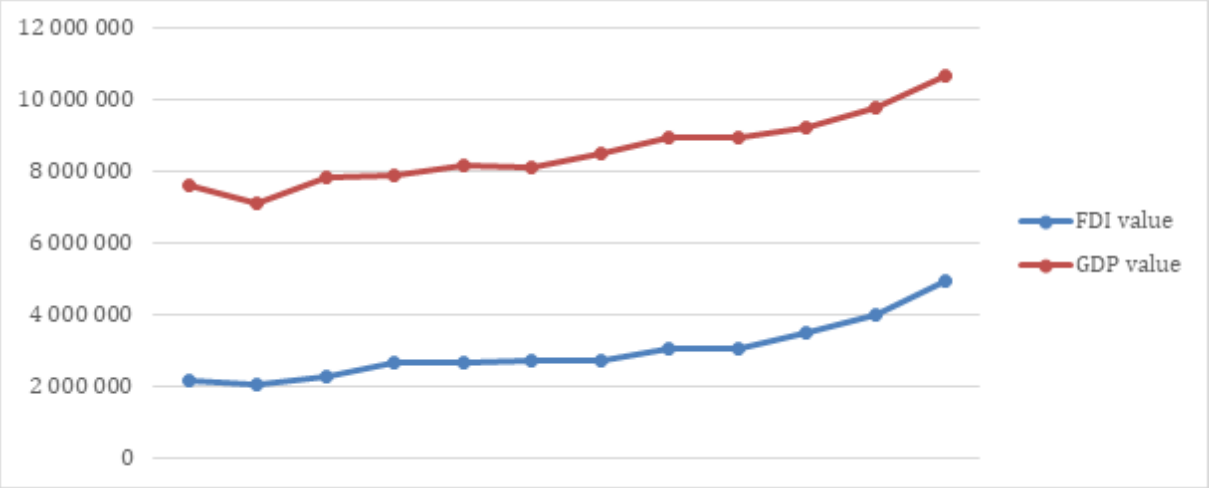
Figure 1: Development of the value of FDI and GDP in Zilina region in 2008–2019



Source: National Bank of Slovakia, Statistical Office of the Slovak Republic

Table 3: Calculation of Person correlation coefficient and regression coefficient

Variables	Indicator	Measurement unit	Pearson correlation coefficient	Regression coefficient b_1
X – independent	value of foreign direct investment	thousand €	0.9741	1.19423
Y – dependent	value of gross domestic product	thousand €		

Source: authors' calculations in SPSS

Based on a review of the literature, we selected the indicator of labour productivity to be analysed in relation to the development of FDI in the Zilina region. The indicator of labour productivity expresses the effectiveness of the consumption of business production factors measured by the value of the outputs produced. It increases as a result of advanced technologies, higher workforce skills, and capital deepening, including the inflow of FDI that improves capital equipment. Table 4 presents the yearly labour productivity per employed person in the Zilina region.

Table 4: Nominal labour productivity per employed person in the Zilina region

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Labour productivity (€)	22,724	21,754	24,156	24,165	24,665	24,571
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Labour productivity (€)	25,087	25,607	25,093	25,093	25,788	27,218

Source: Statistical Office of the Slovak Republic

The Zilina region experienced its highest labour productivity during the observed period in 2019, reaching 27,218 euros per employed person, which coincided with the highest level of FDI. On the contrary, the lowest labour productivity was observed in 2009, aligning with the lowest level of FDI in the Zilina region.

The following Table 5 presents the results of the correlation and regression analysis between the value of FDI and the productivity of labour per employed person.

The Pearson correlation coefficient in Table 5 reveals a strong positive linear relationship between the level of FDI (PZI) and the labour productivity per employee, with a coefficient value of 0.8665. This correlation coefficient indicates that as the level of FDI increases, labour productivity also tends to increase. Furthermore, the regression coefficient, b1, shows that for every 1,000,000 euros increase in the FDI level on an annual basis, labour productivity per employed person, on average, increases by 1.49 euros.

Table 5: Correlation and regression analysis of the impact of FDI on labour productivity

Variables	Indicator	Measurement unit	Pearson correlation coefficient	Regression coefficient b_1
X – independent	value of foreign direct investment	thousand €	0.8665	0.00149
Y - dependent	value of labour productivity	€		

Source: authors' calculations in SPSS

The last indicator that we included in our research was the registered unemployment rate in the Zilina region. The following table illustrates the evolution of the registered unemployment rate in the Zilina region from 2008 to 2019.

Table 6: Registered unemployment rate in the Zilina region

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Registered unemployment rate (%)	6.20	10.89	10.86	11.91	12.79	12.51
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Registered unemployment rate (%)	10.91	8.86	6.92	4.70	4.04	3.96

Source: Statistical Office of the Slovak Republic

The data in Table 6 reveals an inverse relationship between the level of FDI and unemployment, indicating that as the level of FDI increases, the registered unemployment rate decreases. In recent years, when the FDI level reached its highest point, the region experienced the lowest registered unemployment rate. Specifically, 2019 recorded the lowest registered unemployment rate, coinciding with the highest FDI level in the Zilina region.

Table 7: Correlation and regression analysis of the impact of FDI on the unemployment rate

Variables	Indicator	Measurement unit	Pearson correlation coefficient	Regression coefficient b_1
X – independent	value of foreign direct investment	thousand €	- 0.7062	- 0.0000029
Y - dependent	value of unemployment rate	%		

Source: authors' calculations in SPSS

The correlation coefficient in the Table 7 reveals a robust negative linear relationship between the level of FDI (PZI) and the registered unemployment rate, with a coefficient value of -0.7062. This indicates that as the annual level of FDI increases, the registered unemployment rate proportionally decreases. The regression coefficient, b1, has a value of -0.0000029, signifying that a 1,000,000 euro increase in the FDI level corresponds to an average decrease of 0.0029% in the registered unemployment rate.

Through our previous empirical analysis of the correlation and regression of FDI in selected regional indicators, we have established the significant importance of FDI for the regional development of the Zilina region.

4. Discussion

The Zilina region plays a significant role in the economy of Slovakia, this can be confirmed through the values of many economic indicators. In 2021, the Zilina Region accounted for more than 11% of the total GDP of the Slovak Republic, making it the third largest share among the eight regions. Regarding the total number of jobs created (based on available data for 2020) in Slovakia (2,419,902), more than 13% were generated in the Zilina region, placing it as the second-highest region in terms of job creation, following the Bratislava region. In terms of research and development expenditures, the Zilina Region holds a significant position. In 2021,

the region allocated more than €78 million to research and development, ensuring that the Zilina region occupied the fourth position among other regions (based on available data for 2021). Several foreign investors have expressed interest in this region, as indicated by the structure of foreign direct investment in 2019. Almost 10% of the total volume of foreign direct investment flowing into Slovakia was directed to the Zilina region, representing the second highest share among all regions in the Slovak Republic.

Investigating the relationship between foreign direct investment and economic growth has been the objective of various domestic and international studies. Some studies have focused on regional aspects and specific regions (Fabus, 2014), while others have examined the overall countries (Quoc and Thi, 2018; Carbonell and Werner, 2018; Hlavacek and Bal-Domanska, 2016). The results of these studies differ; some have confirmed a strong correlation and impact of foreign direct investment on subsequent economic growth, while others argue that such a connection does not exist. As our focus is on regional analysis of selected regions in the Slovak Republic, the study by Fabus (2014) becomes particularly relevant for comparison. This author examined four specific regions in Slovakia: Bratislava region, Zilina region, Banská Bystrica region and region, in all of them, a strong relationship between FDI and economic growth was confirmed, that is, FDI is significant to GDP growth in these regions. As we demonstrate the positive correlation between FDI and GDP level in the Zilina region, our results are in line with studies by Hlavacek and Bal-Domanska (2016) as well as Bayer and Marius (2018) who examined the positive impact of FDI on GDP growth in countries in Central and Eastern Europe.

Similarly, to the trends of previous indicators (GDP and labour productivity), the development of the unemployment rate in the Zilina region confirmed the beneficial impact of FDI. Pearson's correlation coefficient recorded a strongly negative correlation in relation to FDI, and thus confirmed the indirect dependence of unemployment in the region on the growth of FDI. Similar results were recorded by Balcerzak and Zurek (2011) recorded similar results, who carried out research on the relationship between FDI and the labour market in Poland, using a quarterly data period 1995-2009. They found a long-term link between increased FDI and decreased unemployment in Poland.

5. Conclusions

This article aimed to analyse the relationship between foreign direct investment and the economic growth of Zilina region. Foreign direct investments are associated with a multitude of impacts and changes in the regional economy and the development of the host country. According to many studies, they have a long-term positive influence on the development of the host country and contribute to raising the living standards of its population. One of the main positive effects of foreign direct investment is the increase of labour productivity and contribution to the creation of the host country's national income (Boghean and State, 2015). Drabek and Merkova (2010) also describe the effects in employment growth, increase of exports, improvement of the institutional environment, investments in education, and enhanced access to foreign capital.

The effects of FDI can be analysed not only through the GDP or labour productivity generated in particular region; therefore, this study could be expanded by additional analysis of other economic and noneconomic indicators and potential influence of foreign direct investment on them. Moreover, there is also the possibility of analysing the opposite effect through potential influence of economic growth on the inflow of FDI.

The authors see several limitations of this study. First, as the analysed period in the article was twelve years, it may cause some distortions on macroeconomic indicators. Second, the presence of a global economic crisis from 2008 may lead to economic and political instability in the analysed region. This potential problem has not been considered in the study.

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Data Availability Statement: Publicly available datasets were analysed in this study. These data can be found here:

https://datacube.statistics.sk/#!/lang/sk/?utm_source=susr_portalHP&utm_medium=page_database&utm_campaign=DATAcube_portalHP

https://nbs.sk/statisticke-udaje/statistika-platobnej-bilancie/priame-zahranicne-investicie/

Conflicts of Interest: The authors declare that they have no conflict of interest.

References

Abbes, S. M., Mostefa, B., Seghir, G. M. & Zakarya, G. Y. (2015). Causal Interactions between FDI, and Economic Growth: Evidence from Dynamic Panel Co-Integration. *2nd Global conference on Business, Economics, Management and Tourism. Procedia Economics and Finance*, *23*, 276–290.

Ajaga, E., & Nunnenkamp, P. (2008). Inward FDI, Value Added and Employment in US States: A Panel Cointegration Approach. *Kiel Working Papers, 1420*.

Aktar, I., & Ozturk, L. (2009). Can Unemployment Be Cured by Economic Growth and Foreign Direct Investment in Turkey? *International Research Journal of Finance and Economics*, *27*, 203-211.

Bakkalci, A. C., & Argin. N. (2013). Internalization of Foreign Trade in the Context of Labor Market Induced by Foreign Investment. *Journal of Labour Relations, 4*(1), 71-97.

Balcerzak, A., & Zurek, M. (2011). Foreign Direct Investment and Unemployment: VAR Analysis for Poland in 1995-2009. *European Research Studies*, *14*(1).

Bayer, Y., & Marius, D. G. (2018). FDI inflows and financial development in central and Eastern EU Union countries: A panel co integration and causality. *International Journal of Financial Studies*, *6*(2), 55.

Ben Hamida, L., & Piscitello, L. (2013). The impact of foreign R&D activities on the MNC's performance at home: evidence from the case of Swiss manufacturing firms. *Revue d'économie industrielle*, (143), 11-33.

Bewick, V., Cheek, L., & Ball, J. (2003). Statistics review 7: Correlation and regression. *Critical Care*, 7(6), 451-459.

Boghean, C., & State, M. (2015). The relation between foreign direct investments (FDI) and labour productivity in the European Union countries. *Procedia Economics and Finance*, *32*, 278-285.

Carbonell, J. B., & Werner, R. A. (2018). Does Foreign Direct Investment Generate Economic Growth? A New Empirical Approach Applied to Spain. *Economic Geography*, *94*(4), 425-456.

Chen, J., & Zhou, Z. (2023). The effects of FDI on innovative entrepreneurship: A regional-level study. *Technological Forecasting & Social Change*, *186*, 122159.

Darmo, L., Novak, M., & Lisy, J. (2020). Vztah medzi prilevom priamych zahranicnych investicii a nezamestnanostou v Slovenskej republike. *Politicka ekonomie*, *68*(4), 443–461.

Drabek, J., & Merkova, M. (2010). *Efektivnost priamych zahranicnych investicii v odvetvi spracovania dreva*. Technicka univerzita vo Zvolene, Drevarska fakulta.

Encinas-Ferrer, C., & Villegas-Zermeno, E. (2015). Foreign Direct Investment and Gross Domestic Product Growth. *Procedia Economics and Finance*, *24*, 198–207.

Fabus, M. (2014). Foreign direct investment and its impact on the Slovak Republic´s economy. *Economic Annals-XXI*, *9-10*(1), 42-45.

Hanousek, J., Kocenda, E., & Maurel, M. (2011). Direct and indirect effects of FDI in emerging European markets: A survey and meta-analysis. *Economic Systems*, *35*(3), 301–322.

Hlavacek, P., & Bal-Domanska, B. (2016). Impact of Foreign Direct Investment on Economic Growth in Central and Eastern European Countries. *Inzinerine Ekonomika - Engineering Economics*, *27*(3), 294-303.

Jyun-Yi, W., & Chih-Chiang, H. (2008). Does foreign direct investment promote economic growth? Evidence from a threshold regression analysis. *Economics Bulletin, 15*, 1–10.

Karlsson, S., Lundin, N., Sjoholm, F., & He, P. (2009). Foreign Firms and Chinese Employment. *World Economy*, *32*(1), 178-201.

Lyroudi, K., Papanastasiou, J., & Vamvakidis, A. (2004). Foreign direct investment and economic growth in transition economies. *South Eastern Europe Journal of Economics*. *2*(1), 97–110.

National Bank of Slovakia (2023, June 20). *Data from Database of the National Bank of Slovakia*. https://nbs.sk/statisticke-udaje/statistika-platobnej-bilancie/priame-zahranicne-investicie/

Nguyen, H. M., Ngoc H. B., & Vo, D. H. (2019). The Nexus between Economic Integration and Growth: Application to Vietnam. *Annals of Financial Economics, 14*(3), 1950014.

Obilor, E. I., & Amadi, E. Ch. (2018). Test for Significance of Pearson's Correlation Coefficient (r). *International Journal of Innovative Mathematics, Statistics & Energy Policies*, *6*(1), 11-23.

OECD. (2023). *Foreign direct investment*. OECD iLibrary. https://www.oecd-ilibrary.org/finance-and-investment/foreign-direct-investment-fdi/indicator-group/english_9a523b18-en

Osei, M. J., & Kim, J. (2020). Foreign direct investment and economic growth: Is more financial development better? *Economic Modelling*, *93*, 154–161.

Pegkas, P. (2015). The impact of FDI on economic growth in Eurozone countries. *The Journal of Economic Asymmetries*, *12*(2), 124–132.

Rizvi, Z.A., & Nishat, M. (2009). The Impact of Foreign Direct Investment on Employment Opportunities: Panel Data Analysis. Evidence from Pakistan, India, and China. *The Pakistan Development Review*, *48*, 841–851.

Quoc, Ch. H., & Thi, Ch. D. (2018). Analysis of foreign direct investment and economic growth in Vietnam. *International Journal of Business, Economics and Law*, *15*(5), 19-27.

Simionescu, M. (2016). The relation between economic growth and foreign direct investment during the economic crisis in the European Union. *Proceedings of Rijeka School of Economics*, *34*(1), 187-213.

Sokhanvar, A. (2019). Does foreign direct investment accelerate tourism and economic growth within Europe? *Tourism Management Perspectives*, *29*, 86–96.

Statistical Office of the Slovak Republic (2023, July 15). *Data from Internal Database of the Statistical Office of the Slovak Republic.* https://datacube.statistics.sk/#!/lang/sk/?utm_source=susr_portalHP&utm_medium=page_database&utm_campaign=DATAcube_portalHP

Strat, V. A., Davidescu, A., & Paul. A. M. (2015). FDI and The Unemployment - A Causality Analysis for the Latest EU Members, *2ND Global Conference On Business, Economics, Management and Tourism, 23*, 635-643.

Sufyan, A., Imran, A., Atiso, F., Novak, P., & Gavurova, B. (2023). Analyse the effect of foreign direct investment inflows on the development of SMEs in Visegrad group. *Proceedings of 91st International Scientific Conference on Economic and Social Development*, 1–11

Vo, D. H, Vo, A. T., & Zhaoyong Z. (2019). Exchange Rate Volatility and Disaggregated Manufacturing Exports: Evidence from an Emerging Country. *Journal of Risk and Financial Management*, *12*(1), 12.

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APPLICATION OF CRISIS MANAGEMENT METHODS AND TECHNIQUES DURING A SEISMIC SEA WAVE (TSUNAMI)

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Abstract:
Research background: Every year the natural disasters kill or affect millions of people and cause gigantic economic damages. Although it is impossible to eliminate these natural disasters at all, it is possible to mitigate their impacts partly – by effective rescue works implemented in these cases. The impact of these risk events depends on several factors, such as the economic development of the country or locality, and especially on predictability (early warning).
Purpose of the article: These activities also include a plan for the deployment of aid distribution centers after a crisis event occurs. The study focuses on the analysis of disaster management events and their development in recent years. On the basis of these findings, it is concluded that for perfect organization it is appropriate to determine the location of the relief distribution centers using mathematical methods.
Methods: A multiple objective model is proposed to select relief distribution centres and channels. Thanks to the optimization carried out, it can be easier to provide the necessary help in a timely manner, which is reflected in lower losses of life and property. Optimization model contains three minimization objective functions – following (1) the number of distribution centres in total, (2) the number of distribution channels in total and (3) total distance between distribution centres and channels. The model also contains four constraints.
Findings & Value added: Based on the investigation and performed normalization of values, it is advisable to minimize the number of distribution channels, as this purpose function provides the best results. The findings can be applied in tsunami-prone areas to reduce the impact of this natural disaster on the number of deaths, the number of people affected, and the costs associated with rescue efforts.

Keywords: crisis management; disaster management; optimization; relief distribution; tsunami

JEL Classification: H12; C6; D81

1. Introduction

Natural disasters with a significant impact on the Earth and human society become a regular occurrence in current world. These are extreme phenomena caused by environmental factors and climate change (Hidalgo and Baez, 2019). Similarly, Cappelli et al. (2021) state that there may be a dependency between climate change and the occurrence of catastrophic events, especially in the case of wildfires and extreme temperatures. However, according to them, the dependence between the occurrence of catastrophic events is much stronger with countries with significant income inequality, while this inequality increases future vulnerability. According to Saeed and Gargano (2022), natural disasters are adverse events that can often result in injury, property damage, or even death. Natural disasters are increasingly serious and have an impact on the financial situation (Sapulveda-Velasquez et al., 2023). According to Cooke et al. (2022), natural disasters are specific in that they have a direct or indirect impact on humans, fauna and flora. This fact is confirmed by Matsuda et al. (2023), who state that natural disasters have a serious impact on human health and social functions. Among other things, they have a negative impact on infrastructure, and economic and social activity (Kljucanin et al., 2021).

According to Centre for Research on the Epidemiology of Disasters (CRED) and its international disasters database EM-DAT, since 2000 almost 1.5 million people have died as a result of natural disasters, about 3.8 billion people have been affected and total damages have amounted to 2.4 trillion USD. The processing and recording of relevant data in the databases of the given organization is carried out with high accuracy, and any missing information is supplemented in accordance with appropriate statistical methods (Jones et al., 2022). As Coppola (2011) says, the number of natural disasters has increased in recent 20 years compared to the previous time period. The reason for this is the fact that the Earth is constantly evolving, which causes a number of changes. These changes arise due to natural processes and development, but also to human activity (interventions). According to Li et al. (2021), human activity and people in general fundamentally influence the environment, which is one of the most important factors in our lives. In connection with the increasing impact of natural disasters, the need for effective and efficient operations has become a major problem to solve in the disaster management area. Sahil and Sood (2021) argue that due to frequent natural disasters, different countries are focusing on programs and research that can influence these devastating effects. However, there are no comprehensively known and consistently applied tools in the world.

The aim of this article is to propose a multi-criteria relief distribution optimization model that can be applied in affected areas after the impact of the tsunami wave. The given model is based on data that was created based on the coastal dispositions of countries in South East Asia. The proposed model contains a total of three objective functions and four constraints, which decide on the appropriate number of distribution centres, distribution channels and the distances between them.

1.1 Natural disasters

The power of impact of any natural disaster depends on many factors, such as place of event and its economic maturity, location of relief distribution centres, preparedness, type of natural disaster, use of early warning systems and other (Pathirage et al., 2014). According to Khairuddin et al. (2022) this is an unavoidable phenomenon that has an impact on the entire affected location. In China, natural disasters have even been proven to have devastating effects on social and economic development (Wang and Zhao, 2023). This is confirmed by Agarwal et al. (2023) who argue that land use is being reduced and this is leading to more natural disasters

that affect socio-economic factors. Floods are the most common type of natural disaster. Floods thus bring the greatest economic burden and it is very difficult to prepare for them, as well as for other natural disasters (Arshad et al., 2020). They occur almost worldwide and have enormous impacts on population health. Of course, these impacts include drowning, but the transmission of viral diseases may also increase (Yavarian et al., 2019). According to Yu et al. (2022), it is crucial to evaluate flood disasters and analyze the causes of these disasters. Only then to examine the consequences that the floods brought with them. They often arise as a side effect of another catastrophic event (storms, underwater earthquakes, volcanic activity) and proportionally affect a high number of people. Storms and hurricanes "due to a good predictability even less affecting people" anyway are most often accompanied by rainstorms and floods causing more casualties than the storm itself (Haddow et al., 2011). Floods and storms together have occurred most often since 2000 and they represent over 70 % of all natural disasters (Ritchie and Roser, 2019). Earthquake is almost every year the deadliest type of natural disasters. According to Latupeiris and Pujianto (2020), earthquakes have similar consequences to floods, including fatalities and material losses. In less developed countries, where it has repeatedly struck in recent years (for example, Nepal or Haiti), it has a fundamental effect on labor migration, especially among men (Shakya et al., 2022). An effective way to reduce losses and risk is to increase awareness of the issue and thereby increase the ability to respond effectively to earthquakes (Wei et al., 2020). The reason for a low predictability, significant settlements in risk areas and accompanying side effects (tsunami) in the case of underwater earthquake. According to Ebisuzaki (2021), strong earthquake vibrations are amplified by secondary submarine landslides. These abnormal landslides and high waves are associated with a longer time horizon compared to typical events (Katsumata et al., 2021). Usually, droughts occur in the same areas (e.g. India) and have major effects on a number of people. Volcanic activity is well predictable and therefore affects only a small number of people even if causes extensive damages. Even so, it has a negative impact on the population, and it is therefore important to carry out assessments related to volcanic activity (Liu et al., 2020). Allende et al. (2020) argue that volcanic activity has a significant negative effect on the growth and survival of flora.

Table 1: Natural disasters 2017 to 2022

Year	Floods	Storms	Droughts (incl. extreme temperatures)	Earthquakes	Volcanic activity	Wildfires
2017	126 (41.7 %)	127 (42.1 %)	10 (3.3 %)	22 (7.3 %)	2 (0.7 %)	15 (5 %)
2018	127 (42.3 %)	95 (31.7 %)	41 (13.7 %)	20 (6.7 %)	7 (2.3 %)	10 (3.3 %)
2019	194 (52.3 %)	90 (24.3 %)	37 (10 %)	32 (8.6 %)	4 (1.1 %)	14 (3.8 %)
2020	201 (54.3 %)	127 (34.3 %)	14 (3.8 %)	16 (4.3 %)	4 (1.1 %)	8 (2.2 %)
2021	223 (53.3 %)	121 (28.9 %)	18 (4.3 %)	28 (6.7 %)	9 (2.2 %)	19 (4.5 %)
2022	176 (47.7 %)	108 (29.3 %)	34 (9.2 %)	31 (8.4 %)	5 (1.4 %)	15 (4.1 %)
Average 2017-2022	175 (49.2 %)	111 (31.2 %)	26 (7.3 %)	25 (7 %)	5 (1.4 %)	14 (3.9 %)
Average 2002-2021	168 (47.9 %)	104 (29.6 %)	35 (10 %)	27 (7.7 %)	6 (1.7 %)	11 (3.1 %)

Source: authors (processed on the basis of data from the EM-DAT database at CRED)

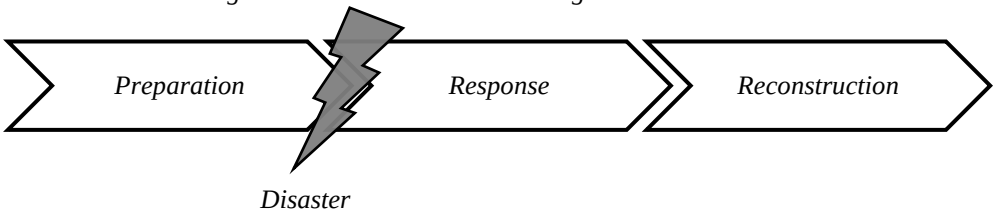
Perhaps the tsunami wave which accompanies the undersea earthquake and volcanic activity has the most devastating impact. It takes only from a few minutes to hours for the entire process,

from the emergence of the danger to the impact in the vulnerable zone. The earthquakes and tsunamis in the Indian Ocean (2004) and in Japan (2011) are the biggest events since 2000. The earthquake and tsunami in Indonesia in September (4,340 deaths) was the largest natural disasters in 2018. Table 1 shows the number of natural disasters by type since 2017 to 2022 (Yaghmaei, 2023). Tsunami waves are not captured because they are always a side effect of another devastating disaster.

1.2 Phases in disaster management

According to Kovacs and Spens (2007) the model of disaster management consists of three consecutive phases, which together constitute a closed-circuit cycle. The preparation phase forestalls the disaster while the following response and reconstruction phases are implemented after the disaster occurrence. The term cycle above refers to the situation when preparation begin with the gradual end of the reconstruction phase. The whole described system is shown in Figure 1.

Figure 1: Phases in disaster management classic model



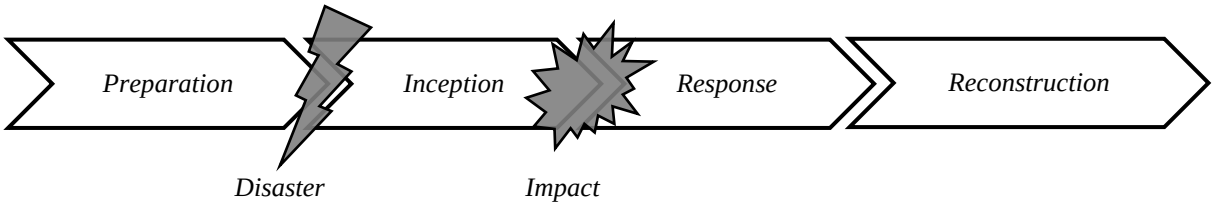
Source: Kovacs and Spens (2007)

Furthermore, the strategies and activities allocated to each stage are briefly presented.

- Preparation phase – Based on Coppola (2011) the preparation phase covers steps that lead to reducing the risk and overall impact of natural disasters. During the preparation phase first aid supplies and pre-positioning strategies for relief distribution should be made (Ozdamar and Ertem, 2015). According to Van Wassenhove (2006) trainings for emergency situations should be taken by locals.
- Response phase – Takes place shortly after a disaster, includes first aid to injured people and creation of crisis plans. The response phase usually lasts from 12 hours (Ahmadi and Tootooni, 2015) up to few days (Cao et al., 2017) based on activities allocated. Alexander (2002) formulates a similar model and states that the response phase covers finding victims, providing lifesaving assistance and transportation of these people to hospitals or provisional medical facilities.
- Reconstruction phase – Comes with a quietening of the situation after the response phase. Reconstruction phase has strategic goals and covers reconstruction works that lead to get back to normality as soon as possible (Hoyos et al., 2015). Ozdamar and Ertem (2015) states that this phase closes the disaster cycle because allocated activities proceed to the first phase.

The idea of the given system was developed by Chamrada and Subrt (2020), who created a new phase, called the “Inception phase”. The inception phase includes the time span between the occurrence of the disaster and the impact. Its beginning is defined by the moment when an early impact is confirmed (it is established that the event will hit a certain location) and its end comes at the moment of impact (the first loss of property or lives). The inception phase follows on from the preparation phase and at the same time precedes the response phase, as shown in Figure 2.

Figure 2: Phases in disaster management developed model



Source: Chamrada and Subrt (2020)

In professional literature, this period of time can only be encountered exceptionally, when it is usually referred to as "Preparation" or "Pre-Impact" (Alexander, 2002), but it is still not clearly defined in catastrophe timeline. The duration of the inception phase is highly variable, however, it is similar for individual types of disasters. According to Chamrada and Subrt (2020), based on 323 investigated events, it takes about 2 minutes in the case of earthquakes, about 1 hour in the case of tsunamis, and about 10 hours in the case of wildfires. The impact of floods and storms can be predicted in days, and the impact of extreme temperatures, droughts and volcanic activity can be identified even longer ahead.

It is worth mentioning that there is a number of other views on the system of Phases in disaster management, many of which are explained on the cycle system. Graphical representation in closed cycle format is mentioned by Balamir (2022), who points out the limits of the simplified model and suggests its extension. Against this, Bosher et al. (2021) opposes the cyclical concept, which significantly and inappropriately simplifies the system of managing catastrophic events. They present the development of disaster risk management phases by means of a helix in a two-axis graph, which evaluates the necessity and utilization of (1) resources and (2) efforts depending on the time development.

1.3 Problem description

According to Caunhye et al. (2012) the disaster management uses relief distribution centres for warehousing and prepositioning. The main distribution centres are constructed during the preparation phase for permanent use and they are usually located in a safe zone (out of the affected area). A network providing relief distribution as a result of humanitarian aid (medicals, water, food, etc.) arises in these centres and during the response phase distribution channels are provisionally built in the nearby area of them. Distribution channels are used to evacuate people and to provide humanitarian aid in the lowest level. They are built exactly in or close to the affected area.

Relief distribution centres are supplied a long time before crisis situations. The location of the warehouses and possibilities for making stock items available must meet the risk of (expected) catastrophic events (Safeer et al., 2014). The selection of points for distribution centers and foreseen distribution channel locations must take into account the possible infrastructure failure due to disaster (Torabi et al., 2013).

The current problem is therefore to identify the appropriate number of distribution centers and distribution channels as well as the distance between them and to the demand points in affected areas. Optimization will allow a proper allocation of rescue forces to individual areas. As a result, relief would be provided to the maximum number of injured people in a minimal number of relief distribution places.

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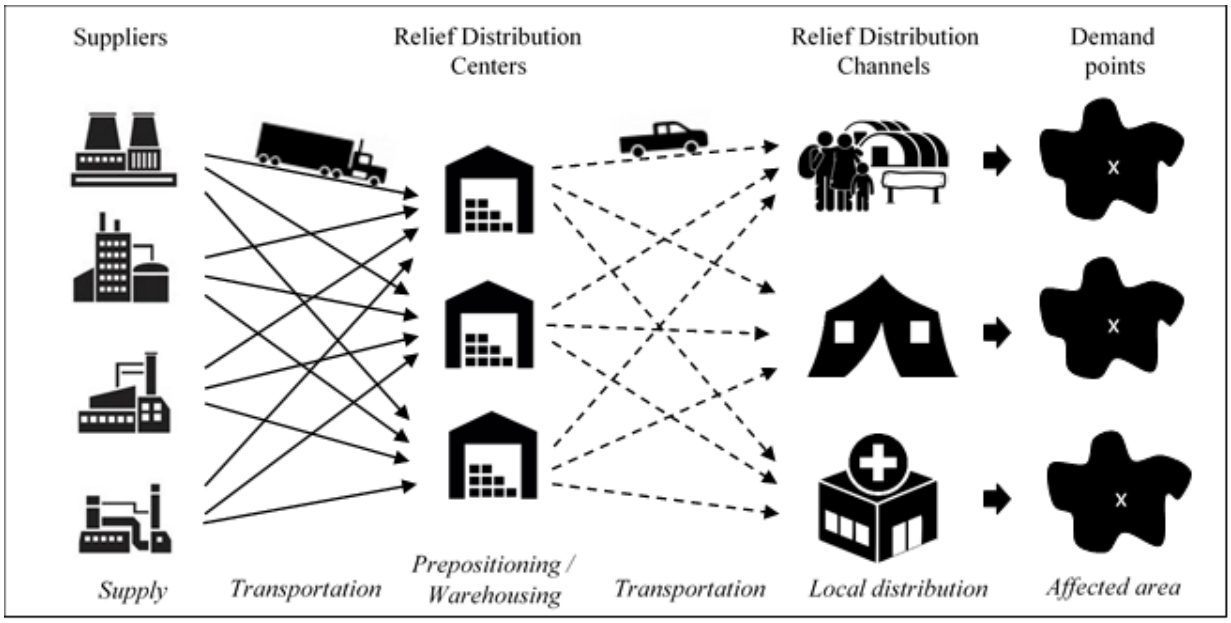
Figure 3: Relief Supply Network



Source: author

2. Methodology

In this paper, we propose a decision support model that could be used during operations in disaster response phase as a result of the tsunami wave. The model consists of 3 main objectives: (1) minimization of the number of relief distribution centres; (2) minimization of the amount of distribution channels; (3) minimization of the total distance between mentioned points. The model also includes the sets of variables, parameters and decision.

In the model, we focus on one area which represents a part of the third world country by the scope of the relief provided. The lenght of the defined area is equal to in its coastline. It may represent (1) industrial area; (2) urban agglomeration; (3) tourist resort; (4) uninhabited natural area and/or its combination. In our situation, the model is universal. Anyway there is a population that needs to be evacuated.

The model parameters values were randomly generated, but they correspond to the real and actual values.

The mathematical model consists of 3 minimizing objectives, 3 sets describing distribution centres, distribution channels and demand points, 4 groups of binary decision variables and parameters concerning the distance between centres and channels.

$$MIN \sum_s x_s \tag{1}$$

$$MIN \sum_t y_t \tag{2}$$

$$MIN \sum_s \sum_t c_{st} a_{st} \tag{3}$$

$$\sum_{t=1}^{n} b_{tu} \leq 3, for \; \forall \; u \tag{4}$$

$$a_{st} \leq x_s, for \; \forall \; s, t \tag{5}$$

$$b_{tu} \leq y_t, for \; \forall \; t, u \tag{6}$$

$$y_t \leq \sum_s a_{st}\,, for\ \forall\ t \quad (7)$$

where objectives

$O1(1)$ is minimization of distribution centres in total

$O2(2)$ is minimization of distribution channels in total

$O3(3)$ is minimization of total distance between distribution centres and channels

where sets and parameters

s is the distribution centres set

t is the distribution channels set

u is the demand point set

c_{st} is "cost" distance between distribution centres and distribution channels

and where decision variables

a_{st} {1 if part of solution; 0 otherwise}

b_{tu} {1 if part of solution; 0 otherwise}

x_s {1 if distribution centre is open; 0 otherwise}

y_t {1 if distribution channel is open; 0 otherwise}

Equations (1) – (7) define the aforementioned model. Formula (1) minimizes the number of distribution centers that must be created in the area. Formula (2) minimizes the amount of distribution channels created to provide aid. The units of formulas (1) and (2) are calculated in absolute values of the total number of aid distributing entities. The minimization of the total distance between the distribution centers and the channels is included in equation (3), with values quantified in transportation costs.

Constraint (4) limits the maximum number of assigned demand points to one distribution channel up to 3. Constrains (5), (6) and (7) ensure the flow only from centres that are open.

3. Results and Discussion

Within the solution of the given optimization model, each of the objectives was solved individually, and therefore independently of other objective functions. The obtained results are shown in Table 2. A prepared dataset was used for the implementation of the calculation, the data of which reflect the arrangement, fragmentation and general disposition of the coasts of countries in South East Asia.

Table 2: Results for optimization of each objective

Solved for	Value O1	Value O2	Value O3
O1	1	6	47,100
O2	2	2	45,100
O3	2	6	32,500

Source: author

From the results in Table 2, the minimum values in the relevant column and row can be seen on the main diagonal. This fact in itself testifies to the correctly performed optimization in the given problem with minimization objective functions. The mentioned solutions propose the creation of one to two distribution centres and two to six distribution channels. The minimized distance then takes on values from 32,500 to 47,100.

Based on the data obtained, it is appropriate to normalize the values, whereby all variables will take on values ranging from 0 to 1 (including values). The newly obtained values are shown in Table 3.

Table 3: Results for optimization of each objective (normalization of values)

Solved for	Norm. Val. O1	Norm. Val. O2	Norm. Val. O3
O1	0	1	1
O2	1	0	0.863
O3	1	1	0

Source: author

Table 3 shows the normalized values of the objective function, which in most cases reach extreme values of O and 1. The only exception is objective function O2, normalized according to the value of objective function O3. It reaches a value of 0.863. Zero values on the main diagonal then show the optimal solution of individual objective functions. A value of 1 then indicates the greatest distance from the optimal solution.

Table 4 shows that objective 2 leads to the best results in the situation when the model is solved for each objective individually. The optimal value is highlighted in bold.

Table 4: Accumulation of normalized data

Solved for	Sum Value
O1	2
O2	**1.863**
O3	2

Source: author

The optimal solution of the normalized values reaches 1.863, which is the smallest of the listed sums. This value was obtained by objective function O2, which had a relatively low value when minimizing the total distance between distribution centres and channels.

It is worth mentioning that the model is limited in its scope, where it only focuses on the number of relief distribution centers, the number of relief distribution channels and the distance between these objects and demand points. Although the model is insufficient in the context of the entire disaster management, it appropriately reflects one of its key components. Implementation of the proposed conclusions can lead to increased effectiveness of time pressure and crisis activities. It is important to note that our solution does not work with real numbers but approximate estimates. These estimates are specific to the South East Asia region (a frequent site of tsunami disaster events).

It is also appropriate to compare this model with similar research by other authors. Banomyong et al. (2009) propose a model and hierarchy of implemented activities after the impact, whereby the basic system of regional, provincial and local support centers should be created within 3 hours, and the control and coordination body within 13 hours after the impact of the disaster. Basic support should be delivered within the specified 13 hours, more complex support within 37 hours. Their study is based on data from the 2004 Tsunami that struck Thailand. A similar study is presented by Ilabaca et al. (2022), who analyze the situation in the city of Iquique, Chile. They also focus on the time availability of help, which can be delivered within 4 to 7 hours thanks to the more developed urban infrastructure. Patrisina et al. (2018), who created a two-stage mixed-integer programming model applied in a 3-tier of a relief distribution network, also dealt with the issue of relief distribution sites in the event of a tsunami. However, the objective functions of their model focused exclusively on the distances between distribution centers and affected areas and reflected the different fragmentation of the coast. It should be noted that the mentioned case studies and expert outputs do not directly

reflect the number of distribution centers or distribution channels created, but focus on the time of delivery of aid. This is explained in the model presented by us using the third objective function – formula (3). They also often take into account other and further constraints of the proposed model.

The model should be expanded in next studies involving more variables (factors). It is necessary to think about the idea of whether it is appropriate to cumulate survivors in Relief distribution channels or if it is better to transport them to Relief distribution centres. Both cases have their pros and cons. In first case (Relief distribution channels) there is a raising risk of epidemic threats in the closed population, but the group is isolated from the rest of the world. The negative is also the dependence on constant supplies (food, water, medicals, etc.) from distribution centres. However, according to Ekici and Ozener (2020), in general a key factor in the success of humanitarian aid is fair and rapid distribution, because in the case of delayed and unfair deliveries, people affected by a natural disaster can suffer and die. In second case (Relief distribution centres) the survivors must be transported immediately after the disaster to other place. However, the costs in time decreasing and distribution channel naturally expires due to the loss of meaning. Depending on this fact, proper logistics planning is necessary, including the transportation of injured persons who have been affected by the situation to hospitals or temporary clinics (Niyazi and Behnamian, 2022).

With the use of early warning systems, tsunamis can be predicted (after an earthquake or volcano eruption) a few minutes to hours before impact in the vulnerable area. This time horizon can be used for initial analysis. It is also possible to start with rescue activities and preparations before the impact of the wave. However, for example, Relief distribution channels cannot be built due to the risk of immediate flooding. When dealing with a natural disaster, it is crucial to consider all relevant components and thoughtfully evaluate which approach would be most appropriate for the circumstances.

4. Conclusions

Natural disasters should not be taken lightly, and it is necessary to know both the theoretical and practical basis of the issue of destructive realities. Properly set processes can eliminate the impact of natural disasters and loss of life and property.

Overall, this study recommends a proposed model that identifies distribution centers and channels that have the potential to improve the effectiveness of crisis management in places where natural disasters occur frequently. The implementation of the proposed solutions could shorten the reaction time and guarantee a faster distribution of aid to the affected networks. Regardless, it is essential to note that the model works with assumed values and could be additionally extended by various elements that influence the dynamics during emergencies. Further research could help to refine this approach and materialize it in the surveillance of catastrophic events and to ensure a faster and more effective response to these crises. On the basis of theoretical data, it is good to emphasize that states, corporations, but also smaller entities throughout the world try to ensure the greatest possible protection and elimination in the event of a natural disaster.

The shorter investigated time horizon and especially the lower quality of processed data is the limit of the work, while there is still proctor for the further implementation of the research, where the data of an older nature could be applied and compared with the current time of the development of natural disasters. The implementation of further research can also compare the individual countries of occurrence of natural disasters and evaluate the differentiation of the consequences of natural disasters. The comparison of approaches can then lead to the

identification of correctly chosen crisis management strategies and the creation of preventive and effective measures in the event of a sudden occurrence of natural disasters.

In the article, they are used both of a theoretical and practical nature, which can be used for further research, not only in the field of natural disasters, but also in risk management of other hard-to-influence situations on a global scale. The achieved results can be applied to all areas and the contribution of the work is not only from a theoretical but also a practical point of view. Within this fact, it is possible to state that the goal of the work was fulfilled.

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References

Agarwal, P., Sahoo, D., Parida, Y., Paltasingh, K. R., & Chowdhury, J. R. (2023). Land use changes and natural disaster fatalities: Empirical analysis for India. *Ecological Indicators*, *154*.

Ahmadi, A. S., & Tootooni, B. (2015). A humanitarian logistics model for disaster relief operation considering network failure and standard relief time: A case study on San Francisco district. *Transportation Research Part E: Logistics and Transportation Review*, *75*, 145–163.

Alexander, D. (2002). *Principles of Emergency Planning and Management*. Oxford: Oxford University Press.

Allende, T. C., Macias, J. L., Mendoza, M. E., & Daz, J. V. (2020). Evidence of volcanic activity in the growth rings of trees at the Tacana volcano, Mexico-Guatemala border. *Canadian Journal of Forest Research*, *50*(1), 65-72.

Arshad, M., Mughal, M. K., Giallo, R., & Kingston, D. (2020). Predictors of child resilience in a community-based cohort facing flood as natural disaster. *BMC Psychiatry*, *20*(1).

Balamir, M. (2022). The "disaster cycle" (DC) and actors in disaster management. *International Journal of Disaster Resilience in the Built Environment*, *14*(2), 185-192.

Banomyong, R., Beresford, A., & Pettit, S. J. (2009). Logistics relief response model: The case of Thailand's tsunami affected area. *International Journal of Services Technology and Management*, *12*(4), 414-429.

Bosher, L., Chmutina, K., & Niekerk, V. D. (2021). Stop going around in circles: towards a reconceptualisation of disaster risk management phases. *Disaster Prevention and Management an International Journal*, *30*(4-5), 525-537.

Cao, C., Li, C., Yang, Q., & Zhang, F. (2017). Multi-Objective Optimization Model of Emergency Organization Allocation for Sustainable Disaster Supply Chain. *Sustainability*. *9*(11).

Cappelli, F., Costantini, V., & Consoli, D. (2021). The trap of climate change-induced "natural" disasters and inequality. *Global Environmental Change*, *70*.

Caunhye, A. M., Nie, X., & Pokharel, S. (2012). Optimization models in emergency logistics: A literature review. *Socio-Economic Planning Sciences*, *46*(1), 4-13

Chamrada, D., & Subrt, T. (2020). Possibilities of Effective Use of Emergency Logistics Applying the Inception Phase in Disaster Management. *Conference Proceedings, 9th Carpathian Logistics* Congress – CLC 2019, 93-98.

Cooke, S. J., Galassi, D. M. P., Gillanders, B. M., Landsman, S. J., Hammerschlag, N., Gallagher, A. J., Eliason, E. J., Kraft, C. E., Taylor, M. K., Crisafulli, C. M., Shugar, D. H., & Lannox, R. J. (2022). Consequences of ?natural? disasters on aquatic life and habitats. *Environmental Reviews*.

Coppola, D. P. (2011). *Introduction to international disaster management*. Boston: Butterworth-Heinemann

Ebisuzaki, T. (2021). What is Tsunami Earthquake? OMAE2021. *Proceedings Of ASME 2021 40th International Conference On Ocean, Offshore And Arctic Engineering (OMAE2021*), *5*.

Ekici, A., & Ozener, O. O. (2020). Inventory routing for the last mile delivery of humanitarian relief supplies. *OR Spectrum*, *42*(3), 621-660.

Haddow, G. D., Bullock, J. A., & Coppola, D. P. (2011). *Introduction to emergency management*. Burlington, MA: Butterworth Heinemann.

Hidalgo, J., & Baez, A. A. (2019). Natural Disasters. Critical Care Clinics, 35(4), 591-607.

Hoyos, C., Morales, R. S., & Akhavan-Tabatabaei, R. (2015). OR models with stochastic components in disaster operations management: A literature survey. *Computers & Industrial Engineering*, *82*, 183–197.

Ilabaca, A., Paredes-Belmar, G., & Alvarez, P. P. (2022). Optimization of Humanitarian Aid Distribution in Case of an Earthquake and Tsunami in the City of Iquique, Chile. *Sustainability*, *14*(2).

Jones, R. L., Guha-Sapir, D., & Tubeuf, S. (2022). Human and economic impacts of natural disasters: can we trust the global data? *Scientific Data*, *9*(1).

Katsumata, A., Tanaka, M., & Nishimiya, T (2021). Rapid estimation of tsunami earthquake magnitudes at local distance. *Earth Planets and Space*, *73*(1).

Khairuddin, I. E., Uzir, N. A., Zaini, M. K., & Ghazali, A. K. (2022). Decentralized Distribution of Humanitarian Aid for Natural Disaster Relief. *Environmental-Behaviour Proceedings Journal*, *7*, 233-239.

Kljucanin, S., Rezo, M., Dzebo, S., & Hadzic, E. (2021). Spatial Data Infrastructure in Natural Disaster Management. *Tehnicki Glasnik-Technical Journal*, *15*(4), 455-461.

Kovacs, G., & Spens, M. (2007). Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management*, *37*(2), 99–114.

Latupeirisa, V. P. S., & Pujianto. (2020). Level of earthquake disaster preparedness and its integrity in natural science learning: A literature review. *5th International Seminar on Science Education*, *1440*.

Li, Y., Li, H. Y., & Ruan, J. Q. (2021). Do Long-Term Natural Disasters Influence Social Trust? Empirical Evidence from China. *International Journal of Environmental Research and Public Health*, *18*(14).

Liu, W. Q., Li, L., Chen, L. Q., Wen, M. X., Wang, J., Yuan, L., Liu, Y. Q., & Li, H. (2020). Testing a Comprehensive Volcanic Risk Assessment of Tenerife by Volcanic Hazard Simulations and Social Vulnerability Analysis. *ISPRS International Journal of Geo-Information*, *9*(4).

Matsuda, S., Yoshimura, H., & Kawachi, I. (2023). Impact of natural disaster on oral health: A scoping review. *Medicine*, *102*(8).

Niyazi, M., & Behnamian, J. (2022). Application of Emerging Digital Technologies in Disaster Relief Operations: A Systematic Review. *Archives of Computational Methods in Engineering*, *30*(3), 1579-1599.

Ozdamar, L., & Ertem, M. A. (2015). Models, solutions and enabling technologies in humanitarian logistics. *European Journal of Operational Research*, *244*(1), 55–65.

Pathirage, C., Seneviratne, K., Amaratunga, D., & Haigh, R. (2014). Knowledge factors and associated challenges for successful disaster knowledge sharing. *Prepared for the Global Assessment Report on Disaster Risk Reduction 2015*, 1-30.

Patrisina, R., Sirivongpaisal, N., & Suthummanon, S. (2018). A Logistical Relief Distribution Preparedness Model: Responses to a Probable Tsunami Case Study in West Sumatra, Indonesia. *Industrial Engineering & Management Systems*, *17*(4), 850 - 863.

Ritchie, H. & Roser, M. (2019). Natural Disasters: Empirical View. https://ourworldindata.org/natural-disasters

Saeed, S. A., & Gargano, S. P. (2022). Natural disasters and mental health. *International Review of Psychiatry*, *34*(1), 16-25.

Safeer, M., Anbuudayasankar, S. P., Balkumar, K., & Ganesh, K. (2014). Analyzing Transportation and Distribution in Emergency Humanitarian Logistics. *12th Global Congress On Manufacturing and Management (GCMM - 2014)*, *97*, 2248-2258.

Sahil, & Sood, S. K. (2021). Scientometric Analysis of Natural Disaster Management Research. *Natural Hazards Review*, *22*(2).

Sapulveda-Velasquez, J., Tapia-Grinen, P., & Pasten-Henriquez, B. (2023). Financial effects of natural disasters: a bibliometric analysis. *Natural Hazards*, *118*(3), 2691-2710.

Shakya, S., Basnet, S., & Paudel, J. (2022). Natural disasters and labor migration: Evidence from Nepal's earthquake. *World Development*, *151*.

Torabi, S. A., Baghersad, M., & Meisami, A. (2013). Emergency relief routing and temporary depots location problem considering roads restoration. *Proceedings of the 24th Annual Conference of the Production and Operations Management Society*, 3-6.

Van Wassenhove, L. N. (2006). Humanitarian aid logistics: supply chain management in high gear. *Journal of the Operational Research Society*, *57*(5), 475–489.

Wang, W. W., & Zhao, Y. F. (2023). Impact of Natural Disasters on Household Income and Expenditure Inequality in China. *Sustainability*, *15*(18).

Wei, B. Y., Su, G. W., & Li, Y. K. (2020). Evaluating the cognition and response of middle/high school students to earthquake - a case study from the 2013 Mw6.6 Lushan earthquake-hit area, China. *International Journal of Disaster Risk Reducation*, *51*.

Yaghmaei, N. (2023). *Disasters 2017-2022: Year in Review*. Centre for Research on the Epidemiology of Disasters. Louvain. https://www.preventionweb.net/publication/cred-crunch-newsletter-issue-no-70-april-2023-disasters-year-review-2022

Yavarian, J., Shafiei-Jandaghi, N. Z., & Mokhtari-Azad, T. (2019). Possible viral infections in flood disasters: a review considering 2019 spring floods in Iran. *Iranian Journal of Microbiology*, *11*(2), 85-89.

Yu, Q., Wang, Y. Y., & Liu, N. (2022). Extreme Flood Disasters: Comprehensive Impact and Assessment. *Water*, *14*(8).

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ANALYSIS OF SHARED TRANSPORTATION PLATFORMS IN TERMS OF ECONOMIC AND ENVIRONMENTAL FACTORS

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Abstract:
Research background: Sharing economy is an economic system in which assets and services are shared between individuals. It is peer-to-peer based activity of sharing and obtaining to goods, services, and resources. The functioning of sharing economy platforms and specifically shared transportation of goods and services is still an area that is not fully explored. It is necessary to pay attention to the profitability of the platforms, but in addition to economic indicators, it is also necessary to deal with environmental issues, which are directly connected with these facts.
Purpose of the article: The study deals with how revenue and profitability are achieved by shared transportation platforms, specifically the platforms Bolt Services SK, Uber Slovakia, Wolt Slovakia and Bistro Slovakia considering their operation within the territory of the Slovak Republic. Following this issue, the study reveals which economic and environmental benefits the shared transportation system can bring.
Methods: Methods of determining the profitability of selected sharing economy platforms in the field of transport and delivery services are used in the studies. Environmental factors are explored through studies by authors dealing with this issue.
Findings & Value added: The main findings of the study point to the unstable situation of platforms operating in the segment of shared transport and delivery services. Through profitability analysis, we were able to find out the fact that the global COVID-19 pandemic has affected the operation of shared transportation platforms in various ways. The unstable profitability of platforms for the shared transportation of people, goods and services was observed especially in the time before the COVID-19 pandemic. During the pandemic, we observed positive changes in profitability, or there was almost no worsening of the financial situation during the pandemic.

Keywords: sharing economy; shared transportation platforms; sustainability; economic analysis; transport in cities

JEL Classification: D16; E26; F60; F64

1. Introduction

The sharing economy as a part of human life in its essence has existed for a long time. Many times, people used its services or products daily. However, the exact name as the sharing economy or the collaborative economy, has only spread in recent decades (Gabor and Lajos, 2019; Botsman and Rogers, 2010). This fact was mainly caused because many experts and the public became more interested in this type of economy. With the current development of the world, economic, but also environmental needs, the view that shared transport can contribute to a more economical and ecological mode of transport by its functioning resonates (Akan and Tepeler, 2022). In the last ten years, the emergence of a sharing economy has modified the way goods are consumed and owned. The sharing economy is generally understood as all borrowing, lending, renting, sharing, bartering, and swapping practices mediated by digital platforms (Popov and Veretennikova, 2022; Tham et al., 2022). The economics discipline known as the "sharing economy" is relatively new and is rapidly gaining favor in academia and business. It has numerous uses, including in the fields of materials science, hospitality, transportation, and knowledge sharing. It is also associated with several economic and environmental factors, such as circularity, sustainability, environmentally friendly practices, reduced production, and more conscientious resource use. The sharing economy is considered a means of achieving economic opportunity, a more sustainable mode of consumption, and a bridge towards a sustainable and just society. It is closely associated with sustainability (Daglis, 2022; Martin, 2016; Boar et al., 2020).

In addition, sharing can work even without technological facilities, but the continuity of the development of information and communication technologies mediates the use of available forms of shared goods and services for a large part of the population that is interested in participating in this business model and thus increases its marketing, economic and consumer reach and familiarity. This principle is also supported by the very concept referred to as the so-called P2P, peer to peer economy (Huynh and Gurtner, 2023). Literally, this term can be translated as "equal to equal". The P2P economy, which also includes the sharing economy, is generally referred to as a decentralized model of providing, obtaining, or sharing access to goods or services, the operation of which is significantly facilitated by a community platform (Kuhzady et al., 2022). The shared economy, and its rapid development, is caused by scientific and technical progress. It is mobile applications that form the most important element that allows connecting supply with demand, that is, those who provide their services through sharing economy platforms and thereby earn money, and those who are willing to use and pay for such a service. Compared to traditional taxi services, the applications are the methods that provide a more flexible and adaptable way of using transport services (Williams et al., 2020). In today's digitized world, shared mobility is experiencing a boom. and it can be observed in various forms. Digital platforms, bikesharing, sharing of scooters, community use of cars.

The history of the shared economy is not particularly long within the Slovak Republic. Uber started providing its services in the capital of Slovakia Bratislava in the middle of 2015, marking the beginning of the sharing economy movement in Slovakian transportation services. Only traditional taxi drivers and public transportation existed up to that point. Uber brought numerous new features to Bratislava's urban transportation system that set it apart from the city's taxis. Uber platform is historically the first platform whose operation on the territory of the Slovak Republic can be found as official. In Slovakia, the sharing economy is not yet anchored in any law, which makes it impossible to prevent undeclared work or other tax and levy fraud. Certain changes are necessary in this case, as they will help eliminate the mechanism without conditions and contribute to the creation of fair competition. Uber Technologies offers freight transportation, food delivery, and ride-hailing services. The first ridesharing app in Europe is

called Bolt. Bolt is an Estonian startup that provides ride-hailing, food and grocery delivery (through the Bolt Food app), carsharing, and micromobility rentals. Wolt platform is a technology company founded in Finland. The main function of this company's operations is to allow customers to place orders for food and other related products from restaurants and other affiliated businesses via the Wolt mobile application or website (Pap et al., 2021). Bistro Slovakia is the biggest online food delivery service in Slovakia. In 2021, Bistro was bought by the Dutch company Just Eat Takeaway, which is one of the world leaders in this industry. Customers can order their food online through application or directly through the website. Just Eat Takeaway.com is a Dutch multinational online food ordering and delivery company. Using an app or website, users can order food from restaurant menus online and have it delivered straight to their house or place of business. Just Eat Takeaway has multiple meal ordering and delivery platforms (Goffe et al., 2021).

Sharing economy is closely connected with the concept of sustainability, socially responsible business, a more sustainable and ecological way of life. Currently, there are several problems that are topical within the environmental situation: global warming, climate crisis, deforestation, combustion of fossil fuels. Excessive consumption of natural resources. An increasing number of countries at risk of extreme poverty. These global problems and many others are a reality, and the global population will face their unprecedented consequences (Helbling and Meierrieks, 2023). In an increasingly urgent situation, the countries of the world are looking for a compromise and for a more gentle, environmentally acceptable, and sustainable way of life for individuals, but also for societies and countries. Two of the most discussed and significant advantages of the sharing system are sustainability and its ability to assist both individuals and the state in addressing environmental concerns, which is why many nations are implementing it. A concept called the "circular economy" calls for reducing and doing away with waste and pollution in the environment (Jalles, 2023). Recycling, the reuse of products that have not yet lost their value, is the basic principle on which this system is built. In principle, the companies operate largely on a linear economic model. Extraction of natural raw materials, transport to different countries of the world, where different types of goods are produced from them. They are distributed by logistics chains to businesses and households, where they are used by consumers and then mostly thrown away. This system creates a large amount of waste, which can be found in incinerators, landfills, or simply thrown in the natural environment. It is a constantly repeating circle, the basis of which is mining and the enormously high consumption of fossil non-renewable raw materials (Morseletto, 2020; Diana and Maria, 2020).

The main aim of the study is closely linked to the research question, and it is: How does the profitability of shared transport platforms affect their operation and how does sharing affect the environment?

The study is divided into the following sections. The methodology section presents the methods we used in this study. Using widely used ratio indicators of profitability, we examined the platforms' profitability, which express the profitability of business efforts. Profitability indicators express the efficiency of business activities. We applied profitability indicators to all investigated platforms. We discuss the findings from the conducted analysis in the results section. This part also contains a mention of the analyses we used in describing the environmental benefits of shared transportation. In the discussion part, we pointed to authors dealing with the issue of shared transportation and the impact of the COVID-19 pandemic on the operation of platforms and the impact of platforms on improving environmental conditions. The final, conclusion part contains a summary of the most important findings and addition of research limitations with a focus on future challenges within the sharing economy.

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2. Methodology

Financial performance is the economic effect within an enterprise. The link between the economic gains that businesses obtained and the expenses they incurred to obtain those benefits reflect in financial performance (Do, 2021; Nguyen et al., 2021). An economic entity's financial performance is a key area of interest for both its internal and external environments. For a business to be thriving, appealing, effective, and showing promise, it needs to turn a profit. In the circumstances of a dynamic, constantly changing economic climate with a focus on maximizing profitability or the primary goal of is the capacity to turn a profit as a gauge of performance the operations of a business. The financial health of companies depends on profitability. When business profitability rises, so does the profitability of invested capital. This contributes to the growth of a company's financial health (Nagy and Valaskova, 2023).

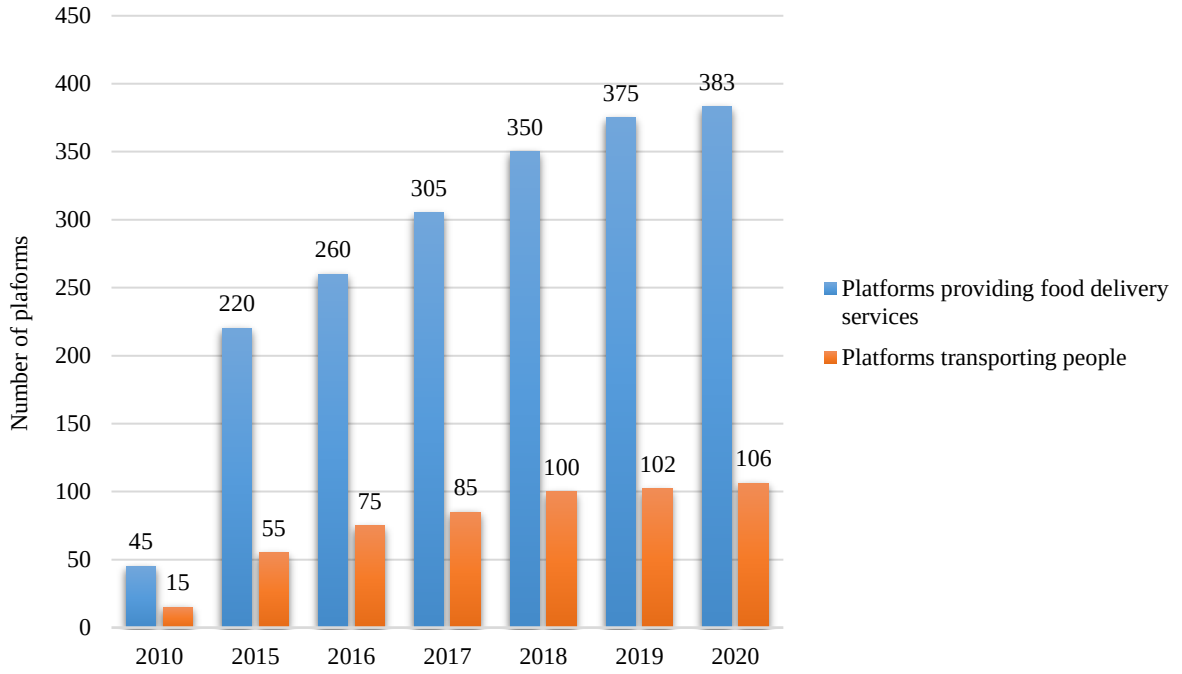
As part of the quantification of selected economic and financial indicators, we investigated profitability indicators. Profitability is one of the forms of expressing economic efficiency with summarizing the efforts made to obtain the expected results. Some of the most important metrics for evaluating financial performance are return on assets (ROA) and return on sales (ROS). Profit is defined as observed revenue less observed cost (Barbero and Zofio, 2023). Return on assets (ROA) is a profitability ratio and is calculated by dividing net income by average total assets. Return of sales (ROS) is determined by scaling operating (net) profits by total sales recorded over the same period (Alipour and Pejman, 2015). Profitability of sales expresses how much €1 of sales brought the company's profit. Return on assets expresses how much €1 of company's profit was produced by €1 of assets. We used EAT (Earnings after tax) in the numerator of individual formulas. We used this form of profit because we performed the analysis in the conditions of the Slovak Republic without comparison with other countries. It is not necessary to abstract from the impact of interest, tax burden and depreciation policy of companies. We focused on indicators of profitability of sales and profitability of assets.

The shared transportation platforms examined were Uber Slovakia and Bolt Services SK. As part of platforms that provide food delivery, Bistro Slovakia and Wolt Slovakia were studied. However, it should not be forgotten that transport is an integral part of the shared economy. Because in most cases, the primary goal is not to own a vehicle, but to use its capability and transport from a certain place to a chosen destination. Shared transport thus represents an innovative short-term approach to any available means of transport that the consumer needs to use, usually in the form of a mobile phone application (Castellanos et al., 2022). In this context, we are already getting to specific companies that typologically belong and fall into the field of shared transport and transport services. A closer specification and focus of the study on the area of sharing transport and transport of people, goods and services is obvious from the point of view of the importance of the functioning of this segment and the need for constant progress. Shared transportation platforms have also been forced to face the unprecedented consequences of the COVID-19 pandemic. As part of further investigation, we also demonstrated the impact of shared transportation on the environment. We assessed the impact of the shared economy on the environment according to published studies that clearly demonstrate a causal relationship between the introduction of the shared transport system and the benefits that result from its use. As part of the analyses, we analysed the financial statements of the platforms Bolt Services SK, Wolt Slovakia, Uber Slovakia, and Bistro Slovakia. As part of the calculation of individual indicators, we examined earnings after taxes, sales, and asset platforms on sales or assets. In this way, we quantified profitability indicators, namely return on sales and return on assets. The environmental factors associated with the use of shared transportation were investigated through concrete practical examples that were investigated within the framework of studies focused on this issue.

3. Results

The more efficient use of cars was considered one of the most key factors for the development of this segment at the beginning of the operation of shared transportation. Therefore, it is necessary to evaluate how the industries in the field of transport and transport services have developed worldwide in the framework of sharing. According to the research of the International Labour Organization (ILO), which is a specialized agency of the United Nations (UN) promoting social justice and the recognition of human, social and labour rights, published a survey based on the report on World Employment and Social Outlook, which points to the development of the number of platforms registered after worldwide in the field of transport and transport services (Berg et al., 2021). Figure 1 shows the number of digital platforms in the field of transport and transport services.

Figure 1: Number of digital platforms in the field of transport and transport services



Source: own research according to International Labour Organization (2021)

According to the research of the ILO, over the last decade, digital work platforms have grown in the sum of both categories from 60 platforms in 2010 to 489 registered official platforms in 2020. Through analysis, we find that the food delivery industry, food, and services that are directly related to such activity is significantly higher than a segment that provides services similar to classic taxis (passenger transport). The genesis of the development of digital platforms in the field of transport is directly related to the provision of increased demand and the willingness of consumers and providers to participate in this economic model, where each group has its own requirements.

Further, we analysed the profitability of selected shared transport platforms operating in the territory of the Slovak Republic. In the following Table 1, we quantified the profitability indicators of the platform Bolt Services SK.

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Table 1: Profitability of sales and assets of Bolt Services SK platform

Platform	Year	ROS	ROA
Bolt Services SK	2018	–	–
	2019	0.04	0.25
	2020	0.04	0.23
	2021	0.03	0.12

Source: own research based on data in Register of financial statements Bolt Services SK (2023a)

Table 2: Profitability of sales and assets of Uber Slovakia platform

Platform	Year	ROS	ROA
Uber Slovakia	2018	0.08	0.14
	2019	0.04	0.07
	2020	0.05	0.08
	2021	0.04	0.04

Source: own research based on data in Register of financial statements Uber Slovakia (2023c)

We proceeded in the same way with the Wolt Slovakia platform. Table 3 shows profitability indicators (ROS and ROA).

Table 3: Profitability of sales and assets of Wolt Slovakia platform

Platform	Year	ROS	ROA
Wolt Slovakia	2018	–	–
	2019	0.09	0.02
	2020	0.01	0.05
	2021	0.01	0.03

Source: own research based on data in Register of financial statements Wolt Slovakia (2023b)

We also quantified profitability indicators (ROS and ROA) for the Bistro Slovakia platform, which is one of the largest delivery services in Slovakia (Table 4).

Table 4: Profitability of sales and assets of Bistro Slovakia platform

Platform	Year	ROS	ROA
Bistro Slovakia	2018	- 0.58	- 0.15
	2019	- 0.34	- 0.12
	2020	- 0.06	- 0.03
	2021	1.59	0.34

Source: own research based on data in Register of financial statements Bistro Slovakia (2023d)

Profitability analysis does not provide a clear trend. The range of acceptable values is not specified within the profitability indicators. In general, it is desirable for companies to have the highest possible value of these indicators. Profitability of the Bolt, Uber and Wolt platforms achieve values that are similar. The trend of this indicator is not positive, as businesses generate only €0.01 to €0.09 of net profit per €1 of sales. The profitability of sales for the Bistro platform in the years 2018, 2019 and 2020 even reached a negative value, which means that €1 of sales generated a loss. The turning point occurred in 2021, when the Bistro platform generated €1.59 of profit from €1 of sales, which is a much higher than average value compared to the other values within the investigated platforms. The return on assets in some cases already reached higher values. The highest value was achieved by Bistro, when €1 of assets produced €0.34 of net profit in the company. Between 2018 and 2020, €1 of assets generated a loss for the Bistro platform. The profitability of the platforms does not reach the required value even in the segment of shared transportation. The exception is again Bistro in 2021, when we recorded a significant increase in the profitability of both sales and assets. This change was caused by a change in business strategy and especially by a change of owner.

If we analyse the profitability of the platforms in more detail, we can state certain findings. From the point of view of profitability, of all the platforms that were examined, the Bistro platform is the one that showed the biggest increase in profitability. With this platform, it is possible to clearly define that the COVID-19 pandemic has rapidly increased the growth of this company and the services it provides. The year 2021 was decisive for the Bistro platform. The governments of individual countries (including the Slovak Republic) have introduced restrictions on free movement to slow down the spread of the COVID-19 virus. Businesses had to be closed due to anti-pandemic measures and thus lost part of their sales. The Bistro platform operates on the territory of the Slovak Republic. So, it is an established platform. The COVID-19 pandemic significantly contributed to the positive trend of this platform's profitability. Bistro had an advantage over other delivery platforms operating in the territory of the Slovak Republic. This advantage lay in the familiarity and marketing of this platform. Other foreign platforms (especially Wolt) had to convince their customers of the advantages of the offered services. Wolt in the territory of the Slovak Republic thanks to its marketing activities and raising awareness of this expanding company. This platform succeeded mainly thanks to advantageous offers and discounts for consumers in the case of using and discovering the given service, but also to massive advertising throughout the territory of the Slovak Republic. This was also reflected in the increase in sales, but the high share of short-term liabilities reduced the profitability of this platform. Overall, the most significant growth was recorded by the Bistro Slovakia platform. The other examined platforms did not reach the required profitability values. COVID-19 pandemic had a dual impact on platforms, both positive and negative. It brought an opportunity to provide its services to a larger number of potential customers, especially due to closed restaurant operations. This situation was able to bring new financial resources to the platforms and they were also able to expand the portfolio of offered services. However, the platforms were already achieving unstable financial results in the period before the COVID-19 pandemic. The pandemic was able to increase sales, which, however, could not be reflected adequately in the profitability of platforms operating in the delivery service segment.

4. Discussion

Distinctive feature that must be considered in the area of the shared economy is also the environmental area. Environmental benefits are directly linked to the use of transport services, as the available modes of transport represent a significant share of overall air pollution. Special attention should be paid to enterprises operating in industrial production, where the level of air pollution and waste generation during the production process is enormously high. Furthermore, the responsibility of the final consumer of the products and his judicious handling of the produced waste (Hao et al., 2022). Authors Adam et al. (2021) in a study focused on the environment in connection with the COVID-19 pandemic, express the opinion that in response to the rapidly spreading virus around the world and the need to protect public health, state governments have introduced unprecedented measures, such as restrictions on free movement, restrictions on road and air travel transport, which ultimately led to reduced mobility of the population of countries around the world. The authors managed to find that there has been a reduction in atmospheric levels of air pollutants worldwide. A significant decrease occurred in the concentrations of substances such as nitrogen dioxide (NO_2), carbon monoxide (CO) and sulfur dioxide (SO_2).

To illustrate the impacts of shared transportation on the environment, Bolt platform conducted its own internal research, which was carried out in Berlin. The research, called Bolt City Vision, presents a comprehensive analysis processed with more than 800 studies on

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mobility in the city, with interviews and personal experiences with Berlin residents and the Bolt platform's own operational research. The research was carried out for the year 2022. It focused mainly on public transport, sharing cars, bicycles, scooters and e-scooters. After performing the analysis, certain results can be drawn from it. The results show that over the next 1 to 3 years, due to the use of all mentioned alternative forms of transport, the number of cars in this city will be reduced by 7%. Legally, this effect of reducing the number of automobiles also has an impact on the environment and the state of the air. With a 7% reduction in the number of cars, the residents of this European metropolis would save 508 hours of sitting in traffic jams every month of the year. The effect would also be reflected in the reduction of CO_2 emissions. In the short term, reducing the number of cars in Berlin by 7% would reduce the monthly emissions of CO_2 by 4.4 kilotons. In the event of a theoretical 32% reduction in the number of cars in 2027, Berlin's monthly CO_2 emissions would decrease by 13.4 kiloton. Converted, it would be equal to the annual energy consumption of 9,000 households. It is also necessary to mention another significant factor. The number of traffic accidents would be significantly reduced, namely approximately 514 fewer traffic incidents per month. It would mean up to 6,000 fewer traffic accidents for the entire calendar year (Bolt City Vision, 2022).

The current rates of food waste in developed economies are unsustainable in the long run from an economic, social, or environmental standpoint. Along the whole supply chain, as well as in the attitudes and behaviours of customers, structural adjustments will be required. The sharing economy is making a significant contribution to the effort to establish more sustainable patterns in the food industry as well. Specifically, several programs and start-ups are being established in the US and Europe that involve gathering and utilizing food surplus from shops and customers as well as promoting it (Falcone and Imbert, 2017). Several companies' in-home delivery helps restaurants deliver what, when, and where diners want to be served. Recently, in connection with the COVID-19 pandemic, "home food delivery systems" have gained special importance. With most European nations going through at least two waves of the COVID-19 pandemic and related lockdown measures, the applicability of restaurant delivery has grown, especially as restaurants have been forced to curtail their offerings to choose from (Cesnuityte et al., 2022). The COVID-19 pandemic has had rather negative effects on the sharing economy, but it can adapt and, given its benefits and potential (at least in the case of certain companies), can be expected to withstand and continue to develop (Safrova and Hejdukova, 2021). Public and shared transportation are among the sectors that have been severely affected by the COVID-19 pandemic, as they were perceived to be risky environments for disease transmission (Haddad et al., 2022). These factors are the main difference between shared passenger transport and delivery services, since the physical presence of the driver and the potential customer is necessary to carry out the journeys, unlike delivery services, which were able to carry out their orders even without the presence of the customer. The analysed platforms thus proceeded to expand their portfolio to include food delivery services in the form of Uber Eats and Bolt Food.

Shared transportation represents one of the most used forms of the shared economy. Platforms acting as an intermediary between the provider and the consumer of shared transportation services contributed to this fact (Sun et al., 2021). The enormous increase in awareness of shared transport offered the possibility to examine the functioning of these platforms, but also to evaluate transport in the territory of the Slovak Republic. In today's world, where digitization, robotization and artificial intelligence move production processes forward in a quick way, it is also necessary to think about the environment, so that innovations, progress, and their creation are in accordance with the principles protecting the environment (Chinoracky and Corejova, 2021). Free movement within countries around the world, within the member states of the European Union, traveling for the purposes of education, work, recreation, vacation

or other purposes is a great benefit. The possibility to travel the world, work and live abroad, travel for an internship was a common thing in the period before the COVID-19 pandemic. The virus, which changed the functioning of countries in the world in terms of health and economy, had a fundamental impact on free movement and travel. A similar statement can also be made in the segment of shared services in the field of transport and transportation of people, goods, and services. Personal contact when the driver transports a traveling customer cannot be replaced by any "online" form. Every day, many people, goods and services are transported along the built roads in the territory of the Slovak Republic. Cities and towns evolve in large part due to transportation and transportation infrastructure. In recent years, many world authors have begun to devote themselves in a massive way to the impact of the shared economy on various areas of human life. In the ride- and car-sharing industry, trust-based commercial sharing is advantageous to both users and providers. In comparison to traditional taxi businesses, drivers in the driving industry experience less obstacles to entrance, earn higher wages, and enjoy more flexible work schedules (Kashyap and Bhatia, 2018; Vaclavik and Pithan, 2018). Customers benefit from enhanced effectiveness and cost-effectiveness, especially when utilizing carpooling services like Uber or Bolt.

Sharing is closely linked and connected to the circular economy (or circular economy), which has gained urgent importance in recent years in connection with the global problems of the planet. The impulse of the need to solve climate problems was one of the main reasons for the development of the sharing economy system. The current linear system of consumption and production is unsustainable in the long term. Currently, we already see efforts on the part of institutions to appeal to individuals, but also companies operating in the industrial sector to introduce mechanisms for waste reduction, recycling, reuse of materials and bringing new and innovative procedures in the field of greening production. The findings from the research Bolt City Vision are also important for other European countries, including the Slovak Republic. Derive and apply from this survey also for transport and the situation in transport in the territory of the Slovak Republic. These findings from the research can also be useful for the Slovak Republic. The basic element that must be fulfilled in every innovation is that the innovation must be acceptable to the user. An innovation is of no use if consumers do not actually use it. Bolt City Vision research has shown that residents, especially of larger cities/metropolises, are able and willing to change their transport and travel habits and the way they move around the city. However, a lot of useful and relevant information for the Slovak Republic also flows from the mentioned research. The research did not only discuss shared transportation. A significant role is also played by public mass transport, which, even under the conditions of the Slovak Republic, represents a form of transport that continues to be used. It is not entirely possible to compare the metropolis of Germany with cities in Slovakia, especially in terms of the number of inhabitants, but also the overall traffic situation. However, certain parallels can be observed in both countries. The goal of the sharing economy is not to replace car ownership. However, we can already see that, especially in larger cities, residents prefer to use alternative forms of transport.

5. Conclusions

The financial analysis demonstrated the difference in the functioning of these platforms. We analysed the Uber Slovakia and Bolt Services SK platforms as typical representatives of shared passenger transportation in the territory of the Slovak Republic. The analysis was also supplemented by platforms such as Wolt Slovakia and Bistro, which represent the most widespread platforms in the field of meal and food delivery services. In the profitability

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analysis, we did not observe a clearly defining trend. The Uber platform on the territory of the Slovak Republic does not develop its activity in the same way as it was at the beginning of the platform's operation. Overall, we can say that apart from the Bistro Slovakia platform, which in 2021 achieves high above-average profitability values, the profitability of the platforms is relatively low. This fact is mainly because platforms in their balance sheets achieve relatively low values of profit after tax.

Studies in the sharing economy concentrate on platform usage, popularity, benefits or disadvantages of utilizing and offering different services. Research frequently ignores platform operations, financial and economic outcomes, and distinctions from other, more established industries. These facts were the focus of our analysis. Additionally, the research has immediate practical implications for Slovak Republic residents, as the expansion of shared transportation platforms in urban areas and cities can offer a more environmentally friendly alternative, frequently save customers time that they would have otherwise wasted in traffic, and generally offer a more effective mode of transportation. In addition, due to the analysis of studies dealing with the impact of the shared economy and specifically shared transportation, we managed to demonstrate the positive impact of using the available means of shared transportation within the territory of the European Union.

The analysis of shared transport platforms' financial and economic outcomes is crucial from a practical standpoint. Although these platforms are always evolving, their operation in the Slovak Republic—including during the COVID-19 pandemic—showed that they could adapt to changing market conditions and make full use of their platform's potential by diversifying the services they offer. The interests of numerous countries, including those outside of the Slovak Republic, like the countries of the Visegrad Group (the Czech Republic, Poland, and Hungary), must be considered while addressing future research challenges. One area of difficulty for the study seems to be charting the many sharing economy sectors, particularly the hotel services business (Airbnb). Among the barriers of this research, we can include the absence of other sectors of the sharing economy, such as the accommodation sector of the sharing economy (Airbnb) or the analysis of shared bicycles and scooters, which generally belong to the available forms of shared transportation of people, goods, and services. It is therefore necessary to be inspired by the legislative requirements of countries that have implemented the sharing economy as part of the national economy with the expected benefits and risks that the entire "ecosystem" of sharing can bring to ordinary citizens, villages, and cities. More extensive mapping of the available sharing economy sectors could bring further insights and challenges that sharing economy platforms have to go through.

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References

Adam, M. G., Tran, P. T., & Balasubramanian, R. (2021). Air quality changes in cities during the COVID-19 lockdown: A critical review. *Atmospheric Research*, *264*, 105823.

Akan, Y., & Tepeler, M. (2022). Sharing Economy in the Dimension of Sustainability and Trust. *Sosyoekonomi*, *30*(53), 447-464.

Alipour, M., & Pejman, M. E. (2015). The impact of performance measures, leverage and efficiency on market value added: Evidence from Iran. *Global Economics and Management Review*, *20*(1), 6-14.

Barbero, J., & Zofio, J. L. (2023). The measurement of profit, profitability, cost and revenue efficiency through data envelopment analysis: A comparison of models using BenchmarkingEconomicEfficiency.jl. *Socio-Economic Planning Sciences*, *89*, 101656.

Berg, J., Hilal, A., El, S., & Horne, R. (2021). World employment and social outlook: Trends 2021. *International Labour Organization.* https://www.ilo.org/global/research/global-reports/weso/2021/WCMS_795453/lang--en/index.htm

Boar, A., Bastida, R., & Marimon, F. (2020). A systematic literature review. Relationships between the sharing economy, sustainability and sustainable development goals. *Sustainability*, *12*(17), 6744.

Bolt City Vision. (2022, September 22). *Bolt's City Vision: Reducing car journeys in Berlin by 25%.* Bolt Blog. https://bolt.eu/en-gb/blog/blts-city-vision-reducing-car-journeys-in-berlin-by-25/

Botsman, R., & Rogers, R. (2010). *What's Mine Is Yours: The Rise of Collaborative Consumption*. Harper Collins.

Castellanos, S., Grant-Muller, S., & Wright, K. (2022). Technology, transport, and the sharing economy: Towards a working taxonomy for shared mobility. *Transport reviews*, *42*(3), 318-336.

Cesnuityte, V., Klimczuk, A., Miguel, C., & Avram, G. (2022). The sharing economy in Europe: Developments, practices, and contradictions. *Springer Nature.*

Chinoracky, R., & Corejova, T. (2021). How to evaluate the digital economy scale and potential?. *Entrepreneurship and Sustainability Issues*, *8*(4), 536-552.

Daglis, T. (2022). Sharing economy. Encyclopedia, *2*(3), 1322-1332.

Diana, H. I., & Maria, M. M. (2020). The importance of profitability indicators In assessing The financial performance of economic entities. *Annals of the University of Oradea*, *1*(1), 219-228.

Do, D. T. (2021). A study on financial performance of transport & warehouses firms listed on the Hanoi stock exchange. *Economics and Finance Letters*, *8*(1), 44-52.

Falcone, P. M., & Imbert, E. (2017). Bringing a sharing economy approach into the food sector: The potential of food sharing for reducing food waste. *Food waste reduction and valorisation: Sustainability assessment and policy analysis*, 197-214.

Gabor, D., & Lajos, B. (2019). Dilemmas of defining the sharing economy. *Ter es Tarsadalom*, *33*(1), 107-130.

Goffe, L., Chivukula, S. S., Bowyer, A., Bowen, S., Toombs, A. L., & Gray, C. M. (2021). Web augmentation for well-being: the human-centred design of a takeaway food ordering digital platform. *Interacting with Computers*, *33*(4), 335-352.

Haddad, H., Bouyahia, Z., & Horchani, L. (2022). On the Sustainability of Shared Mobility Since COVID-19: From Socially Structured to Social Bubble Vanpooling. *Sustainability*, *14*(23), 15764.

Hao, Y., Guo, Y., Li, S., Luo, S., Jiang, X., Shen, Z., & Wu, H. (2022). Towards achieving the sustainable development goal of industry: How does industrial agglomeration affect air pollution?. *Innovation and Green Development*, *1*(1), 100003.

Helbling, M., & Meierrieks, D. (2023). Global warming and urbanization. *Journal of Population Economics*, *36*(3), 1187-1223.

Huynh, T., & Gurtner, S. (2023). Resistance to the sharing economy: Why some consumers and providers do not participate in P2P sharing. *Journal of Cleaner Production*, *422*, 138628.

International Labour Organization. (2021). World Employment and Social Outlook – Trends 2021. https://www.ilo.org/global/research/global-reports/weso/trends2021/WCMS_795453/lang--en/index.htm

Jalles, J. T. (2023). Financial Crises and Climate Change. *Comparative Economic Studies*, 1-25.

Kashyap, R., & Bhatia, A. (2018). Taxi drivers and taxidars: a case study of Uber and Ola in Delhi. *Journal of Developing Societies*, *34*(2), 169-194.

Kuhzady, S., Seyfi, S., & Beal, L. (2022). Peer-to-peer (P2P) accommodation in the sharing economy: A review. *Current Issues in Tourism*, *25*(19), 3115-3130.

Martin, C. J. (2016). The sharing economy: A pathway to sustainability or a nightmarish form of neoliberal capitalism?. *Ecological economics*, *121*, 149-159.

Morseletto, P. (2020). Targets for a circular economy. *Resources, Conservation and Recycling*, *153*, 104553.

Nagy, M., & Valaskova, K. (2023). An Analysis of the Financial Health of Companies Concerning the Business Environment of the V4 Countries. *Folia Oeconomica Stetinensia*, *23*(1), 170–193.

Nguyen V. H., Nguyen, T. T. C., Nguyen, V. T., & Do, D. T. (2021). Internal factors affecting firm performance: A case study in Vietnam. *Journal of Asian Finance, Economics and Business*, *8*(5), 303-314.

Pap, J., Mako, C., & Miklos, I. (2021). High-Growth Platform in the Delivery Economy (WOLT-The Hungarian Case). *Social Science Research Network*.

Popov, E. V., & Veretennikova, A. Y. (2022). Typology of digital platforms in shared economy. *Terra Economicus*, *20*(4), 45-58.

Register of financial statements (2023a). Individual Financial Statements of Bolt Services SK. https://www.registeruz.sk/cruz-public/dmain/accountingentity/show/1825290

Register of financial statements (2023b). Individual Financial Statements of Wolt Slovakia. https://www.registeruz.sk/cruz-public/domain/accountingentity/show/1854119

Register of financial statements (2023c). Individual Financial Statements of Uber Slovakia. https://www.registeruz.sk/cruz-public/domain/accountingentity/show/1603220

Register of financial statements (2023d). Individual Financial Statements of Bistro Slovakia. https://www.registeruz.sk/cruz-public/domain/accountingentity/show/1736801

Safrova, D., & Hejdukova, P. (2021). COVID-19 pandemic and the sharing economy. *Humanities and Social Sciences*, *3*, 55-64.

Sun, Z., Wang, Y., Zhou, H., Jiao, J., & Overstreet, R. E. (2021). Travel behaviours, user characteristics, and social-economic impacts of shared transportation: A comprehensive review. *International Journal of Logistics Research and Applications*, *24*(1), 51-78.

Tham, W. K., Lim, W. M., & Vieceli, J. (2022). Foundations of consumption and production in the sharing economy. *Electronic Commerce Research*, 1-24.

Vaclavik, M. C., & Pithan, L. H. (2018). The agency search: The meaning of work for app drivers. *RAM. Revista de Administração Mackenzie, 19*.

Williams, G., Tushev, M., Ebrahimi, F., & Mahmoud, A. (2020). Modeling user concerns in sharing economy: the case of food delivery apps. *Automated Software Engineering*, *27*(3-4), 229-263.

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THE IMPACT OF SOFT SKILLS DEVELOPMENT ON THE PERFORMANCE AND PROFITABILITY OF CONSTRUCTION COMPANIES: A CASE STUDY IN THE CZECH REPUBLIC

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Abstract:
Research background: This study examines the potential impact of modifying the profiling of management and professional abilities on the performance of construction companies, with the aim of enhancing the value delivered by these organisations to their owners and consumers. To obtain a response to this inquiry, we conducted a comparative analysis of 41 construction firms operating in the South Bohemia region of the Czech Republic.
Purpose of the article: In contemporary society, operational managers bear a significant responsibility for effectively guiding their subordinates towards the achievement of organisational objectives. Simultaneously, it can be argued that, considering the unavoidable transformations in the labour market, employers must embrace the skills required for the future to effectively respond to the rapidly evolving corporate landscape.
Methods: This investigation involved the utilisation of correlation analysis, a one-criteria analysis of variance, and the chi-square test. Our research has provided a strong focus on the distinctive characteristics of first-line managers. Instances of this phenomenon can be observed inside construction enterprises, where it is manifested through the roles of foremen and group leaders.
Findings & Value Added: Moreover, fostering a wider range of soft skills is not only beneficial but also imperative. This assertion can be substantiated by illustrating the necessity for employers to embrace future-oriented talents as a means of effectively responding to the rapidly increasing pace of change within the business landscape. The implications of the solution's findings suggest that the matter of managerial and professional abilities within the building sector is presently relevant, essential, and holds social significance. This assertion holds validity when considering the industry's transformations that arise directly from the crisis.

Keywords: managerial competencies; organizational management; crisis conditions; soft skills; management

JEL Classification: J53; L25; M12

1. Introduction

According to the theoretical foundations of scientific management, which are now taught in universities with an economic profile, this discipline is perceived as a system of managerial authority and control (Manaf et al., 2020). In terms of management and professional skills, the construction industry is behind other industries. This lack of competence results in poor project outcomes, cost and time overruns, and loss of value to the company. To improve the performance of construction companies and increase their value to both the owner and the client, it is necessary to fundamentally change the profile of managerial and professional competencies. In a dynamic business environment, most companies already recognize that effective, focused, and creative management is key to the future sustainability of construction companies. However, not all companies have created the appropriate conditions for the innovation of managerial competencies in their internal environment. The relationship between human capital and economic performance has long been known and respected by the management of companies, but it is not always implemented in corporate practise. As a result, the public administration tries to support the development of specific types of work skills (Siepel et al., 2019). Peri et al. (2015) suggest that the presence of educated managers and other workers is associated with higher value-added creation, regional levels of labour productivity, wage growth, and the development of digitalisation and robotization processes. Several international studies have shown that the economic stagnation of some EU countries and their declining productivity are due to insufficient or absent managerial skills. This reality of many sectors, including construction, can be documented in several scientific outputs that address this issue (Erceg and Zoranovic, 2020). According to a survey conducted by the European Commission, the level of managerial skills and competencies is related to the level of data and knowledge management (Ada et al., 2021). The management paradigm continues to deepen because of first the COVID pandemic and then the energy, material and political crises. There is an existential need for all sectors, including the construction industry, which has been significantly affected by these crises, to change, especially to implement changes in the education and profiling of managers at all levels of management.

2. Literature Review

It is objective to state at the outset of this section that many managers now perceive corporate strategy as a business strategy comprised of business product models. Entrepreneurial or business strategy has a significant impact on the development, growth, and profitability of SMEs (Latifah et al., 2020), which are predominant in the construction industry. Since business strategy dictates the long-term direction and goals of an organisation, it can also facilitate the achievement of competitive advantage in many ways (Wang et al., 2021). Competitive advantage is the key to the success of a business, and business strategy is a long-term plan to achieve competitive advantage by influencing the financial behavior of the business (Dobrovic et al., 2019). According to Porter (1980) and Yuan et al. (2020), business strategy is based on the activities of the business and the decisions that management makes are in response to changes in the business environment. In recent years, the concept of business strategy has changed significantly, among other things, due to the huge reduction in the time required for

innovation (Gavurova et al., 2021). Consequently, it is natural that businesses look for ways to significantly reduce costs, maximise customer satisfaction, and often use, for example, outsourcing (Hira, 2019). Regardless of technology or environment, business owners and managers must employ change management frameworks and techniques (Keengwe et al., 2009). Business enterprise models should be applied in accordance with the internal corporate environment, especially the intermediate environment that determines the competitive ring of a given company (Strakova et al., 2017). The value chain also contributes to a sound strategic analysis of opportunities and risks as one of the basic tools to build a successful competitive strategy (Strakova et al., 2020). Education and skills of managers and employees, as well as the size of the company, must also be part of the enterprise strategy (Qehaja and Kutllovci, 2020). The new concept of an enterprise's business models consists in establishing its value-creating processes and distinguishing them into primary processes where value is added (margin) and supporting processes (Talir and Strakova, 2023).

According to Domanizova et al. (2021), Bidmon and Knab (2018), established businesses do not respond to crises by adopting new technologies, business perspectives and models. The rationale given is that established companies in the industry are trapped in leveraging their existing assets, capabilities, strategic commitments, value networks, and business strategies (Onufrey and Bergek, 2021). Zimmer et al. (2017) emphasise the need for fundamental innovation in business processes, while Koster et al. (2017) highlight the link between the innovation process in a firm and the development of new products and services. Pedersen et al. (2018) examined the links between business process innovation, corporate sustainability, and organisational value and identified their interconnectedness and interdependence. Business managers are looking for modern approaches and strategies to compete with rivals and provide innovative, attractive, and quality goods and services to their customers at competitive costs (Do et al., 2020). In this context, process quality management is a feasible and sustainable alternative that can systematically contribute to the consolidation of an organisation's production capacity (Androniceanu, 2017). According to Abdul-Rashid et al. (2017), it is necessary to set acceptable constraints for sub-business processes, production processes and managerial capabilities.

Although most business managers are results-orientated, few decisions respect the value of human capital in business processes as a carrier of added value (Capestro and Kinkel, 2020; Pelster and Schaltegger, 2021). Human capital has become a matter of strategy within management systems in the current economic environment (Boon et al., 2018; Niculae et al., 2019). Investing in people is the first and most important element of a sustainability plan that uses talent as the main driver of human capital growth (Bonner et al., 2022). According to Gianchandani (2018), 77% of the world's youth workforce will be made up of young people between the ages of 15 and 25 in Asia, Africa, and the Pacific, and with an estimated 70.9 million of these people estimated to be unemployed, it is critical to invest in their potential and develop their skills and capabilities. It is essential to recognise that people represent the human capital of organisations and that everyone should be able to use and develop their skills to provide quality services to the public (Sousa and Nobrega, 2018). It is no coincidence that the initial phase of purposeful design or modelling of organisational processes has focused on the business and sales domains, and it should be objectively stated that this trend continues. This can be explained by the paramount importance of satisfying consumer needs, which is a prerequisite for the competitiveness of the company. Perceiving human capital as a part of the overall capital of the enterprise is a prerequisite for solving all crisis situations (Plotnikov and Pirogova, 2018). This is also related to the change in the behaviour of company employees (Tafvelin et al., 2020). In 2009–2013, Traylor et al. (2021) found that employee performance

was not systematically evaluated; therefore, soft skills were prioritised over hard competencies. Soon, companies with good production potential and talented individuals will become more competitive, and talented employees must play a vital role in achieving strategic goals due to their valuable knowledge and skills (AlQershi et al., 2020). As a result of technological advances, human capital and production technologies compete in all sectors. Therefore, it is essential to adapt and recognise the need to acquire new skills early on to increase one's own capabilities (Pasch, 2019). However, not all levels require the same competencies, and it is essential that a company to determine which component falls into which category (Zhou et al., 2018). In the construction industry, setting competencies can increase the efficiency of each department and allow the organisation to achieve its objectives. A company can positively influence competencies by continuously improving them and improving them in many ways (Pratolo et al., 2020). In a study by Amdani et al. (2019), it was confirmed that competencies positively and significantly affect the performance of these employees.

Companies are trying to enter the digital sphere and sell their products and subsequently their services through their websites and the Internet (Tolstykth et al., 2019). Mazurchenko et al. (2020) suggest that the successful use of employees' digital knowledge, skills, interests, and experiences varies significantly by the main sector of the organisation. According to Tolstykh et al. (2019), the digital revolution is radically changing the way businesses operate. In the construction industry, these changes are resonating more and more strongly, not always matched by managerial behaviour and their level of competence corresponding to the current level of construction technology. Therefore, managers of these enterprises are looking for modern approaches and strategies to compete with rivals and provide innovative, attractive, and quality products and services to their customers at competitive costs (Do et al., 2020). Production and business process management are feasible and sustainable alternatives to construction. These processes systematically contribute to the consolidation of a company's production capacity (Androniceanu, 2017). According to Abdul-Rashid et al. (2017), product-based business processes and the corresponding managerial competencies are essential. The goal is to achieve a balance between sustainable production processes and economic sustainability, taking into account environmental, economic, and social factors in addition to managerial decision making (Hannila et al., 2020). The authors of the study believe that there will be an opening of a discussion in the field of the new profiling of managers in line with the ideas of new and circular economies, as well as the social challenges of our time.

According to the literature review conducted, the research activities and the following hypotheses and research questions were established:

Q1: What management competencies are the most important and most used in the construction industry?

H1: The age of the employee influences the number of practical and managerial competencies acquired.

H2: The level of soft skills is conditioned by the level of hard skills in the context of work performance.

H3: There is a synergy between the employee's level of soft skills and the type of self-learning required by the employee.

3. Methodology

The database covers the years 2020 to 2022 and consists of 41 construction companies operating in the regional area of the Czech Republic. The test set includes all sizes of construction companies. Statistical data processing used correlation analysis, one-criteria

ANOVA, and Chi-Square. The correlation analysis will analyse the dependence between the selected variables using the correlation coefficient r, which ranges from -1 to 1. If the correlation coefficient is close to 1, it is a direct relationship. If the result is close to -1, it is an indirect relationship. The last form is independence, which occurs when the value of r is equal to 0 (Dwiyanti et al., 2021; Katthi and Ganapathy, 2021). The one-criteria mathematical model of ANOVA will be used to test the hypotheses to prove the relationship between the quantitative variable and the factor. The result of the analysis is the p-values, where a p-value greater than 0.05 (Akbay et al., 2019; Kim, 2022) confirms the validity of the set hypothesis. ANOVA sample is calculated:

$$y_{ij} = \mu + \alpha_i + \varepsilon_{ij}, \tag{1}$$

where y_{ij} is measured value

μ is mean value

α_i is change in the measured value caused by a factor

ε_{ij} is experimental error

Following the previous model, the Chi-square test will be used to statistically test the agreement between expected and observed values. Chi-square should only be used for a certain frequency of data, as otherwise it may lead to erroneous data. As with the ANOVA method, we only perform hypothesis testing if the p-value is greater than 0.05 (Berrett and Samworth, 2021; Xu et al., 2019). Pearson's goodness-of-fit test is calculated:

$$\chi^2 = \sum_{i=1}^{k} \frac{n_{ei} - n_{oi}}{n_{0i}}, \tag{2}$$

where n_{ei} is experimental frequency

n_{0i} is theoretical frequency

4. Results

According to the context of the research question, a correlation analysis was carried out in the first stage of the investigation, in which the interdependence of competencies (the so-called hard competencies) was analysed in terms of occurrence, that is, which competencies are used most often together, and in terms of importance, that is, which competencies are most valued by employees in terms of their managerial function. The results of the correlation analysis are presented in Figure 1, including the legend relating to each competency.

The highest value of perceived contingency between A1: 'managerial' and A2: 'organisational', then A1: 'managerial' and A3: 'personnel', and finally A3: 'personnel' and A7: 'social' can be considered as new and innovative knowledge in the field of managerial competencies. This finding confirms in practise the ongoing process of innovation of managerial competencies built on four pillars, namely managerial, organisational, personal, and social. The dominance demonstrated in the parameters A1 and A2 "organisational management". It is assumed that there will be an increasing significance between the domain's "personnel" and "social", where the latter will increase in importance in the context of increasing crises in society and the corporate sphere. The perceived relevance of competencies with a medium level of conclusiveness was identified between parameters A3: 'personal' and

A1: 'managerial', and for parameter A5: 'conceptual.

Figure 1: Results of the correlation matrix

What kind of competence do you use the most?								
	1.000	**0.660**	**0.658**	-0.035	0.481	-0.203	0.528	**A1**
	A1	1.000	0.535	-0.084	0.480	-0.334	0.556	**A2**
A1	1.000	**A2**	1.000	-0.118	0.557	-0.105	**0.608**	**A3**
A2	0.580	1.000	**A3**	1.000	0.203	0.532	-0.084	**A4**
A3	**0.741**	0.557	1.000	**A4**	1.000	-0.026	0.366	**A5**
A4	0.230	0.281	0.238	1.000	**A5**	1.000	-0.152	**A6**
A5	0.568	0.532	**0.654**	0.487	1.000	**A6**	1.000	**A7**
A6	0.120	0.114	0.240	0.569	0.422	1.000	**A7**	
A7	0.535	0.535	0.586	0.149	0.534	0.211	1.000	

What competencies are you most important?			
Legend:		**A4**	Technical
A1	Control	**A5**	Conceptual
A2	Organisational	**A6**	Manual dexterity
A3	HR	**A7**	Social

Source: authors

In a follow-up stage, the so-called soft skills domain, which are functionally related to the competencies tested in the previous table, was analysed using correlation analysis. Testing these competencies only makes sense if they are linked to the daily tasks of business managers, in our case, construction managers, performed by managers throughout the work cycle. It is objective to state that the dominance of individual managerial competences also depends on the contract portfolio of construction companies. The researchers tried to create a test set of companies with similar or close construction activities. The results are presented in Figure 2.

Figure 2: Results of the correlation matrix

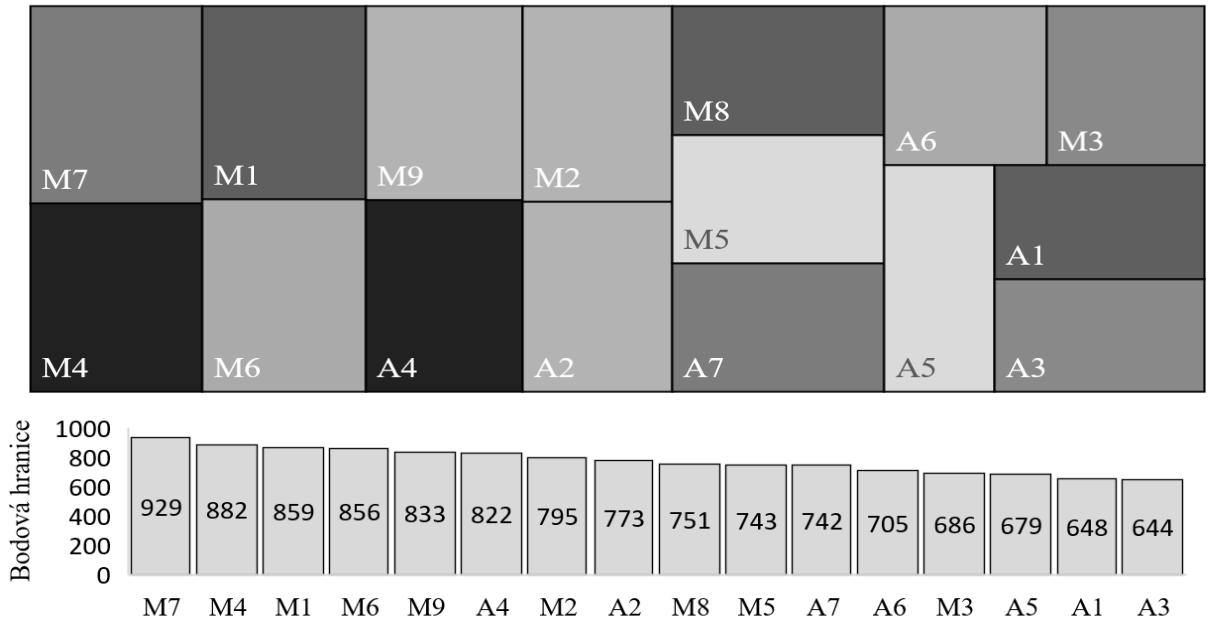
	M1	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**
M1	1.000								
M2	0.501	1.000							
M3	0.372	0.392	1.000						
M4	0.484	0.399	0.437	1.000					
M5	**0.567**	0.289	0.532	0.444	1.000				
M6	0.516	0.362	0.209	0.428	0.436	1.000			
M7	**0.564**	0.376	0.183	0.502	0.287	**0.561**	1.000		
M8	**0.672**	0.428	0.376	0.475	**0.591**	0.485	0.435	1.000	
M9	0.398	0.343	0.271	0.381	0.197	0.412	0.528	0.369	1.000

Legend					
M1	Communication skills	**M4**	Critical thinking	**M7**	Independence
M2	Teamwork	**M5**	Empathetic approach	**M8**	Assertiveness
M3	Creativity	**M6**	Flexibility	**M9**	Lifelong learning

Source: authors

The parameter with the highest reliability coefficient was M1 “communication skills” with M8 “assertiveness” with a coefficient of 0,672, followed by M5 “empathetic attitude” with M8 “assertiveness” with a coefficient of 0,591. The conditional relationship between M1 “communication skills” and M5 “empathic approach” was also found with a coefficient of 0,567. There is a consensus in the scientific and professional community that the two types of competence are mutually conditional, integrated at the same time. Therefore, it is recommended to maintain this concept in the field of corporate management education by strengthening and improving them in business managers. This observation led to the development of Figure 3, which shows both their conditionality and the frequency of individual managerial competences in their management and decision-making process.

Figure 3: Results of the correlation matrix



Source: authors

The most widely used evaluation metric was M7, followed by M4 in terms of A4 and A2. Our investigation continues with the assessment of managerial and professional skills to confirm the statistical significance of the distinctive factors evaluated. The results of the analysis are presented in the following table (Table 1).

Table 1: ANOVA one-criteria test: management competence

ANOVA test	**Tested factor: a 1 – "management competence"**				
	Df	**Sum Sq**	**Mean Sq**	**F value**	**Pr (>F)**
Working positions	5	9.69	1.9371	2.113	**0.0653**
Residuals	205	187.94	0.9168		
Length of time in post	3	3.98	1.3282	1.42	0.238
Residuals	207	193.65	0.9355		
Higher educational qualification?	3	2.97	0.9898	1.053	0.37
Residuals	207	194.66	0.9404		
Age group	2	2.43	1.2142	1.294	0.276
Residuals	208	195.20	0.9385		
	Tested factor: a 4 – "technical competence"				
	Df	**Sum Sq**	**Mean Sq**	**F value**	**Pr (>F)**
Working positions	5	16.43	3.286	3.928	**0.00201 ****
Residuals	205	171.49	0.837		
Length of time in post	3	8.02	2.6718	3.074	**0.0287 ***
Residuals	207	179.91	0.8691		
Higher educational qualification?	3	7.1	2.3677	2.711	0.0461 *
Residuals	207	180.8	0.8735		
Age group	2	3.46	1.7301	1.951	0.145
Residuals	208	184.46	0.8868		

*Note: [Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05'. 0.1'' 1]*
Source: authors

Due to the limited capacity of the paper, the results of hard-competency analyses are presented. The results of the analysis are presented in Table 1. The assumptions were not confirmed. Strong and statistically significant outcomes were not obtained for both types of competencies. From this perspective, the factor "job position" can be more favourably evaluated for the management competencies, whose p-value was close to the acceptance value of 0,0653, indicating minimal statistical dependence. This can be explained by the very strong

interdependence of the two parameters tested. For technical competence, the results are more positive, where the highest p-value of 0.00201 was found for the job position, followed by 'work time' with a p-value of 0.0287 and 0.0461, was for 'type of education'.

The last stage of the research activities was the implementation of "Structural Equation Modelling" using chi-square. The aim of this part was to find out the statistical significance between the form of training, feedback from subordinates, and soft and hard skills level acquired in relation to employee's job performance. The findings of this part of the solution are presented in Table 2.

Table 2: Results of the Structural Equation Modelling: Chi-square test

External links from Structural equation modelling – Chi-squared test			
What kind of education would be the most suitable for you?	**X-squared**	**df**	**p-value**
How do you handle feedback from subordinates, colleagues?	7.2169	4	0.1249
How do you process feedback from subordinates, colleagues?	**X-squared**	**df**	**p-value**
What is your level of soft skills?	8.8062	8	0.3589
What is your level of soft skills?	**X-squared**	**df**	**p-value**
Does your level of soft skills affect your job performance?	60.897	16	**3693E-6**
Does your level of soft skills affect your job performance?	**X-squared**	**df**	**p-value**
Does your level of hard skills affect your job performance?	46.914	16	**7024E-4**
Does your level of hard skills affect your job performance?	**X-squared**	**df**	**p-value**
What kind of education would be the most appropriate for you?	5.7238	8	0.6781
Internal links from structural equation modelling – Chi-squared test			
What kind of education would be the most suitable for you?	**X-squared**	**df**	**p-value**
What is your level of soft skills?	16.516	8	**0.03556**
How do you process feedback from subordinates, colleagues?	**X-squared**	**df**	**p-value**
Does your level of soft skills affect your job performance?	21.087	8	**0.00692**
What is your level of soft skills?	**X-squared**	**df**	**p-value**
Does your level of hard skills affect your job performance?	28.687	16	**0.02614**
Does your level of soft skills affect your job performance?	**X-squared**	**df**	**p-value**
What kind of education would be the most appropriate for you?	8.2979	8	0.4049
Does your level of hard skills affect your job performance?	**X-squared**	**df**	**p-value**
How do you process feedback from subordinates, colleagues?	12.899	8	0.1154

Source: authors

As can be inferred from the data in Table 2, statistically significant relationships were confirmed between the five parameters tested. The relationship between the level of soft skills acquired and their potential contribution to the employee's job performance was confirmed (p-value = 3693E-6). A similar significance (p-value = 7024E-4) was analysed between the level of soft skills achieved and the level of hard skills achieved in terms of job performance, between the choice of the most appropriate type of training and its effect on the level of soft skills (p= 0.03556). Statistical significance (p = 0.0069) was identified between the "attitude toward getting feedback from colleagues and subordinates" on the "employee's job performance". The significance was also tested between "soft skill level" and "effect of hard skill level" on "employee's job performance". As shown in Figure 3, the entire testing procedure and its results can be illustrated using an established diagram called "Structural Equation Modelling", which consists of external and internal links. The dependency found can be described as significant and inspiring for setting the training policy of managers in construction companies. The basic premises of the findings can be summarised in three areas. The first point is to the necessary linking and simultaneous balancing of both forms of managers' skills within their educational process, provided by both internal and external resources. The second insight relates to the need to differentiate corporate training in managerial competencies according to management levels. The third area aims to indicate the need to specify the educational cycle of managers according to individual sectors or parts thereof.

5. Discussion

There is a consensus on the irreplaceable importance of managerial competencies for the efficient and sustainable management of construction companies. The crisis caused by the COVID-19 pandemic and subsequent turbulence in energy, material, and price has negatively affected construction companies with great intensity. This further enhances the importance of the issue addressed in the present document, where management skills can be considered as one of the tools to deal with these crises in the European Union. In terms of the verification of the set research question, focused on "Determination of the importance of individual competencies and their frequency of use" during management and decision-making by managers of construction companies, the following conclusions can be drawn. Considerable differentiation was analysed in terms of the importance of individual competences, similarly in terms of their use during the working day. These findings are in line with, for example, the research findings of Kovaci et al. (2021) and Plotnikov and Pirogova (2018), who attribute the fundamental importance of organisational management competencies to managers within the framework of technical competencies. Then, they are classified as supporting competencies in the areas of strategic and analytical thinking, the ability to organise work effectively, and a flexible approach with an emphasis on efficiency and results. Using correlation, we can identify the mutual integrity between the competences, where we found a cluster of competences consisting of managerial, organisational, and social competencies characteristic of "executive management". Similar clusters can be defined for managers at the tactical and operational levels. Communication, flexibility, operability, and empathy, including teamwork skills, start to predominate. Consistent with the findings in real business practise, the uniqueness of first-line managers has been confirmed. In construction companies, these are, for example, foremen, leaders of construction groups. Today, operational managers have the greatest responsibility to guide their subordinates to achieve corporate objectives.

In terms of testing the validity of the first hypothesis, "Employee's age influences the amount of acquired practical and managerial competences", it was rejected. The research showed that there is no statistically significant relationship between the working age of an employee and the acquired managerial competencies. The same and much more interesting finding is offered for the area of practical competences, where we measured a slightly higher level of significance, but this does not establish the premise to confirm the hypothesis.

The second hypothesis targeting "The level of soft skills is conditioned by the level of hard skills in the context of job performance" was confirmed. This is demonstrated by statistical analysis; at the same time, the interdependence between soft and hard skills was confirmed by the new finding that the results indicate an unequal relationship between the two types of skills. In case an employee excels in "hard" skills, a significant proportion of managers are analysed to be in the opposite condition in "soft" skills, and vice versa. This issue will be addressed in the following research activities. Traylor et al. (2021) and Tang (2019), who addressed the interdependence of "hard and soft skills" considering the balance between these attributes as optimal, but not as a prevailing phenomenon in real practise, reached a similar conclusion.

The last hypothesis was directed at testing 'the existence of a synergy between the level of soft skills of an employee and the type of self-education desired by the employee'. Employee training is not only a matter of the current education system but also a tool for organisations to expand their expertise and get to know their employees. From this perspective, the existence of a link between the quality of 'soft skills' and the requirement or types of corporate training received by construction company employees has been demonstrated. We can conclude that the last hypothesis is confirmed. In this case, we can rely on similar findings of other authors, such as Mazurchenko et al. (2020) and Tolstykth et al. (2019). They state that, given the inevitability

of changes in the labour market, employers need to adopt the skills of the future to adapt to the increasing speed of change in the corporate environment, and further state that the development of broader soft skills is beneficial and necessary. Furthermore, the conclusions of the following authors regarding the speed of change support the validation of the hypothesis. In the past, change took place over a period of twenty years, whereas today it occurs on average over a period of two to five years. At the same time, the useful life of professional skills is decreasing. Even software developers must update their knowledge every 12 to 18 months (Erceg and Zoranovic, 2020; Liu et al., 2019).

6. Conclusions

The results of the solution indicate that the issue of managerial and professional skills in the construction sector is current, necessary, and, especially regarding the changes that occur in the sector because of crisis conditions, socially significant. To improve managerial competencies, it is important to first identify areas where improvements can be made and then put these findings into practise. With this goal in mind, the authors approached the problem, where the motivation was to learn about the real situation in the corporate sphere in terms of managerial quality. The existing forms of their corporate training are in many cases of a general nature and are not aimed at the competencies that are crucial in terms of the changes that are taking place in the construction industry (Gudanowska et al., 2020). This aspect has also been the subject of research activities. Although there are defined standards for individual competences, these are partly outdated and do not reflect technical, organisational, managerial, and economic changes in the construction sector. It is a fact that even these are not adhered to in company practise, even though adherence to them is a prerequisite for reviewing company competencies in line with the set standards. The relationship between human capital and economic performance is well known and is generally accepted but not implemented in all companies (Mandal et al., 2020). It is believed that the long-term stagnation and declining productivity of European countries are due to their managerial skills, or lack thereof. An enterprise can positively influence the competences of its employees, if there is systematic, targeted, systematic care of employee training with feedback of its effectiveness which is consistent with the study by Nursaid et al. (2021).

The competencies of corporate managers in construction companies have been analysed from different perspectives in research activities. In terms of their importance, interdependence, frequency of their use, in terms of the relevant management levels, and especially in the breakdown of the so-called "hard and soft competences. Statistical methods were used to determine the significance of the observed links and priorities. A new element in the research on managers' competencies was the clustering of competencies for individual groups of managers. The clustering of competencies allowed for a definition of ‘executive management’, with the specification of its competencies. A further output of this process was a set of two conceptual competencies related to HR, which create the prerequisites for "first-line managers". The field of training is not only a question of the current educational system but also a means of helping construction companies develop their know-how and a way of getting to know their employees. There is a synergy between the level of soft skills of an employee and the type of self-education the employee desires.

New business models aim to maximise value added in company processes, leading to increased profitability for most businesses (Strakova et al., 2022). These significant changes in business strategy need fundamental adjustments in corporate manager profiles. Creative and imaginative managers, cultivated in new training programmes, carry the new economy's goals,

and sustain businesses. According to Gianchandani (2018), 77% of the global workforce will be 15–25-year-olds in Asia, Africa, and the Pacific. A long-term human resource business strategy influences a company's financial behaviour to gain a competitive advantage. Manager profiling is a new problem for the corporate sector, especially managers, in line with emerging sociological and economic challenges in Europe and the world. The writers know that managerial competencies are too complex to cover in one paper. In their contribution, the authors hope to start a scientific and lay discussion on this problem, which has been unjustifiably outside of business priorities during the economic crisis.

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References

Abdul-Rashid, S. H., Sakundarini, N., Ghazilla, R. A., & Thurasamy, R. (2017). The impact of sustainable manufacturing practices on sustainability performance: Empirical evidence from Malaysia. *International Journal of Operations & Production Managemen*t, *37*(2), 182-204.

Ada, N., Ilic, D., & Sagnak, M. (2021). A Framework for New Workforce Skills in the Era of Industry 4.0. *International Journal of Mathematical Engineering and Management Sciences*, *6*(3), 771-786.

Akbay, L., Akbay, T., Erol. O., & Kilinc, M. (2019). Inadvertent Use of ANOVA in Educational Research: ANOVA is not A Surrogate for MANOVA. *Journal of Measurement and Evaluation in Education and Psychology*, *10*(3), 302-314.

AlQershi, N. A., Diah, M. L. B. M., Latiffi, A. B. A., & Ahmad, W. N. K. W. (2020). Strategic Innovation and Competitive Advantage of Manufacturing SMEs: The Mediating Role of Human Capital. *Quality Innovation Prosperity-Kvalita Inovacia Prosperita*, *24*(3), 70-89.

Amdani, D., Sinulingga, S., Absah, Y., & Muda, I. (2019). The effect of competencies and organizational culture on employee performance ganesha while polytechnic. *International Journal of Scientific and Technology Research*, *8*(4), 155–159

Androniceanu, A. (2017). The Three-Dimensional Approach of Total Quality Management, an Essential Strategic Option for Business Excellence. *Amfiteatru Economic Journal*, *19*(44), 61-78.

Berrett, T., B. & Samworth, R. J. (2021). USP: an independence test that improves on Pearson's chi-squared and the G-test. *Proceedings of the Royal Society A-Mathematical Physical and Engineering Sciences*, *477*.

Bidmon, C. M., & Knab, S. F. (2018). The three roles of business models in societal transitions: New linkages between business model and transition research. *Journal of Cleaner Production*, *178*, 903-916.

Bonner, R. L., Neely, A. R., Stone, C. B., Lengnick-Hall, C. A., & Lengnick-Hall, M. L. (2022). Triaging your human capital: An integrative perspective on strategic human capital asset allocation. *Management Research Review*, *46*(3), 467-482.

Boon, C., Eckardt, R., Lepak, D. P., & Boselie, P. (2018). Integrating strategic human capital and strategic human resource management. *International Journal of Human Resource Management*, *29*(1), 34-67.

Capestro, M. M., & Kinkel, S. (2020). Industry 4.0. and Knowledge management: A review of empirical studies. *Knowledge Management and Organizational Learning*, *9*(1), 19-52.

Do, T. N., Kumar, V., & Do, M. H. (2020). Prioritize the key parameters of Vietnamese coffee industries for sustainability. *International Journal of Productivity and Performance Management*, *69*(6), 1153-1176.

Dobrovic, J., Kmeco, L., Gallo, P., & Gallo Jr., P. (2019). Implications of the Model EFQM as a Strategic Management Tool in Practice: A Case of Slovak Tourism Sector. *Journal of Tourism and Services*, *10*(18), 47-62.

Domanizova, P., Janickova, N., & Milichovsky, F. (2021). Specification of product value as a key part of the Canvas business model in the context of industry 4.0. *Littera Scripta*, *14*(1), 1-10.

Dwiyanti, L., Rusmawati, Y., Wisanggeni, A. & Nugraha, F. (2021). Correlation Analysis on Big Data for Legislative Election. *2021 International Conference on Data and Software Engineering (ICoDSE)*, Bandung, Indonesia,1-5.Erceg, V., & Zoranovic, T. (2020). Knowledge management and digital business transformation. *Strategic Management*, *27*(2), 57-63.

Gavurova, B., Cepel, M., Belas, J., & Dvorsky, J. (2021). Strategic Management in SMEs and Its Significance for Enhancing Competitiveness in the V4 Countries-A Comparative Analysis. *Management and marketing*, *15*(4), 557-569.

Gianchandani, P. (2018). *Why do companies invest in Vocational Training & Apprenticeships?* Valencia: Iated-INT Assoc Technology Education & Development.

Gudanowska, A. E., Kononiuk, A., & Debkowska, K. (2020). The Application of Cluster Analysis for the Selection of Key Competences of Future-Orientated Entrepreneurs. *Inzinerine ekonomika-engineering economics*, *31*(5), 565-574.

Hannila, H., Kuula, S., Harkonen, J., & Haapasalo, H. (2020). Digitalisation of a company decision-making system: a concept for data-driven and fact-based product portfolio management. *Journal of the decision system*, *31*(3), 258-279.

Hira, R. (2019). Outsourcing STEM Jobs: What STEM Educators Should Know. *Journal of Science Education and Technology*, *28*(1), 41-51.

Katthi, J. R., & Ganapathy, S. (2021). Deep Correlation Analysis for Audio-EEG Decoding. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, *29*, 2742-2753.

Keengwe, J., Kidd, T., & Kyei-Blankson, L. (2009). Faculty and technology: Implications for faculty training and technology leadership. *Journal of Science Education and Technology*, *18*(1), 23-28.

Kim, M. (2022). Application of functional ANOVA and functional MANOVA. *Korean Journal of Applied Statistics*, *35*(5), 579-591.

Koster, M., Vos, B., & Schroede, R. (2017). Management innovation driving sustainable supply management Process studies in exemplar MNEs. *BRQ-Business Research Quarterly*, *20*(4), 240-257.

Kovaci, I., Tahiri, A., Bushi, F., & Zhubi, M. (2021). Organization as a Function of Management and the Types of Organizational Structures that Apply in SMEs in Kosovo. *Quality-Access to Success*, *22*(181) 3-6.

Latifah, L., Setiawan, D., Aryani, Y.A., & Rahmawati, R. (2020). Business strategy–MSMEs' performance relationship: innovation and accounting information system as mediators. *Journal of Small Business and Enterprise Development*, *28*(1), 1-21.

Liu, Y., Chi, M., Zhao, J., & Huang, R. (2019). Digital business strategy as an initiator of e-business capability generation. *Proceedings Of Eighteenth Wuhan International Conference On E-Business*, 420-421.

Manaf, H. A., Harvey, W. S., Armstrong, S. J., & Lawton, A. (2020). Differences in personality and the sharing of managerial tacit knowledge: an empirical analysis of public sector managers in Malaysia. *Journal of Knowledge Management*, *24*(5), 1177-1199.

Mandal, K., Otola, I., & Roy, K. (2020). Is Trust Influencing Longer Business Relationship? An Empirical Study, *Proceedings of the 3rd International Conference Contemporary Issues in Theory and Practice of Management*, 189-197.

Mazurchenko, A., Zelenka, M., & Marikova, K. (2020). Influence of technological changes on digital competences in organisations. *Digitalized economy, society and information management, 49*. 41-48

Niculae, E., Ionescu, S. C., & Dima, D. (2019). The role of Integrated Management Systems in Strategic Management. *Management Perspectives in The Digital Transformation*, 555-560.

Nursaid, F. K. S., Martini, N. N. P., Sanosra, A., & Qomariah, N. (2021). The Impact of Competence and Work Environment on Employee Motivation and Performance in The Financial and Asset Management Division. *Quality-Access to Success*, *21*(185), 52-63.

Onufrey, K., & Bergek, A. (2021). Transformation in a mature industry: The role of business and innovation strategies. *Technovation*, *105*.

Pasch, T. (2019). Strategy and innovation: the mediating role of management accountants and management accounting systems' use. *Strategy of Management Control*, *30*(2), 213-246.

Pedersen, E. R. G., Gwozdz, W., & Hvass, K. K. (2018). Exploring the Relationship between Business Model Innovation, Corporate Sustainability, and Organizational Values within the Fashion Industry. *Journal of Business Ethics*, *149*, 267–284.

Pelster, M., & Schaltegger, S. (2021). The dark triad and corporate sustainability: An empirical analysis of personality traits of sustainability managers. *Business Ethics, the Environment & Responsibility*, *31*(1), 80-99.

Peri, G., Shih, K., & Sparber, C. (2015). STEM Workers, H-1B Visas, and Productivity in US Cities. *Journal of Labor Economics*, *33*(3), 225-255.

Plotnikov, V., & Pirogova, O. (2018). Key competencies as an enterprise value management tool. *Innovational Management and Education Excellence through Vision*, 1716-1721.

Porter, M. E. (1980). *Competitive Strategy*. New York: Free Press.

Pratolo, S., Sofyani, H., & Anwar, M. (2020). Performance-based budgeting implementation in higher education institutions: Determinants and impact on quality. *Cogent Business & Management*, 7(1).

Qehaja, A. B., & Kuttlovci, E. (2020). Strategy tools in use: New empirical insights from the strategy-as-practice perspective. *Journal of Contemporary Management Issues*, *25*(1), 145-169.

Siepel, J., Camerani, R., & Masucci, M. (2019). Skills combinations and firm performance. *Small Business Economics*, *56*(4), 1425-1447.

Sousa, M. G., & Nobrega, B. (2018). A aplicacao da gestao por competencias nos processos de gestao de pessoas: um estudo com os servidores tccnico-administrativos no Centro de Ciencias Juridicas e Sociais/UFCG. *REUNIR: Revista de Administracao, Contabilidade e Sustentabilidade*, *8*(3).

Strakova, J., Partlova, P., & Vachal, J. (2017). Vliv faktoru makroprostredi a mezoprostredi na ekonomickou stabilitu a rozvoj malych a strednich podniku v CR. *Logos polytechnikos*, *8*(3), 147-159.

Strakova, J., Rajiani, I., Partlova, P., Vachal, J., & Dobrovic, J. (2020). Use of the Value Chain in the Process of Generating a Sustainable Business Strategy on the Example of Manufacturing and Industrial Enterprises in the Czech Republic. *Sustainability*, *12*(4).

Strakova, J., Talir, M., & Vachal, J. (2022). Opportunities and threats of digital transformation of business models in SMEs. *Economics & Sociology*, *15*(3), 159-171.

Talir, M., & Strakova, J. (2023). Innovation of the production process of engineering companies in relation to business portfolio. *Entrepreneurship and Sustainability Issues*, *10*(4), 118-134.

Tafvelin, S., Schwaz, U. V., & Stenling, A. (2020). Leadership Training to Increase Need Satisfaction at Work: A Quasi-Experimental Mixed Method Study. *Frontiers in psychology*, 11.

Tang, K. N. (2019). Leadership in Business Organization. *Leadership and Change Management*, 1-19.

Tolstykh T. O., Shakarupeta E. V., Purgaeva I. A, & Federenko R. V. (2019). Transformation of positions, competences and skills in the digital economy industry. *GCPMED 2018 - international scientific conference global challenges and prospects of the modern economic development*, *57*, 953-959.

Traylor, A. M., Reyes, D. L., & Holladay, C. L. (2021). Do we practice what we preach? the association between Judgements of soft skills and performance evaluations over time. *Current psychology*, *41*(10), 7208-7214.

Wang, C., Brabenec, T., Gao, P., & Tang, Z. Y. (2021). The Business Strategy, Competitive Advantage and Financial Strategy: A Perspective from Corporate Maturity Mismatched Investment. *Journal of Competitiveness*, *13*(1), 164-181.

Xu, M. Y., Zhang, D. N. & Wei, B. W. (2019). Pearson's chi-squared statistics: approximation theory and beyond. *Biometrika*, *106*(3), 716-723.

Yuan, Y., Lu, L. Y., Tian, G., & Yu, Y. (2020). Business Strategy and Corporate Social Responsibility. *Journal of Business Ethics*, *162*(2), 359-377.

Zhou, J. M., Bi, G. B., Liu, H. F., Fang, Y. L., & Hua, Z. S. (2018). Understanding employee competence, operational IS alignment, and organizational agility - An ambidexterity perspective. *Information & Management*, *55*(6), 696-708.

Zimmer, P., Iata, C. M., De Souza, J. A., & Cunha, C. J. C. D. (2017). Determining Factors for Innovation Performance from Industries in Santa Catarina State. *Revista gestao & tecnologia-journal of management and technology*, *17*(3), 191-216.

BANKRUPTCY PREDICTION FOR THE MANUFACTURING SECTOR IN V4 COUNTRIES

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Abstract:
Research background: Nomenclature of Economic Activities NACE C includes the wide spread of enterprises, such as manufacturers of machinery and equipment, motor vehicles, trailers, semi-trailers, other transport equipment, etc., which affect many other sectors and imply importance for each economy and common region of countries. Because of this fact, it is important to analyse and predict the direction of corporate finance, focusing on financial health and bankruptcy.
Purpose of the article: The aim of this article is to map the level of bankruptcies in the manufacturing sector at Visegrad Group using a specific prediction model. The forecasting of the prosperity of enterprises covers the period before and during the COVID-19 pandemic period to identify the consequences of the pandemic. Developments in ratios for profitability, indebtedness, and liquidity, along with indicators of the composition of assets and liabilities, also support this investigation.
Methods: The study was realised based on a sample of 12,336 entities for the period 2017–2021. The median values of the selected variables were illustrated individually per country. Then predictions for the sample of Czech, Hungarian, Polish, and Slovak enterprises were run via a model created for conditions in transitive economies. The numbers of bankruptcies were described individually and for the whole region as well.
Findings & Value added: The predictions showed that the lowest number of non-prosperous entities was in 2017 and the biggest one in 2020. Thus, it was evidenced that the COVID-19 pandemic had an impact on the financial health of the manufacturing sector in the analysed region. Academicians may use this methodology and replicate it for other sectors, including services within transition markets. Practical implications serve to remove animosity among enterprises against prediction models because they have proven to be an early and effective tool of prevention during normal and crisis periods.

Keywords: bankruptcy; corporate finance; manufacturing; prediction; Visegrad Group

JEL Classification: G17; G33; L60

1. Introduction

Managerial decision-making is a significant determinant that impacts business performance. Business performance is one of the defining attributes of competitiveness in the market (Farida and Setiawan, 2022). Economic and financial analysis is an integral component of financial management to make successful decisions and provide a prosperous future without failure (Stefko et al., 2019). But corporate failure may take place in diverse forms and scales, with varying consequences for a contingent of stakeholders depending on the severity and nature of the failure. The growing number of various forms of corporate failure has resulted in the adoption of diverse definitions and connotations associated with failure (Kliestik et al., 2019). Then, a clear understanding and correct prediction of the financial health of a business are critical factors for its success and survival in the market. It is essential that the business maintain a healthy financial situation by setting financial goals and controlling them (Potkany et al., 2023). Kontus and Mihanovic (2019) note that the goal is to display summary data about the financial situation of the company, not only from the present but also regarding prospects. Osiichuk and Mielcarz (2020) describe the goals more comprehensively. They highlight that it is necessary to display summary data about the financial situation of the company to identify weaknesses and possible risks that could result in financial problems and to determine strengths and possible opportunities that could be improved in the future.

The financial management of businesses should be prepared for both anticipated situations and unanticipated crises, such as the COVID-19 pandemic (Kurniawan et al., 2023), that can have an impact on financial decisions. The World Health Organization officially recognized the COVID-19 illness as a pandemic on March 11, 2020. It was classified among the deadliest contagious illnesses (Ben-Ahmed et al., 2022). The crisis that the COVID-19 outbreak caused has had a significant impact on the global economy. The recession was presumed to be the most severe downturn since the era of World War II (Gebski, 2021). The economic ramifications of the epidemic have been amplified as global interconnectedness grows (Kolahchi et al., 2021). The market environment was susceptible to daily fluctuations during the COVID-19 pandemic. In addition, there were several adverse phenomena, including volatility in financial instrument prices, information asymmetry, financial instability, the rapid increase in unemployment, corporate insolvencies, and bankruptcies. This era has compelled numerous industries and businesses to implement "strategic turn" actions, which are distinguished by a broad and even comprehensive scope of required changes, a significant amplitude, a rapid distribution of changes over time (including the so-called crisis waves and other specific unpredictability of the crisis), and a rapid pace of actions and changes implemented (Obrenovic et al., 2020). Therefore, the companies had to monitor their financial health in more detail and be prepared to deal with such unforeseen circumstances (Exenberger and Kavcakova, 2020; Gavurova et al., 2022).

The COVID-19 pandemic has affected various sectors. Tourism, travel, hospitality, supply chains, consumption, production, operations, valuations, security, financial strain, and the costs of all goods—including fossil fuels and renewable energy sources—have been profoundly impacted by the massive uncertainty caused by COVID-19 (Chang et al. 2020). The number of unproductive companies has been increasing during the pandemic (Boratynska, 2021). The increase in bankruptcies has been disclosed also in manufacturing, which is a fundamental pillar of global economies (Berent and Rejman, 2021; Horvathova and Mokrisova, 2020). Meyer and Hassan (2020) discuss that the dynamic and growing manufacturing sector is critical for growth and that this sector is globally known as the "engine of growth" regardless of the phase of the economic cycles. Suhanyi et al. (2023)

prove its importance within the EU, including Visegrad Group countries (Czech Republic, Hungary, Poland, and Slovakia).

Thus, the aim of this study is to map the level of bankruptcies in the manufacturing sector at Visegrad Group using a specific prediction model. Blazek et al. (2023) confirm the significance of evaluating business performance by financial indicators in the region of Visegrad Four (V4). However, the novelty of this research consists of focusing on the failures of enterprises in the chosen sector (NACE C), covering the pre-crisis and crisis periods. In addition, an explanation of the development of eleven financial ratio indicators from 2017 to 2021 is provided. The applied bankruptcy prediction model is constructed based on these ratios.

The article is structured as follows: Firstly, the research background, significance, and novelty are discussed. The creation of samples from the manufacturing sector and the methodology used to replicate the study in other transition economies are covered in Chapter 2. The research results include the number of prosperous and non-prosperous enterprises during the period mentioned in Chapter 3. The findings from V4 are compared with the conclusions of the last studies from similar markets in Chapter 4. Finally, the limitations of this study are defined, and future research directions are highlighted.

2. Methodology

This research focuses on the manufacturing sector during the period 2017-2021. This period was chosen to cover the pre-crisis as well as the era of the pandemic. Ding et al. (2023) stress the importance of predicting corporate financial distress in the pre-COVID period. Bozkurt and Kaya (2023) add mapping bankruptcies and financial distress in the COVID-19 crisis as well. Valaskova et al. (2023) highlight the necessity of identifying bankruptcies based on the financial information for all sectors that operated in the Visegrad Group countries. That is why the following methodological steps were used:

1. Creation of the sample

The basis of the financial study was the ORBIS database, which contains data on 400 million global commercial and public enterprises and is used to predict bankruptcy in transition economies (Gajdosikova et al., 2022). The provider of the mentioned database is Bureau van Dijk. The study maps the V4. The final sample consists of 12,336 companies from NACE C after removing missing cases. Table 1 shows the number of enterprises for each country. The equal subsamples were used for each from the analysed period.

Table 1: The structure of the final sample of enterprises in V4 countries

V4 countries	Number of entities
Czech Republic (CZ)	2036
Hungary (HU)	1696
Poland (PL)	4566
Slovakia (SK)	4038
Sum	12,336

Source: own research

2. Running bankruptcy model

Lesakova et al. (2020) note that the bankruptcy risk of a company must be predicted using financial models. However, the lack of usage of these models is mostly due to their ignorance. It is recommended to apply prediction models to research and management work. The most prominent instruments used to assess the financial condition of an organisation consist of bankruptcy models (Vavrek et al., 2021). Present bankruptcy prediction models serve as a viable instrument for forecasting the financial problems that may affect enterprises (Stefko et

al., 2020). The domain of international financial forecasting comprises fundamental models, such as Altman's Z-score or Springate, Ohlson, and Zmijewski models, which are widely recognised and serve as foundational elements for numerous modified models (Karpac and Bartosova, 2020). Kliestik et al. (2019) created a prediction bankruptcy model for the conditions of transitive economies (TE) using the discriminative function y (Z-score), and it was used for prediction in the delivered study (equation 1).

$$\begin{aligned} y_{TE} = {} & -1.880 + 0.017X_2 - 0.024X_4 + 2.291X_{10} - 0.348X_{11} + 0.552X_{12} \\ & + 1.121X_{15} - 0.013X_{22} + 0.007X_{26} + 0.546X_{27} - 0.435X_{28} \\ & - 0.903X_{35} + 0.639\text{small} + 0.197\text{medium} - 0.113\text{BG} - 0.238\text{HR} \\ & - 0.112\text{CZ} - 0.48\text{EE} - 0.238\text{HU} + 1.037\text{LV} + 0.249\text{RO} - 0.409\text{RS} \\ & - 0.334\text{SI} + 0.387\text{NACE}_\text{B} + 0.097\text{NACE}_\text{C} + 0.33\text{NACE}_\text{D} \\ & + 0.169\text{NACE}_\text{F} + 0.578\text{NACE}_\text{I} + 0.23\text{NACE}_\text{J} + 0.348\text{NACE}_\text{N} \\ & + 0.36\text{NACE}_\text{P} \end{aligned} \tag{1}$$

where

$$X_2 = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$X_4 = \frac{\text{Net profit}}{\text{Equity}}$$

$$X_{10} = \frac{(\text{Noncurrent liabilities} + \text{Current liabilities})}{\text{Total assets}}$$

$$X_{11} = \frac{\text{Current assets}}{\text{Total assets}}$$

$$X_{12} = \frac{\text{Cash and cash equivalents}}{\text{Total assets}}$$

$$X_{15} = \frac{\text{Current assets}}{\text{Total liabilities}}$$

$$X_{22} = \frac{\text{Cash and cash equivalents}}{\text{Current liabilities}}$$

$$X_{26} = \frac{\text{Current assets} - \text{inventory}}{\text{Current liabilities}}$$

$$X_{27} = \frac{\text{Earnings after tax (EAT)}}{\text{Total assets}} \cdot 100$$

$$X_{28} = \frac{\text{Earnings after tax (EAT)}}{\text{Equity}} \cdot 100$$

$$X_{35} = \frac{\text{Earnings before tax (EBT)}}{\text{Operating profit}}$$

Using equation 1, it is possible to predict the future development of companies in transitive economies or classify them in the group of prosperous or non-prosperous enterprises. Since a constant is also used in the model, the resulting discrimination score is compared with the weighted average of the group centroids, which in this case is 0. It is then decided according to the rule that if the resulting Z-score is negative, the company is prosperous; in the case of a

positive Z-score value, the enterprise is included in the group of non-prosperous enterprises. If the business entity belongs to the category of small or medium-sized enterprise, it is located in the countries of Croatia (HR), Estonia (EE), Romania (RO), Bulgaria (BG), Slovenia (SI), Latvia (LV), Serbia (RS), and the Czech Republic (CZ), or it belongs to one of the NACE categories: B (mining and quarrying), C (manufacturing), D (electricity, gas, steam, and air conditioning supply), F (construction), I (accommodation and food service activities), J (information and communication), N (administrative and support service activities), or P (education), the value of the variable is equal to 1, otherwise 0.

The modification, followed by verification of predictive capability within a particular kind of economy and sector, is the advantage of prediction models. But Kitowski et al. (2022) also detect the disadvantage that it is advisable to employ discriminant and logit models to evaluate the likelihood of bankruptcy, together with other existing techniques for analysing the financial state of the company, such as risk scoring approaches and classic ratio analysis. Kovacova et al. (2019) and Kliestik et al. (2020) support the analysis of financial variables and indicators applied in bankruptcy models. The eleven ratios (X_2, X_4, X_{10}, X_{11}, X_{12}, X_{15}, X_{22}, X_{26}, X_{27}, X_{28}, X_{35}) from the prediction model mentioned were analysed individually for each country to depict their development over time. It was used IBM SPSS Statistics for calculation.

3. Results

Firstly, the descriptive statistics of the individual indicators was described. Then, it was graphically illustrated the development during the monitored period, that is, for the years 2017, 2018, 2019, 2020 and 2021. Finally, based on prediction models, the businesses from manufacturing sector were divided into prosperous and non-prosperous ones.

Table 2 shows the individual values of the medians of all ratios for each V4 country over a period of five years.

Table 2: Median values of the variables of V4 country

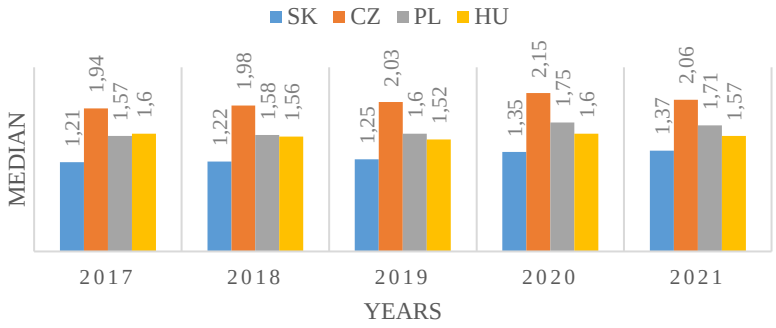
Country	Year	X_2	X_4	X_{10}	X_{11}	X_{12}	X_{15}	X_{22}	X_{26}	X_{27}	X_{28}	X_{35}
SK	2017	1.21	0.10	0.61	0.58	0.12	0.95	0.27	0.84	3.01	10.38	0.02
	2018	1.22	0.09	0.60	0.58	0.13	0.96	0.30	0.82	2.70	9.27	0.02
	2019	1.25	0.08	0.57	0.56	0.13	0.98	0.32	0.85	2.36	7.88	0.02
	2020	1.35	0.07	0.55	0.57	0.15	1.01	0.39	0.92	2.09	6.87	0.02
	2021	1.37	0.08	0.55	0.60	0.14	1.06	0.37	0.91	2.58	8.37	0.02
CZ	2017	1.94	0.10	0.43	0.63	0.18	1.38	0.54	1.24	5.63	10.23	0.04
	2018	1.98	0.09	0.43	0.63	0.16	1.37	0.53	1.23	5.14	9.26	0.03
	2019	2.03	0.09	0.42	0.63	0.17	1.40	0.60	1.28	4.67	9.04	0.03
	2020	2.15	0.08	0.40	0.62	0.20	1.49	0.76	1.38	4.23	7.85	0.03
	2021	2.06	0.09	0.42	0.66	0.19	1.50	0.64	1.25	4.85	8.88	0.04
PL	2017	1.57	0.11	0.47	0.58	0.07	1.18	0.21	1.01	5.10	11.28	0.03
	2018	1.58	0.12	0.47	0.57	0.07	1.17	0.21	0.99	5.09	11.55	0.03
	2019	1.60	0.11	0.46	0.57	0.08	1.19	0.24	1.01	5.14	10.98	0.04
	2020	1.75	0.12	0.45	0.58	0.12	1.26	0.39	1.13	5.75	11.57	0.04
	2021	1.71	0.14	0.45	0.60	0.10	1.29	0.29	1.04	7.31	14.48	0.05
HU	2017	1.60	0.10	0.46	0.58	0.19	1.22	0.53	1.02	5.16	10.30	0.04
	2018	1.56	0.11	0.47	0.58	0.18	1.22	0.48	0.95	5.27	10.66	0.04
	2019	1.52	0.09	0.46	0.56	0.18	1.21	0.51	0.93	4.63	9.43	0.03
	2020	1.60	0.10	0.48	0.57	0.22	1.19	0.67	1.04	4.79	9.84	0.04
	2021	1.57	0.12	0.79	0.59	0.21	1.19	0.57	0.97	5.62	11.54	0.05

Source: own research

Figure 1 shows the median values of the X_2 (current ratio) for individual V4 countries during the analysed period. The median of the ratio of current assets to current liabilities of

the monitored industry for the country of Slovakia had an increasing trend during the analysed years. For the Czech Republic, the trend was increasing only until 2020, and in 2021 there was a decrease. For Poland, the development of the median value followed the same course as for the Czech Republic. The last V4 country is Hungary, where the development of the median had a downward trend until 2019. In 2020, the median was at the same level as in 2017, but in the last analysed year, a further decrease occurred. The smallest median value was recorded in 2017, at 1.21 in the Slovak Republic.

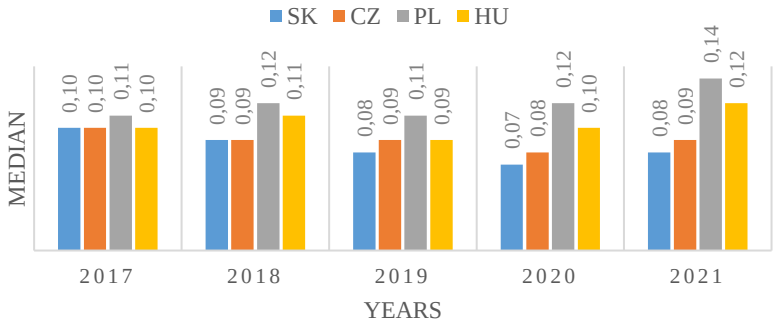
Figure 1: Development of the median X_2 value in V4 countries



Source: own research

Figure 2 shows the median values of the X_4 (return on equity based on net profit) for individual V4 countries during the analysed period. The median of the ratio of net profit to equity of the monitored industry for the country of Slovakia had a decreasing trend until 2020; the increase occurred only in 2021. For the Czech Republic, the trend was decreasing. For Poland, until 2020, the development of the median value had an alternating course, and the increase occurred only in 2021. The last V4 country is Hungary, where the development of the median had the same course of trend until 2020, and an increase was recorded in 2021. The largest median value was recorded in 2021, at 0.14 in Poland.

Figure 2: Development of the median X_4 value in V4 countries



Source: own research

Figure 3 shows the median values of the X_{10} for individual V4 countries during the analysed period. The median of the ratio of noncurrent and current liabilities to total assets of the monitored industry for the country of Slovakia had a downward trend until 2020, and there was no change in 2021. For the Czech Republic, the median value of the ratio was unchanged in the first two years, and from 2018 to 2020, the trend was decreasing. In 2021, the median value rose again. For Poland, until 2020, the development of the median value had the same course as in the Czech Republic, and in 2021, the value of the indicator did not

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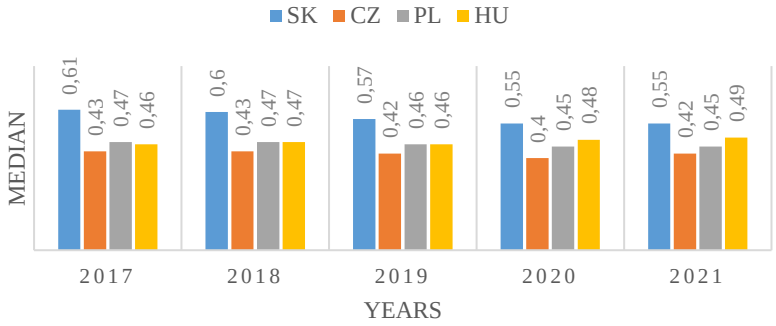
change. The last V4 country is Hungary, where the development of the median had an alternating trend until 2020, and an increase was recorded in 2021. The lowest median value was recorded in 2020, at 0.40 in the Czech Republic.

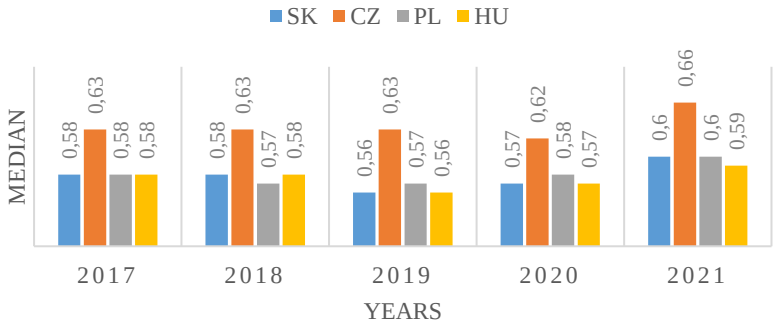
Figure 3: Development of the median X_{10} value in V4 countries



Source: own research

Figure 4 shows the median values of the X_{11} for individual V4 countries during the analysed period. The median of the ratio of current assets to total assets of the monitored industry for the country of Slovakia had a decreasing trend until 2019, and from 2020 on, the development had an increasing trend. For the Czech Republic, the median value of the ratio was unchanged in the first three years; in 2020, there was a decrease; and in 2021, the median value increased. For Poland, until 2019, the development of the median value had a decreasing course, and from 2020 on, the value of the indicator increased. The last V4 country is Hungary, where until 2018 the development of the median was the same; a decrease was recorded in 2019, and since 2020 the development of the indicator value has been increasing. The highest median value was recorded in 2019, at 0.56 in the Slovak Republic.

Figure 4: Development of the median X_{11} value in V4 countries

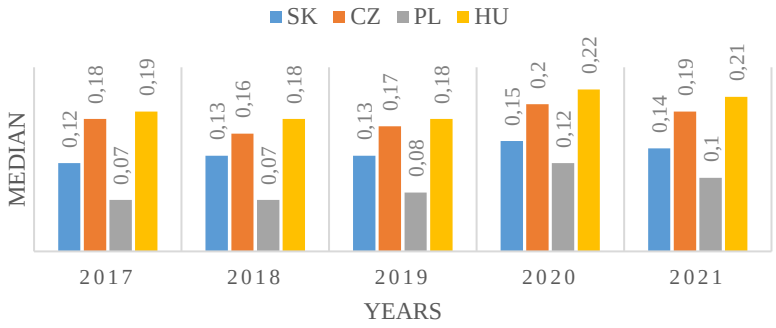


Source: own research

Figure 5 shows the median values of the X_{12} for individual V4 countries during the analysed period. The median of the ratio of cash and cash equivalents to total assets of the monitored industry for the country of Slovakia had an increasing trend until 2020, and in 2021 there was a decrease. For the Czech Republic, in the first three years, the median value of the ratio was alternating; in 2020, there was an increase; and in 2021, the median value decreased. For Poland, until 2020, the development of the median value had an increasing course, and in 2021, the value of the indicator decreased. The last V4 country is Hungary, where until 2019 the development of the median had a downward trend, an increase was recorded in 2020, and

a decrease in the value of the indicator in 2021. The highest median value was recorded in 2020, at 0.22 in Hungary.

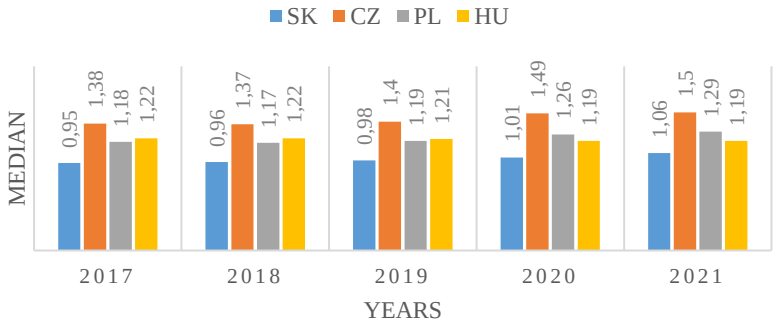
Figure 5: Development of the median X_{12} value in V4 countries



Source: own research

Figure 6 shows the median values of the X_{15} for individual V4 countries during the analysed period. The median ratio of current assets to total liabilities of the monitored industry in Slovakia had a growing trend throughout all the years. For the Czech Republic, in the first two years, the median value of the ratio is decreasing, and from 2019 on, the median value is increasing. For Poland, the development of the median value followed the same course as in the case of the Czech Republic. The last V4 country is Hungary, where the median value had a downward trend. The lowest median value was recorded in 2017, at 0.95 in the Slovak Republic.

Figure 6: Development of the median X_{15} value in V4 countries



Source: own research

Figure 7 shows the median values of the X_{22} (cash ratio) for individual V4 countries during the analysed period. The median of the ratio of cash and cash equivalents to current liabilities of the monitored industry for the country of Slovakia had an increasing trend during the first four years, and in 2021 there was a decrease in the median value. For the Czech Republic, a slight decrease in the development of the median value of the ratio can be seen in the first two years; from 2018 to 2020, the median value increased. In 2021, there was a decrease, as in the previous case. For Poland, until 2020, the development of the median value had an increasing course, and in the last year, its value decreased. The last V4 country is Hungary, where the median value had the same course as in the case of the Czech Republic. The highest median value was recorded in 2020, at 0.76 in the Czech Republic.

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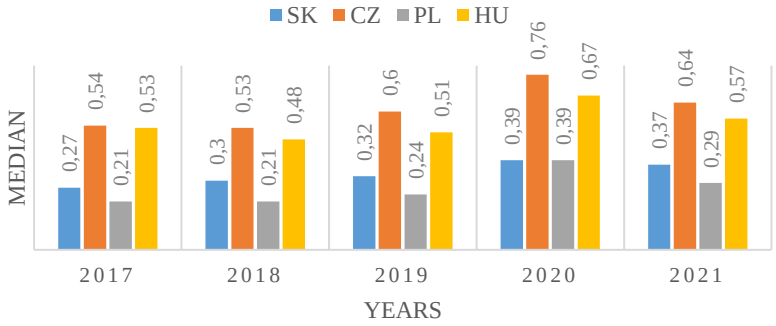
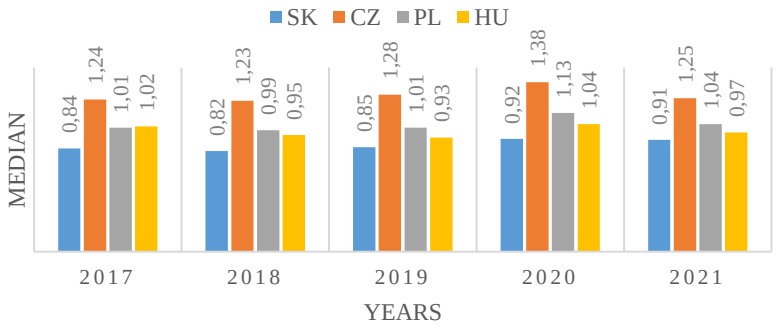
Figure 7: Development of the median X_{22} value in V4 countries



Source: own research

Figure 8 shows the median values of the X_{26} (quick ratio) for individual V4 countries during the analysed period. The median of the ratio of the value of current assets without inventory to current liabilities of the monitored industry for the country of Slovakia had during the first three years an alternating trend; in 2020, the median value increased, but in 2021, it decreased again. For the Czech Republic and Poland, the development of the median value of the ratio had the same trend as in the case of the Slovak Republic. The last V4 country is Hungary, where the median value had a decreasing trend until 2019; in 2020, the median value increased; and in 2021, it decreased again. The lowest median value was recorded in 2018, at 0.82 in the Slovak Republic.

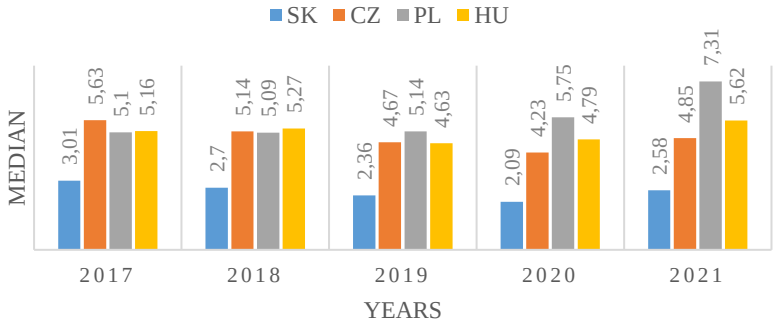
Figure 8: Development of the median X_{26} value in V4 countries



Source: own research

Figure 9 shows the median values of the X_{27} (return on total assets based on EAT) for individual V4 countries during the analysed period. The median of the ratio of EAT to total assets of the monitored industry for the countries of Slovakia and Czech Republic had, during the first four years, a decreasing trend; in 2021, its value increased. For Poland, the development of the median value had in the first two years a downward trend, and from 2019 on, the direction of the trend changed. The last V4 country is Hungary, where the median value had until 2018 an increasing trend. In 2019, the value of the median decreased, and since 2020 it has increased again. The highest median value was recorded in 2021, at 7.31 in Poland.

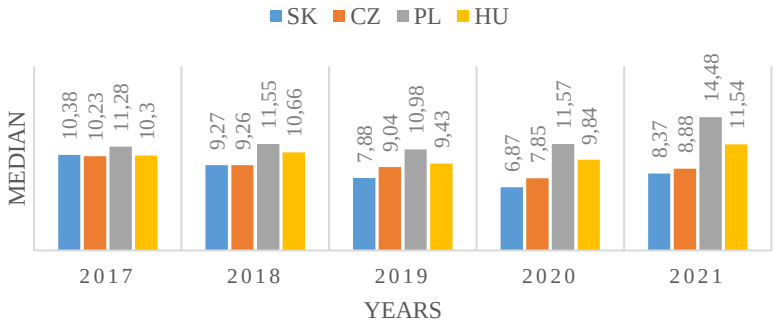
Figure 9: Development of the median X_{27} value in V4 countries



Source: own research

Figure 10 shows the median values of the X_{28} (return on equity based on EAT) for individual V4 countries during the analysed period. The median of the ratio of EAT to equity of the monitored industry for the countries of Slovakia and the Czech Republic had the same trend during the analysed period. For Poland and Hungary, the development of the median value was the same. The lowest median value was recorded in 2020, at 6.87 in Slovakia.

Figure 10: Development of the median X_{28} value in V4 countries



Source: own research

Figure 11 shows the median values of the X_{35} for individual V4 countries during the analysed period. The median of the ratio of EBT to operating profit of the monitored industry for the country of Slovakia had an unchanging trend. For the Czech Republic, the median value of the ratio decreased in 2018; until 2020, the trend was unchanged; and in 2021, the value rose to the same level as in 2017. For Poland, the development of the median value had an increasing trend during the analysed period. The last V4 country is Hungary, where the development of the median decreased in 2019, and since 2020, the trend has started increasing. The highest median value was recorded in 2021, at 0.05 in Poland and Hungary.

Next, it was compared among individual V4 countries according to their total number of prosperous and non-prosperous enterprises over a five-year period.

Table 3 shows the number of enterprises in Slovakia, which we divided into prosperous and non-prosperous enterprises using equation (1). The highest number of thriving businesses was in 2017, 2147 businesses, while the lowest number was in 2020, 1783 businesses, which was caused by the COVID-19 crisis. In the same way, non-prosperous enterprises reached the highest number in 2020, 2255 enterprises, which was also caused by COVID-19, on the contrary, the lowest was in 2017, 1889 enterprises.

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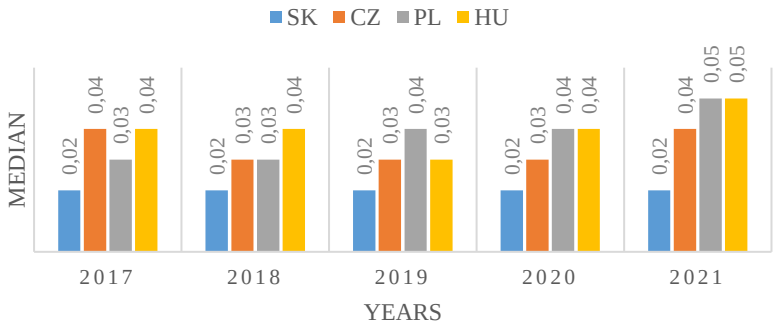
Figure 11: Development of the median X_{35} value in V4 countries



Source: own research

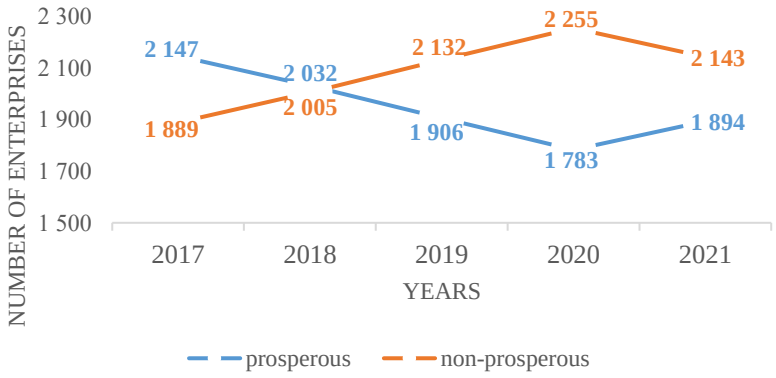
Table 3: Bankruptcy prediction in Slovakia

Slovakia	2017	2018	2019	2020	2021
Prosperous	2149	2033	1906	1783	1895
Non-prosperous	1889	2005	2132	2255	2143

Source: own research

The bankruptcy prediction in Slovakia was also graphically illustrated in Figure 12, where it can be demonstrated how the development in the number of prosperous and non-prosperous enterprises changed during the analysed period. It is depicted that in 2019, which is characteristic of the beginning of the pandemic, there was a change, and from 2019 to 2020, the number of non-prosperous business entities increased. The situation started to improve only in 2021.

Figure 12: Development in the sample of Slovakia



Source: own research

Table 4 shows the number of enterprises divided into prosperous and non-prosperous enterprises for the country of the Czech Republic.

Table 4: Bankruptcy prediction in Czech Republic

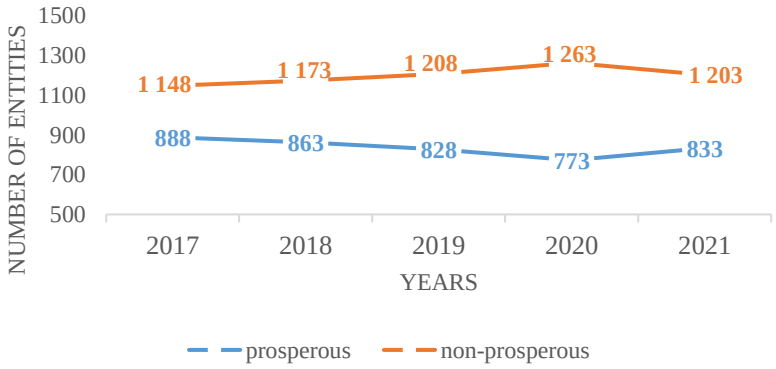
Czech Republic	2017	2018	2019	2020	2021
Prosperous	888	863	828	773	833
Non-prosperous	1148	1173	1208	1263	1203

Source: own research

In Figure 13, there is a graphic representation of the enterprises of the Czech Republic. It was observed that the greater parts of the enterprises are represented by non-prosperous enterprises. Like Slovakia, the Czech Republic achieved the highest number of enterprises in

2017, with 888 enterprises. On the other hand, the lowest number of prosperous businesses was achieved in 2020, which was 773 businesses, which could be due to the COVID-19 pandemic. On the other hand, the number of non-prosperous businesses was the highest in 2020, at 1263, which was again due to the ongoing COVID-19 pandemic. The lowest number of non-prosperous businesses was in 2017, with 1148 businesses.

Figure 13: Development in the sample of Czech Republic



Source: own research

During the analysed period, Poland had an almost equally divided number of enterprises into prosperous and non-prosperous ones. Table 5 shows that there were again the most non-prosperous businesses in the pandemic year of 2020: 2355 businesses. In the following year, their number decreased by 197 enterprises, and at the same time, it represents the lowest number of non-prosperous enterprises in the monitored period. Prosperous businesses had the opposite development as non-prosperous ones. Their number has been decreasing over the years, and the lowest number was reached in 2020, at 2210 businesses, due to the pandemic. However, the year 2021 represents an increase of 197 enterprises to 2407 enterprises.

Table 5: Bankruptcy prediction in Poland

Poland	**2017**	**2018**	**2019**	**2020**	**2021**
Prosperous	2364	2312	2216	2211	2408
Non-prosperous	2202	2254	2350	2355	2158

Source: own research

Figure 14 graphically shows the development of the number of enterprises in Poland over the monitored 5 years. It can be described how the number of prosperous ones gradually decreased, especially in the pandemic years. On the other hand, the number of non-prosperous ones has increased. After 2020, when businesses started to recover from the COVID crisis, their number changed again in 2021, meaning that there were more prosperous than non-prosperous businesses.

From Table 6, it was derived that the number of prosperous and non-prosperous enterprises was relatively the same in Hungary. However, the exception is the year 2019, when 111 prosperous businesses became non-prosperous due to COVID-19. Their number changed again the following year. The number of prosperous enterprises decreased to 779 enterprises; this number also represents the lowest number in the monitored five years. This means that the number of non-prosperous companies increased by 13. This year saw the highest number of non-prosperous enterprises, 917 enterprises.

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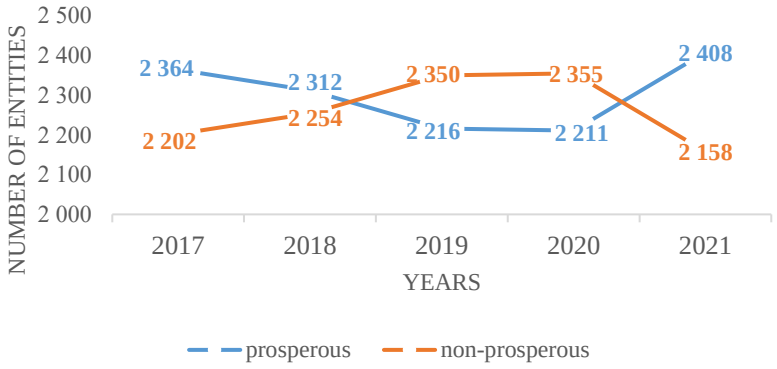
Figure 14: Development in the sample of Poland



Source: own research

Table 6: Bankruptcy prediction in Hungary

Hungary	2017	2018	2019	2020	2021
Prosperous	834	820	792	779	851
Non-prosperous	862	876	904	917	845

Source: own research

Thus, it was proven that the pandemic of the viral disease COVID-19 had a meaningful impact in the V4 region in the critical year 2020. There is an assumption of a gradual return to the original state from the pre-COVID-19 era based on decreased values of 6349 predicted bankruptcies in 2021 (Table 7).

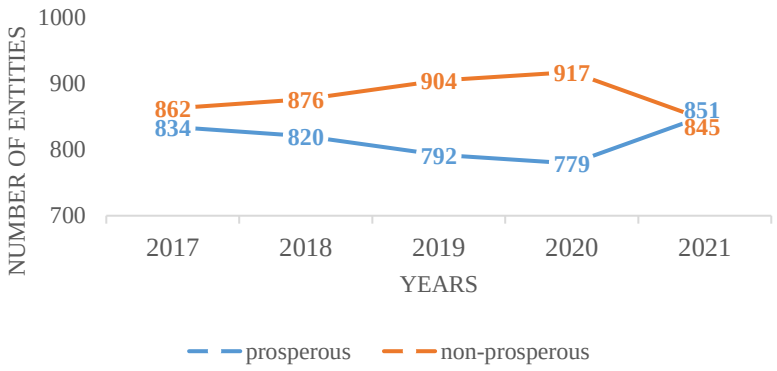
Table 7: Bankruptcy prediction in Visegrad Group

V4	2017	2018	2019	2020	2021
Prosperous	6235	6028	5742	5546	5987
Non-prosperous	6101	6308	6594	6790	6349

Source: own research

Based on Figure 15, it was noted that the number of non-prosperous enterprises was more prevalent than the prosperous ones. It is also possible to observe the overall development of the number of enterprises during the monitored period. However, in the last year, 2021, there was a change when the number of prosperous enterprises exceeded the number of non-prosperous ones by six enterprises.

Figure 15: Development in the sample of Hungary



Source: own research

4. Discussion

The recent results from investigations within Central and Eastern Europe (CEE) related to the bankruptcy were discussed. Marczewska et al. (2023) encourage the comparison of Central CEE countries and explain that initially, these nations were comparable in that they all experienced the transition from a centrally planned to a market economy. Secondly, because they are all EU members, their regulatory frameworks and values are comparable. Thus, in terms of the framing conditions, it is a rather homogeneous group.

Papik and Papikova (2023) analyse the influence of the crisis on the efficacy of bankruptcy prediction models. Information spanning from 2015 to 2019 was gathered for over 90,000 small and medium-sized enterprises (SMEs) to construct predictive models for three distinct time periods: two normal periods and one period marked by a crisis. Predictions were produced for one-year, two-year, and three-year periods using the CatBoost, LightGBM, and XGBoost techniques. The findings of this publication suggest that the predictive models exhibited considerably worse performance during crisis situations compared to non-crisis periods. The most noticeable decline was observed in the accuracy of one-year projections, which decreased by 6.5%. The disparity was marginally reduced for forecasts spanning two years (4.8%) and three years (4.1%). Given that lower sensitivity levels resulted in poorer performance during crisis periods, it may be inferred that these bankruptcies were unforeseen and likely triggered by the crisis. They conclude that after the COVID-19 situation, it will be necessary to revalidate and recalibrate the current bankruptcy models.

Using twelve key debt ratios, Gajdosikova et al. (2023) evaluate the degree of indebtedness of 3509 businesses. The nonparametric Kruskal-Wallis test was then used to conduct a more thorough analysis that addressed statistically significant differences between distinct indebtedness ratios in connection to size and legal form. To identify the location of stochastic ascendancy, they made use of the Bonferroni correction. Due to the size of the enterprises and their legal structure, the Kruskal-Wallis test result showed statistically significant differences in the debt ratio values.

Krasteva and Nagy (2022) examine the financial stability of NACE H (transportation and storage) and prove the importance of financial health prediction. Four models (Altman's model, Taffler's model, the discrimination model for Slovakia, and the discrimination model for Slovakia in NACE H) were used for the bankruptcy prediction of 601 businesses. Selected models were evaluated using ROC (receiver operating characteristic) curves. They identified and detailed in greater depth which models should continue to be employed in the investigated sector based on the results that were obtained.

These aviation-related discoveries came from the investigation by Faizuloyeva and Olechowska (2021). Greater stability in an organisation leads to a reduced risk of bankruptcy, even in the face of unforeseen market changes. Based on the five-factor model of Altman, their financial analysis indicates that, as of December 31, 2020, the analysed firm is financially unstable and experiencing a declining trend in the Z-score. The outcome may be attributed to a significant decrease in demand, which is the impact of the COVID-19 pandemic. During the entirety of 2020, the analysed entity facilitated the transportation of 30.2 million passengers, representing a decrease of 50.3% compared to the same period in 2019. The passenger seat occupancy rate in the group declined by 8.3 percentage points compared to the same time the previous year, reaching 73.6%. The business entity had a 56.5% decline in passenger turnover compared to the corresponding time in the previous year. The calculations of the Altman model indicated that the analysed entity is in an unstable situation, as seen in the market. The link between computation and observational reality

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serves as evidence of the enduring relevance of the Altman model in evaluating financial conditions and forecasting future patterns.

Wieczorek-Kosmala (2021) realises an examination utilising sample data from the hospitality sector of V4 countries. The findings revealed that the level of financial risk preparedness is relatively low. An empirical investigation has verified that around 25% of the examined hospitality firms had a poor or extremely low degree of risk preparation. 25% of enterprises are unable to manage the initial financial challenges that arose quickly after the COVID-19 outbreak, making them very susceptible to bankruptcy. Approximately 34% of the firms analysed demonstrated a moderate level of readiness for potential risks. Overall, almost 60% of the surveyed enterprises are susceptible to the repercussions of operational interruptions.

5. Conclusions

Predicting the financial health of a company is crucial for all businesses in the current globalised world, but particularly for manufacturing ones that affect each economy in a significant manner. The concept of predicting business failure is well-established on an international level, and numerous prediction models have been developed to assess financial well-being and, consequently, ascertain its propensity for either financial prosperity or insolvency of the company. However, there is a preference to use models designed to forecast business failure that are developed exclusively for a single country or even a subsector of the domestic economy.

The main aim of this study is to map the level of bankruptcies in the manufacturing sector at Visegrad Group using a specific prediction model. The descriptive statistics variables for the chosen ratios were calculated based on the discriminant function of prediction models and graphically illustrated their development during the observed period using the median value. Then, using the Z-score for transition economies, the number of successful and unsuccessful enterprises was identified for the sample of 2036 Czech enterprises, 1696 Hungarian enterprises, 4566 Polish enterprises, and 4038 Slovak enterprises. The research evaluated the period before and during the COVID-19 pandemic. The fewest bankruptcies were revealed in 2017, with 6101 enterprises. The most bankruptcies were revealed in 2020: 6790 enterprises. Thus, it was established that in the crucial year 2020, the COVID-19 pandemic had a significant effect on the V4 area. Based on declining values of 6349 projected bankruptcies in 2021, a gradual restoration to the pre-COVID-19 original status is assumed.

The limitations of this study are that it focuses only on one sector and only on V4 countries. This research could be extended with an analysis of the period after the COVID-19 pandemic. Future research can also be extended to related sectors of NACE C and focus on other European countries in the group of transition economies.

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Conflicts of Interest: The authors declare no conflict of interest.

References

Ben-Ahmed, K., Ayadi, I., & Hamad, S. B. (2022). COVID-19 impact on digital companies' stock return: A dynamic data analysis. *Finance Research Letters*, *46*, 102340.

Berent, T., & Rejman, R. (2021). Bankruptcy prediction with a doubly stochastic poisson forward intensity model and low-quality data. *Risks*, *9*(12), 217.

Blazek, R., Durana, P., Michulek, J., & Blazekova, K. (2023). Does the size of the business still matter, or is profitability under new management, by order of the COVID-19?. *Journal of Risk and Financial Management*, *16*(4), 219.

Boratynska, K. (2021). A new approach for risk of corporate bankruptcy assessment during the COVID-19 pandemic. *Journal of Risk and Financial Management*, *14*(12), 590.

Bozkurt, I., & Kaya, M. V. (2023). Foremost features affecting financial distress and Bankruptcy in the acute stage of COVID-19 crisis. *Applied Economics Letters*, *30*(8), 1112-1123.

Chang, C. L., McAleer, M., & Wong, W.-K. (2020). Risk and financial management of COVID-19 in business, economics and finance. *Journal of Risk and Financial Management*, *13*(5), 102.

Ding, S., Cui, T., Bellotti, A. G., Abedin, M. Z., & Lucey, B. (2023). The role of feature importance in predicting corporate financial distress in pre and post COVID periods: Evidence from China. *International Review of Financial Analysis*, *90*, 102851.

Exenberger, E., & Kavcakova, M. (2020). Evaluation of financial health of companies through data envelopment analysis: Selection of variables for the DEA model in R. *Proceedings of Economics and Finance Conferences, Czech Republic*, 55-63, 10913067.

Faizuloyeva, N. & Olechowska, K. (2021). Financial condition and bankruptcy likelihood in aviation on the example of the Aeroflot company. *Financial Internet Quarterly*, *17*(4) 50–69.

Farida, I., & Setiawan, D. (2022). Business strategies and competitive advantage: the role of performance and innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(3), 163.

Gajdosikova, D., Lazaroiu, G., & Valaskova, K. (2023). How particular firm-specific features influence corporate debt level: A case study of Slovak enterprises. *Axioms*, *12*(2), 183.

Gajdosikova, D., Valaskova, K., Kliestik, T., & Machova, V. (2022). COVID-19 pandemic and its impact on challenges in the construction sector: A case study of Slovak enterprises. *Mathematics*, *10*(17), 3130.

Gavurova, B., Jencova, S., Bacik, R., Miskufova, M., & Letkovsky, S. (2022). Artificial intelligence in predicting the bankruptcy of non-financial corporations. *Oeconomia Copernicana*, *13*(4), 1215–1251.

Gebski, L. (2021). The impact of the crisis triggered by the COVID-19 pandemic and the actions of regulators on the consumer finance market in Poland and other European Union countries. *Risks*, *9*(6), 102.

Horvathova, J., & Mokrisova, M. (2020). Comparison of the results of a data envelopment analysis model and logit model in assessing business financial health. *Information*, *11*(3), 160.

Karpac, D., & Bartosova, V. (2020). The verification of prediction and classification ability of selected Slovak prediction models and their emplacement in forecasts of financial health of a company in aspect of globalization. *SHS Web of Conferences*, *74*, 06010.

Kitowski, J., Kowal-Pawul, A., & Lichota, W. (2022). Identifying symptoms of bankruptcy risk based on bankruptcy prediction models–A case study of Poland. *Sustainability*, *14*(3), 1416.

Kliestik, T., Valaskova, K., Kliestikova, J., Kovacova, M., & Svabova, L. (2019). *Prediction of financial health of business entities in transition economies.* University of Zilina: EDIS.

Kliestik, T., Valaskova, K., Lazaroiu, G., Kovacova, M., & Vrbka, J. (2020). Remaining financially healthy and competitive: The role of financial predictors. *Journal of Competitiveness*, *12*(1), 74–92.

Kolahchi, Z., De Domenico, M., Uddin, L. Q., Cauda, V., Grossmann, I., Lacasa, L., Grancini, G., Mahmoudi, M., & Rezaei, N. (2021). COVID-19 and its global economic impact. *Coronavirus Disease-COVID-19*, *1318*, 825–837.

Kontus, E., & Mihanovic, D**. (**2019). Management of liquidity and liguid assets in small and medium-sized enterprises. *Economic Research-Ekonomska Istrazivanja*, *32*(1), 3247–3265.

Kovacova, M., Kliestik, T., Valaskova, K., Durana, P., & Juhaszova, Z. (2019). Systematic review of variables applied in bankruptcy prediction models of Visegrad group countries. *Oeconomia Copernicana*, *10*(4), 743–772.

Krasteva, N., & Nagy, M. (2022). Evaluation of the financial standing of businesses in a certain sector of the national economy. *Ekonomicko-manazerske spektrum*, *16*(2), 18-36.

Kurniawan, Maulana, A., & Iskandar, Y. (2023). The effect of technology adaptation and government financial support on sustainable performance of MSMEs during the COVID-19 Pandemic. *Cogent Business & Management*, *10*(1), 2177400.

Lesakova, L, Gundova, P., & Vinczeova, M. (2020). The practice of use of models predicting financial distress in Slovak companies. *Journal of Eastern European and Central Asian Research (JEECAR)*, *7*(1), 122–136.

Marczewska, M., Weresa, M. A., & Lachowicz, M. (2023). Towards creativity and innovation in universities: Study on Central and Eastern Europe. *Journal of the Knowledge Economy*.

Meyer, D. F., & Hassan, A. (2020). An assessment of the impact of various macro-economic variables on the manufacturing sector: The case of the Visegrad four. *Journal of Eastern European and Central Asian Research (JEECAR)*, *7*(3), 351–362.

Obrenovic, B., Du, J., Godinic, D., Tsoy, D., Khan, M. A. S., & Jakhongirov, I. (2020). Sustaining enterprise operations and productivity during the COVID-19 pandemic: "Enterprise effectiveness and sustainability model". *Sustainability*, *12*(15), 5981.

Osiichuk, D., & Mielcarz, P. (2020). The nonmonotonicity of cash-cash flow relationship: The role of uncertainty and financing constraints. *Economic Research-Ekonomska Istrazivanja*, *34*(1), 2263–2283.

Papik, M., & Papikova, L. (2023). Impacts of crisis on SME bankruptcy prediction models' performance. *Expert Systems with Applications*, *214*, 119072.

Potkany, M., Musa, H., Schmidtova, J., & Barinova, D. (2023). How do high performance manufacturing enterprises differ from others with respect to the essence and use of controlling?. *Journal of International Studies*, *16*(3), 193–207.

Stefko, R., Horvathova, J., & Mokrisova, M. (2020). Bankruptcy prediction with the use of data envelopment analysis: An empirical study of Slovak businesses. *Journal of Risk and Financial Management*, *13*(9), 212.

Stefko, R., Jencova, S., Vsanicova, P., & Litavcova, E. (2019). An evaluation of financial health in the electrical engineering industry. *Journal of Competitiveness*, *11*(4), 144–160.

Suhanyi, L., Suhanyiova, A., Kadarova, J., & Janekova, J. (2023). Relationships between average wages in the manufacturing sector and economic indicators of the manufacturing sector in the region of Visegrad Group countries. *Sustainability*, *15*(5), 4164.

Valaskova, K., Gajdosikova, D., & Belas, J. (2023). Bankruptcy prediction in the post-pandemic period: A case study of Visegrad Group countries. *Oeconomia Copernicana*, *14*(1), 253–293.

Vavrek, R., Kravcakova Vozarova, I., & Kotulic, R. (2021). Evaluating the financial health of agricultural enterprises in the conditions of the Slovak republic using bankruptcy models. *Agriculture*, *11*(3), 242.

Wieczorek-Kosmala, M. (2021). COVID-19 impact on the hospitality industry: Exploratory study of financial-slack-driven risk preparedness. *International Journal of Hospitality Management*, *94*, 102799.

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UNLOCKING THE SECRETS OF CROWDFUNDING SUCCESS: A COMPREHENSIVE ANALYSIS OF KEY DETERMINANTS

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Abstract
Research background: Nowadays, crowdfunding is becoming more and more popular. It is one of the alternative funding options that, when used effectively, may guarantee that firms obtain a competitive advantage.
Purpose of the article: The goal of this work is to find the determinants that condition the success of crowdfunding campaigns and then to evaluate the influence of individual determinants.
Methods: Our database contained 224,180 projects from 2009 to 2021 exclusively from the Kickstarter platform. The data was used to search for determinants, based on which graphs and tables were created. The projects in our database were divided into 4 basic groups: successfully funded projects, unsuccessfully funded projects, projects whose campaign is currently ongoing and projects whose funding has been cancelled. In order to evaluate the dependence between the selected factors and the success of the projects we have excluded from our database all projects whose campaign is currently ongoing, as well as projects that have been cancelled. For verification we used Chi-square tests and two-sample t-test of independent samples and descriptive indicators.
Findings & Value added: The determinants were: the project category, the target amount and the country from which the campaign was launched. The influence of the discovered determinants was not strong, though it was statistically significant. The goal of the thesis was fulfilled, and the reader will be familiar with the influence of factors on the success of crowdfunding campaigns. This study's limitations include its focus on only one platform, Kickstarter, which also implies that the majority of the projects are based in the United States. Another drawback is that we are unsure of the precise ways in which different elements will influence the likelihood of success.

Keywords: crowdfunding; fundraising; campaign; business

JEL Classification: D26; L26

1. Introduction

Every company has to finance its expenses somehow. It can finance expenses either from its own sources or from external sources. One of the possibilities when using foreign resources is an alternative form of financing – crowdfunding, which is different from traditional start up financing (Liu et al., 2023). Crowdfunding includes elements of microfinancing and crowdsourcing, but it represents its own form of fundraising (Mollick, 2014). It is an option that is very interesting, as evidenced by the fact that the amount of funds collected through crowdfunding is constantly increasing since the financial crisis in 2007 (Saric, 2022). Crowdfunding is equally accessible to all people, income or credibility is not assessed, as is the case, for example, in the case of a bank loan. However, this does not mean that everyone will succeed with crowdfunding. It is an alternative method of fundraising, which is primarily intended for small and medium-sized entrepreneurs.

It is widely known what affects the success of bank loan financing. However, there is not so clear data on what affects the success of financing through crowdfunding, yet Agrawal et al. (2015) argues that despite geographically extensive opportunities, backers support disproportionately more local creators, suggesting that country could be one determinant of the success of crowdfunding campaigns. It is not such a simple question, and it certainly depends on the skill of the creator (which is hard to quantify) of the project. The impact of selected factors is also analysed in this article, which can help creative entrepreneurs obtain financing that would not be available to them through credit or leasing. The goal of this work is to find factors that influence the success of such projects and thus increase the chances of companies to obtain financing through crowdfunding.

The article is divided into the following parts: the literature review contains an overview of current literature on the topic of crowdfunding and the determinants of project success, the methodology and data part describes the data used in this work and it's sources, the results part describes the discovered dependencies between variables and their statistical significance, and at the end of the article is a conclusion of the entire work, which also includes a suggestion for future research and points out the weak points of this study.

2. Literature Review

Crowdfunding is one source of funding that entrepreneurs are increasingly exposed to beyond venture capital and angel funding. Di Pietro (2019) described the development and current state of crowdfunding. After presenting the most popular types of crowdfunding, he continues his work by presenting and comparing the development of this phenomenon in four macro-regions: Europe, the USA and Asia and the Pacific. In addition, the work offers an overview of the current state of the literature on crowdfunding, highlighting the incentives and disincentives of creators and funders for starting or participating in crowdfunding projects, the characteristics of a successful campaign and contextual factors that explain the development of this phenomenon in individual countries. The article is concluded with suggestions for future work in this area.

Maehle (2020) investigated the peculiarities of sustainable crowdfunding from the perspective of the project. The study followed a qualitative approach by conducting in-depth interviews with representatives of sustainable projects that have successful crowdfunding campaigns behind them. The selected projects represent various industries and crowdfunding models. Sustainable entrepreneurs have both financial and non-financial motivations for crowdfunding. A distinctive feature is the importance of community involvement, as the community spirit of crowdfunding lends itself well to sustainable projects. Choosing a

crowdfunding platform is more difficult for sustainable entrepreneurs because they have to consider the sustainability of the platform. According to the study, sustainable entrepreneurs also need to put more effort into their communication activities with potential supporters to compensate for the intangibility of sustainability claims. In addition, they need to focus more on building relationships with backers due to the community spirit of their projects and issues of legitimacy. This paper contributes to the limited literature on sustainable crowdfunding and sustainable business finance and can serve as a foundation for further research in this area. Current knowledge also has a high practical value.

The factors determining the success of crowdfunding projects is one of the central issues for crowdfunding researchers. Liu et al. (2023) looked at the success factors of crowdfunding campaigns. They used 53 qualified studies in their work. From these 53 studies, they carefully extracted and categorized 26 potential factors. These factors were then statistically analysed to decide which ones can significantly influence crowdfunding success. The results showed that the success of crowdfunding depends on a set of significant factors, which include the human capital of the fundraiser, the location of the project, the size of the team, the experience of the investor, the quality of the project and the interactivity on the crowdfunding platform. Crowdfunding success determinants were also analysed by various authors: Aleksina et al. (2019), Martinez-Chafer et al. (2023), Elexa et al. (2019), Wasiuzzaman and Suhili (2023), Munim et al. (2020), Alsagr et al. (2023), Emanuel-Correia et al. (2022) looked for determinants of success in developing countries, such as Malaysia, Bangladesh. The results of the analysis show that the minimum funding goal, the minimum required investment, the pre-money valuation and the length of the presentation video are very significant in influencing the success of the campaign in developing countries. Bukhari et al. (2020) compared the determinants of success of crowdfunding campaigns in developing and developed countries. According to the authors, the credibility of the creators and the support of the backers are decisive factors for the success of crowdfunding. The results of an additional test on location (developing and developed countries) suggest that creator credibility is more important than supporter support, especially in developing countries.

Saric (2022) also investigated the determinants of the success of crowdfunding campaigns, specifically in Croatia. His research was conducted on 78 Croatian crowdfunding campaigns. The campaigns were launched on the two most famous and available crowdfunding platforms: Kickstarter and Indiegogo between 2014 and 2019. The collected data were processed using the statistical program IBM SPSS Statistics and the Mann-Whitney U test application. The results show that there is a statistically significant difference between successful and unsuccessful campaigns in terms of the project goal, the duration of the campaign and the number of supporters of the campaign, while there is no statistically significant difference with regard to the amount of the average investment per sponsor. Here it is necessary to point out the fact that only projects created in Croatia were investigated, which means that the research does not take into account and does not analyse the influence of national and cultural specificities.

Pinkow and Emmerich (2021), on the other hand, analysed German crowdfunding projects. A dataset of 338 crowdfunding projects from the largest German crowdfunding platform StartNext between 2015 and 2016 was analysed by performing regression analyses controlling for different sizes of funding targets. They used dependent variables success, degree of success and number of project backers and checked whether the effect of independent variables such as comments, updates and social media depends on different funding targets. The study suggests that the impact of the investigated success factors actually strongly depends on the target funding levels of crowdfunding projects. By grouping projects into groups with different

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funding goals, they found that the impact of individual success factors varies and that funding goal plays a moderating role in project success factors. The great contribution of this study is the fact that many crowdfunding studies focus on the most popular American platforms such as Kickstarter or Indiegogo, but in this study the authors focused on projects on the largest German crowdfunding platform StartNext.

3. Methodology

The data for this work was obtained from the Kickstarter database (WebRobots, 2021) and we used this database as the basis for all calculations in this chapter. We verified the impact of three factors, namely: the project category, the country from which the crowdfunding campaign was launched and the project's target amount. These factors were chosen based on various scientific works discussing the success of crowdfunding campaigns and the availability of data.

In his work, Koch and Cheng (2016) demonstrated the significant impact of the target amount on the output of a crowdfunding campaign. Robertson and Wooster (2015), on the other hand, points to the significant influence of the project category, especially in the number of supporters and the percentage of funded projects. Also based on these works, these factors were selected for analysis.

Our database contained 224,180 projects from 2009 to 2021 exclusively from the Kickstarter platform. We used this platform for all of our analysis because we managed to get the best data for projects on this platform. The projects in our database were divided into 4 basic groups: successfully funded projects, unsuccessfully funded projects, projects whose campaign is currently ongoing and projects whose funding has been cancelled.

In order to verify the influence of individual factors on the success of projects, we need to clearly know whether the project was ultimately successfully financed or not. For this reason, we have excluded from our database all projects whose campaign is currently ongoing, as well as projects that were cancelled. Here the question can be raised whether we should have included the cancelled projects among the unsuccessfully financed ones. However, since we do not know the circumstances under which the projects were cancelled, such a step would probably distort the result - project financing could have been cancelled prematurely for reasons other than just failure. We have 208,507 projects left in the database, we excluded 15,671, which represents about 7% of the total number of projects.

The analysed factors were: the target amount of the project, the country in which the project was created and the category of the project. The target amount of the project represents a quantitative variable whose impact on the success of the project, which is a qualitative variable, was evaluated using a two-sample T-test of independent samples. Our database includes projects from the Kickstarter database, which works on the principle of all or nothing funding, which means that if we do not collect the target amount of funds, the project is automatically marked as failed. Therefore, our logical assumption is that collecting a larger amount of funds is more difficult than collecting a smaller amount, because the hypothesis that we will verify in this work is that the differences in the success of the projects are statistically significant in terms of their target amount. We assume that there are more successful projects with lower target amounts and more unsuccessful ones with higher target amounts. Target amounts in our database ranged from $1 to $100,000,000. The category of the project and the country in which the project was created represent qualitative variables whose influence on the success of the project was evaluated using the Chi-square test. The following categories are available on the Kickstarter platform: Art, comics, crafts, dance, design, fashion, film and video, food, games, journalism, music, photography, publishing, technology, theater. Our data shows that there are

noticeable differences between the categories in terms of the number of projects created, in the dance category only 2,739 projects were created during the monitored period, while in the Film and video category there were 27,097. These differences may partly reflect people's interests and not only creators but also supporters. We therefore assume that there could be statistically significant differences in the individual categories in terms of success, which other authors have already pointed out. Similar to the category, our set is also unbalanced in terms of the country of the project creator. Our database includes projects from many countries, the countries with the highest number of projects include: USA, Great Britain, Canada, Australia and France. As already mentioned, it has been proven in the past that supporters prefer local projects, therefore we expect that this factor could also have a statistically significant impact in terms of project success.

4. Results

The following section presents the results of the analyses. As mentioned above, we evaluated the impact of three variables on the success of crowdfunding campaigns. The results of the analyzes of these impacts are presented in the following sections.

4.1. The impact of the targeted amount on the success of campaigns

A two-sample t-test of independent sets was used to evaluate the impact of the target amount on the success of the campaigns. This test evaluates the impact based on comparison between variance-weighted means and the size of the entire statistical set. Therefore, it is reasonable to first look at the average values of the target sums of successful and unsuccessful projects. Successful projects had an average target amount of $9,160.45, while the average target amount of unsuccessful projects was $81,067.49. These changes are rather noticeable, indicating that the target amount will most likely be a major factor in success.

The Levene's test revealed that the variances are not equal, because the sig. the value of this test was <0.001, which means that we accept the alternative hypothesis. The following table (Table 1) shows the t-test analysis findings for equality of means.

Table 1: The two-sample t-test of independent samples

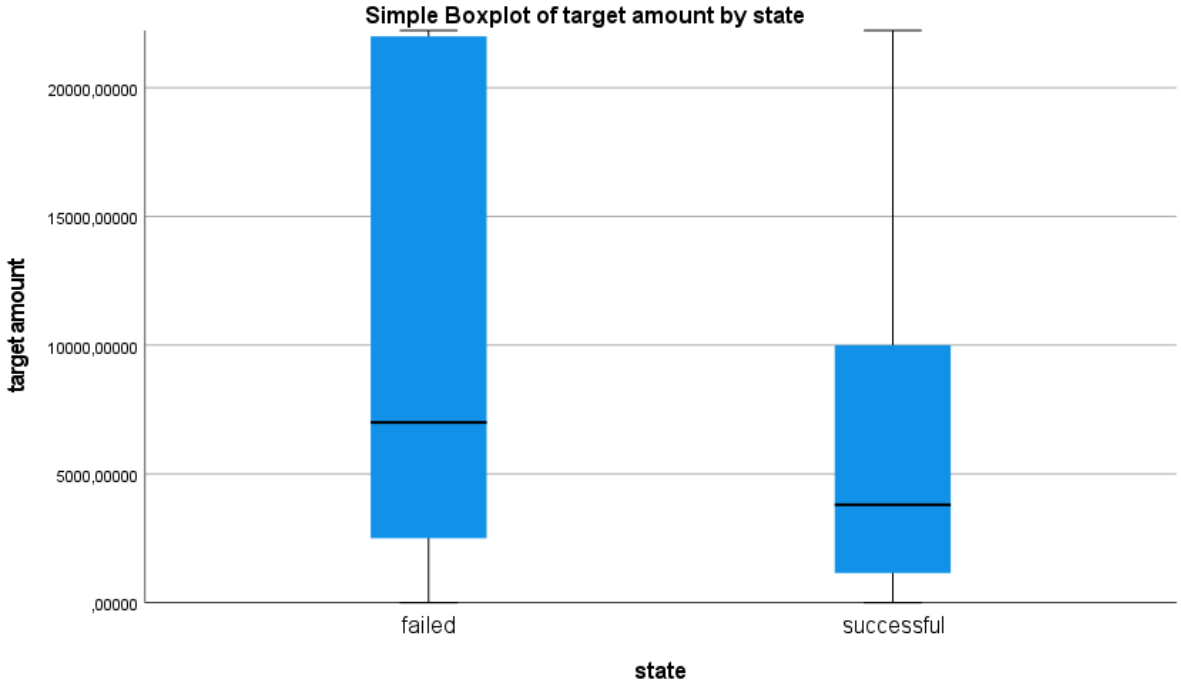
				Significance		
		t	**df**	**One-Sided p**	**Two-Sided p**	**Mean Difference**
Targeted amount	Equal variances assumed	-13.39	142,004	<0.001	<0.001	-71,907.04
	Equal variances not assumed	-10.10	51,486.47	<0.001	<0.001	-71,907.04

Source: own elaboration

The two-sample t-test of independent samples clearly confirmed the statistically significant dependence between the project's target amount and its success. For a better representation of this dependence, we can look at the following graph, which shows boxplots of successful and unsuccessful projects in terms of their target amounts.

In the Figure 1, we can see that the median value is also lower in the case of successful campaigns, which means that the lower average of the target amount in the case of successful campaigns was not caused by extreme values. We can also see that a larger part of successful projects has lower target amounts than in the case of unsuccessful projects, which confirms the previous results.

Figure 1: Boxplots of successful and unsuccessful projects



Source: own elaboration

4.2. The impact of the creator's country on the success of campaigns

The Pearson Chi-Square test was used to evaluate the influence of the country of the project creator on the success of the projects. It was characteristic of most countries that they recorded more failed projects than successful ones. The exceptions were only two countries, namely Austria and Italy, in which there were more successful projects than unsuccessful ones, which indicates the possible influence of the country. The results of Pearson's Chi-Square test are in the following table (Table 2).

Table 2: Chi-Square test of creator's country impact

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	2,043.299[a]	24	<0.001
Likelihood Ratio	2,034.425	24	<0.001
N of Valid Cases	208,507		

a. 0 cells have expected count less than 5. The minimum expected count is 10.69.

Source: own elaboration

Pearson's Chi-Square test revealed a statistically significant dependence between the country of the project creator and the success of the projects, which means that the dependence is not random. Cramer's V coefficient was used to verify the strength of dependence, which is in the following table (Table 3).

Table 3: Symmetric Measures of creator's country impact

		Value	**Approximate Significance**
Nominal by Nominal	Phi	0.099	<0.001
	Cramer's V	0.099	<0.001
N of Valid Cases		208,507	

Source: own elaboration

The value of Cramer's V coefficient is 0.099, which indicates weak dependence. So we can say that the dependence is statistically significant and not random, but it is weak. It is therefore not a key determinant from the point of view of project success, but it should not be neglected.

4.3. The impact of the project category on the success of campaigns

The impact of the project category on the success of the projects was also evaluated using the Pearson Chi-Square test. Again, as in the case of countries, there are more failed projects than successful ones in most categories. Out of a total of 16 categories, only 4 had more successful projects than unsuccessful ones. It is also necessary to point out significant differences in the total number of projects for individual categories. The most numerous project category was Film and Video, with a total of almost 28,000 projects, while the least numerous category was dance, with about 2,700 projects. These facts already speak of the significant and extensive influence of the project category, and not only on success. The results of Pearson's Chi-square test are in the following table (Table 4).

Table 4: Chi-Square test project category impact

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	20,340.237[a]	15	<0.001
Likelihood Ratio	22,313.975	15	<0.001
N of Valid Cases	208,507		

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 1,009.38.

Source: own elaboration

The assumption was confirmed, the effect of the project category is statistically significant and not random. We verified the strength of this dependence using Cramer's V coefficient. The results are in the following table (Table 5).

Table 5: Symmetric Measures of project category impact

		Value	**Approximate Significance**
Nominal by Nominal	Phi	0.312	<0.001
	Cramer's V	0.312	<0.001
N of Valid Cases		208,507	

Source: own elaboration

Cramer's V coefficient has values of 0.312, which still represents a weak dependence, but it is stronger than in the case of the country of the project creator. In both cases, however, there were statistically significant dependencies, so we can claim that the project category is also among the determinants of the success of crowdfunding campaigns.

5. Discussion

In this paper, we managed to find three determinants of the success of crowdfunding campaigns. Among them, the amount of the target amount probably has the strongest influence, as the average amount of the target amount of a successfully funded project is $9,160.45, while the average amount of an unsuccessfully funded project is up to $81,067.49. The median values are also significantly different, and these results are confirmed by the statistically significant result of the two-sample t-test.

Similar results were obtained by Liu et al. (2020), who investigated the effects of attention and reliability on the performance of online medical crowdfunding projects and how the target amount changes these effects. Based on objective data of 1,177 crowdfunding projects from February 2016 to January 2018 in a large medical crowdfunding platform in China, the authors

found that project donor attention, as measured by the number of comments, and trustworthiness positively affect the performance of medical crowdfunding projects. However, the target amount weakens the positive effects of the number of forwards and comments in online medical crowdfunding projects. Therefore, project sponsors should set reasonable target amounts for raising funds and at the same time show attention and reliability to donors. Although this research focused on a medical crowdfunding platform that was in China, they also came up with the results that higher target amounts are likely to be more challenging to succeed, and there are significantly fewer successful projects with high target amounts than smaller ones. Stofa and Zoricak (2016) also looked for factors influencing the success of crowdfunding campaigns. The objective in their paper was to analyse the following project factors: the timing of the crowdfunding campaign, the goal of the funding campaign, and the relative size of the categories. In our work, we also compared the impact of the project category, not necessarily in terms of their size, but in terms of success. The study analysed approximately 100,000 completed projects from the Kickstarter crowdfunding site for the years 2009 - 2014. It is therefore a study for an older period than ours, but on the same platform - Kickstarter, which mainly includes projects from the USA. The authors' findings show a correlation between the success of the project and the timing of the campaign at the beginning and in the middle of the year. The target has an impact on the success of the project, in general, the lower the target amount, the more likely the project is to succeed. This result confirms ours. A study with a similar focus was carried out by the authors Wachira and Wachira (2022). In the study, they looked at what affects the amount of money raised, which can lead to the success or failure of equity-based crowdfunding using Crowdcube. The amount of money collected is related to the success of the campaigns, because by default it is necessary to collect the necessary target amount of money for success in a crowdfunding campaign. The study used Pearson correlations and multiple regression analysis. The regression model was considered appropriate because it was statistically significant. The paper's findings revealed that the number of investors, target amount, and pre-money valuation strongly and positively influence the success of equity-based crowdfunding campaigns.

Another statistically significant determinant of the success of crowdfunding campaigns is the country of the project creator. Although the dependence was weak, it was not random, confirming Agrawal's et al. (2015) claim that people support more local creators. Ljumovic et al. (2021) provided insight into the role of reward-based crowdfunding in farm financing, focusing on its likelihood of success. The study used a sample of 1,566 projects from the Kickstarter platform between 2014 and 2020. Thus, the analysed period partially coincides with ours, but the range of analysed projects is considerably lower compared to our study. However, the authors of the study added the degree of urbanization and the relative importance of agriculture in the country’s economy to the basic elements for assessing the importance of crowdfunding. The authors ran a logistic regression model to examine the factors that motivate investment decisions. They found a statistically significant negative correlation between the campaign’s own goal and the success of the project, as well as a small positive effect of the number of supporters and a positive effect of the importance of agriculture in the country’s economy on the success of crowdfunding. Although this study did not investigate exactly what we did in our article, the results are very similar and partially coincide. In their paper, Martinez-Gomez et al. (2020) conduct an empirical analysis of the characteristics of successful offerings in two countries (UK and Spain) to assess the distribution of overfunding in equity crowdfunding. Among other things, they find significant cross-country differences that persist in the distribution of excess funding. Interestingly, however, the differences between countries in the level of overfunding in the technology sector are disappearing. Cicchiello et al. (2023)

came in a recent study with the results that it is possible to notice that being a company from a country consuming a large amount of renewable energy is positively associated with a higher crowdfunding performance. Conversely, if a company is located in a country that has large shares/ratios of electricity generation from renewable sources, it usually performs modestly compared to its international competitors. Lower transaction values are also attributed to companies based in countries that rely on the use of biomass. The results thus indicate differences in the success of campaigns from the point of view of different countries. Jin (2019) figured out that Chinese campaigns have low and uneven success rates, require legally the participation of charitable organisations and focus on financial distress and family values in appealing for donations. In addition, the ethical analysis suggests that medical crowdfunding in China shares several ethical concerns raised in developed countries such as the veracity of claims and privacy violation. The results indicate possible differences in terms of countries that reach beyond differences in terms of success. A paper by Buttice and Useche (2022) examined the role of internal social capital in the composition of the crowd of supporters attracted to US-born versus immigrant entrepreneurs. Immigrant entrepreneurs who have been active on a crowdfunding platform by supporting the campaigns of others before launching their own attract more backers and have a higher probability of success compared to native-born entrepreneurs. This study points to a possible difference in success between the country from which the campaign was launched and the country from which the creator comes. In our work, the country from which the campaign was launched was found to be a determinant of success.

The last determinant found and confirmed by this work is the project category. The dependence was somewhat stronger than in the case of the country of the project creator, but still weak. Even so, it was statistically significant. Chan et al. (2018) assessed the relative importance of the influence of project, product category, entrepreneur, and location on the success of reward-based crowdfunding. Applying variance decomposition analysis to a sample of 98,336 crowdfunding projects launched between May 2009 and May 2014 on the Kickstarter platform, they found that agency factors, namely project and entrepreneur effects, explained the highest relative variance (more than 80% of the total variance) across three successful crowdfunding outcomes – the amount of the pledge, the number of supporters and the success of the financing. Structural factors, namely the effect of product category and location, have lower but still significant effects. The category was thus a factor that we also identified in our work, and we also found a lower but statistically significant effect. Ko and Ko (2021) found that reward characteristics (category, target, and product feature) had a significant effect on the level of funding ratio. The analyses were carried out on the Korean Wadiz platform for 2019. The results partially coincide with ours. The results of Lee and Chiravuri (2019) show that serial creators who have experienced successful initial crowdfunding are more likely to explore a new industry or product category in the crowdfunding market and set a higher target capital for a subsequent campaign when they change project category. The study points to possible influences in the choice of category and target amount, which can also affect the success of campaigns. According to Agnihotri et al. (2021), investors value information about the past success of a celebrity's project more than information congruent with the product's image, so if the celebrity has a previous successful investment in a non-conforming product category, investors' intentions to invest in the project are still higher than in a project in the same category. category with previous failure. The study points to the fact that previous success may be a stronger predictor of success than project category. Wolfe et al. (2021) found that activity on Twitter can increase the chances of crowdfunding success. The chance of success increases with the increase in unpredictability and the number of posts per project category on Twitter.

6. Conclusions

In this article, we analysed the determinants of the success of crowdfunding campaigns. We found weak, but statistically significant differences in the success of campaigns in terms of their target amount, project category and the country of the project creator. We can therefore consider these factors as determinants. Based on these results, it is possible to recommend lower target amounts for projects, since successful projects have demonstrably lower target amounts than unsuccessful projects. Furthermore, we have shown statistically significant differences in success from the point of view of the creator's country, therefore the Kickstarter platform is optimal for creators from the USA, and for European creators we recommend European platforms, for example German platform StartNext, because, as mentioned in this and other articles, backers prefer local projects. In addition, there are statistically significant differences in the project category, where we recommend focusing on attractive categories that achieve the highest success rate. The limits of this research include the limitation to one platform - Kickstarter, which also means that most of the projects are from the USA, therefore, the results in this work may not apply to all platforms in the world, or for project creators worldwide. Another limitation is that we do not know exactly how individual factors will affect the probability of success. In the future, it would therefore be appropriate to create a model using logistic regression, which could be expanded to include other factors and with which it would be possible to accurately quantify the influence of factors on the chances of success.

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Data Availability Statement: Data available in a publicly accessible repository that does not issue DOIs. Publicly available datasets were analysed in this study. This data can be found here: [https://webrobots.io/kickstarter-datasets/].

Conflicts of Interest: The authors declare no conflict of interest.

References

Agnihotri, A., Bhattacharya, S., & Prasad, S. (2021). Celebrity investors and the success of crowdfunding campaigns. *Journal of Current Issues & Research in Advertising*, *42*(3), 310-327.

Agrawal, A., Catalini, C., & Goldfarb, A. (2015). Crowdfunding: Geography, social networks, and the timing of investment decisions. *Journal of Economics & Management Strategy, 24*(2), 253-274.

Aleksina, A., Akulenka, S., & Lubloy, A. (2019). Success factors of crowdfunding campaigns in medical research: perceptions and reality. *Drug discovery today*, *24*(7), 1413-1420.

Alsagr, N., Cumming, D. J., Davis, J. G., & Sewaid, A. (2023). Geopolitical risk and crowdfunding performance. *Journal of International Financial Markets, Institutions and Money*, *85*, 101766.

Bukhari, F. A. S., Usman, S. M., Usman, M., & Hussain, K. (2020). The effects of creator credibility and backer endorsement in donation crowdfunding campaigns success. *Baltic Journal of Management*, *15*(2), 215-235.

Buttice, V., & Useche, D. (2022). Crowdfunding to overcome the immigrant entrepreneurs' liability of outsidership: the role of internal social capital. *Small Business Economics*, *59*(4), 1519-1540.

Cicchiello, A. F., Gatto, A., & Salerno, D. (2023). At the nexus of circular economy, equity crowdfunding and renewable energy sources: Are enterprises from green countries more performant?. *Journal of Cleaner Production*, *410*, 136932.

Di Pietro, F. (2019). Deciphering Crowdfunding. *Disrupting Finance*, 1-14.

Elexa, L., Hvolkova, L., Klement, L., Klementova, V., Kovalova, M., & Elexova, L. (2019). Crowdfunding Campaigns In Small-scale Economy And Determinants Of Their Success. *International Journal for Quality Research*, *13*(2), 433-450.

Emanuel-Correia, R., Duarte, F., Gama, A. P. M., & Augusto, M. (2022). Does peer-to-peer crowdfunding boost refugee entrepreneurs?. *Finance Research Letters*, *46*, 102264.

Chan, C. R., Park, H. D., Patel, P., & Gomulya, D. (2018). Reward-based crowdfunding success: decomposition of the project, product category, entrepreneur, and location effects. *Venture Capital*, *20*(3), 285-307.

Jin, P. (2019). Medical crowdfunding in China: empirics and ethics. *Journal of medical ethics*, *45*(8), 538-544.

Ko, J., & Ko, E. (2021). What fashion startups should know before launching Crowdfunding projects: Focusing on Wadiz reward Crowdfunding. *Journal of Global Fashion Marketing*, *12*(2), 176-191.

Koch, J. A., & Cheng, Q. (2016). The role of qualitative success factors in the analysis of crowdfunding success: Evidence from Kickstarter. *20th Pacific Asia Conference on Information Systems*, Chiayi, Taiwan.

Lee, C. H., & Chiravuri, A. (2019). Dealing with initial success versus failure in crowdfunding market: Serial crowdfunding, changing strategies, and funding performance. *Internet Research*, *29*(5), 1190-1212.

Liu, S., Cheng, T., & Wang, H. (2020). Effects of attention and reliability on the performance of online medical crowdfunding projects: The moderating role of target amount. *Journal of Management Science and Engineering*, *5*(3), 162-171.

Liu, Z., Ben, S., & Zhang, R. (2023). Factors Affecting Crowdfunding Success. *Journal of Computer Information Systems*, *63*(2), 241-256.

Ljumovic, I., Hanic, A., & Kovacevic, V. (2021). The role of reward-based crowdfunding in farm financing: What characterises successful campaign? *Ekonomika Poljoprivreda-Economics Of Agriculture*, *68*(3), 773-788.

Maehle, N. (2020). Sustainable crowdfunding: insights from the project perspective. *Baltic Journal of Management*, *15*(2), 281-302.

Martinez-Gomez, C., Jimenez-Jimenez, F., & Alba-Fernandez, M. V. (2020). Determinants of overfunding in equity crowdfunding: an empirical study in the UK and Spain. *Sustainability*, *12*(23), 10054.

Martinez-Chafer, L., Molina-Morales, F. X., & Peiro-Palomino, J. (2023). On the drivers of successful crowdfunding: The case of the platform Verkami. *BRQ Business Research Quarterly*, *26*(3), 182-195.

Mollick, E. (2014). The dynamics of crowdfunding: An exploratory study. *Journal of business venturing*, *29*(1), 1-16.

Munim, Z. H., Shneor, R., Adewumi, O. M., & Shakil, M. H. (2020). Determinants of crowdfunding intention in a developing economy: ex-ante evidence from Bangladesh. *International Journal of Emerging Markets*, *16*(6), 1105-1125.

Pinkow, F., & Emmerich, P. (2021). Re-Examining Crowdfunding Success: How The Crowdfunding Goal Moderates The Relationship Of Success Factors And Crowdfunding Performance. *Central European Business Review*, 10(3), 91-114.

Robertson, E., & Wooster, R. B. (2015). Crowdfunding as a social movement: The determinants of success in Kickstarter campaigns. *Social Science Research Network.*

Saric, M. S. (2022). Crowdfunding Success Determinants – Study of Croatian Crowdfunding Campaigns. *11th International Scientific Symposium Region, Entrepreneurship, Development*, 736-750.

Stofa, T., & Zoricak, M. (2016). Selected success factors of crowdfunding projects. *European Financial system*, Brno, Czech Republic.

Wachira, V. K., & Wachira, E. W. (2022). Equity based crowdfunding: determinants of successful campaign: the case of Crowdcube platform in the United Kingdom. *Public Finance Quarterly*, *67*(1), 130-149.

Wasiuzzaman, S., & Suhili, N. F. (2023). Examination of the success drivers of equity crowdfunding campaigns in Malaysia. *Journal of Entrepreneurship in Emerging Economies*, *15*(2), 425-446.

WebRobots. (2021). *Kickstarter Datasets*. https://webrobots.io/kickstarter-datasets/

Wolfe, M. T., Patel, P. C., & Manikas, A. S. (2021). Shock and awe: Loudness and unpredictability in Twitter messages and crowdfunding campaign success. *Journal of Innovation & Knowledge*, *6*(4), 246-256.

ACCESSING THE IMPACT OF CHANGES IN PRE-TAX SUBSIDY ON INFLATION IN DEVELOPING COUNTRIES

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Abstract:
Research background: The framework of classical and Keynesian has little contribution on economic cycle in developing countries rather the issue is mostly structural cause. Subsidy continued to generate contentious issues as to whether it fuels inflation or not. Subsidy on energy has significant implication on pricing gap. Thus reform on subsidy taken cautiously or not can affect productive sector and spike inflationary pressure.
Purpose of the article: This study seeks to investigate the effect of pre-tax subsidy due to its direct effect on energy prices and inflation, it also empirically seeks to investigate the effect of post-tax subsidy due to its direct effect on environment and externality consequently on inflation and lastly, to investigate the effect of change in GDP on inflation.
Methodology: In the manuscript, the price gap model is used to measure pre-tax and post-tax subsidy due to enormous roles they play in energy prices and inflation. This study employs the panel data set often (10) developing countries spanned 2003-2019. The predicted model applied is the panel auto regressive distributed lag model which was selected as a result of the panel unit root test indicating series at 1(0) and 1(1). The pool mean group was selected among all classes of ARDL specifications following the test statistics of Hausman test.
Findings & Value Added: The result of pool mean group shows that pre-tax subsidy has a positive insignificant effect on inflation in the long run. GDP has negative insignificant effect on inflation in the long run and post-tax subsidy has negative and statistical significant effect on inflation in the long run. The result also revealed that there is a unit directional causality running from GDP to inflation. However, employing a separate time series data set on Nigeria, the result shows that all series are integrated in the long run and in any experience of shock in the short run, it will affect the movement in the individual series and eventually makes series to have long run convergence. The value added in this study is that several studies on this subject have measurement flaws not segregating pre-tax and post-tax subsidy separately. In addition, studies on panel data on oil exporting countries are scanty.

Keywords: pre-tax subsidy; post-tax subsidy; GDP; inflation and autoregressive distributed model

JEL Classification: E21; E31; D78

1. Introduction

Subsidy on energy has significant implication on pricing gap as well as demand for energy products and inflationary pressures. The impact at the aggregate level is related to the economy's energy intensity and its openness to external competition and markets. In some cases, subsidy reform translates into an increase in inflationary pressures if price increases are large enough and by implication, the increase or hike in lag value subsidized prices of fuel will cause a first-round increase in fuel inflation, with the magnitude of the pass-through dependent on the weights of food and fuel products in the consumer price index (IMF, 2021). It translates to borrowing to cover up the price gap and by implication open door for corruption amongst oil stakeholders. NNPC oil marketers, MNC, bureaucrats and top political office holders continued to claim volume falsified subsidy claims especially in Nigeria and inflation uncontrollable (Acharya and Sadath, 2017). On theoretical framework that supports subsidy and inflation, Classicalist in (1517) assumes quantity theory of money caused inflation, in addition, Keynesian approach (1930) allows government framework to influence economic cycle. Phillips framework on inflation and wages in 1960, these frameworks only support data for advanced economies. However, inflation in developing countries is structural and it deals with weakness in a country capacity to produce goods internally to maintain adequate flow of supply. The problem of inflation in developing countries that do not produce but depend on import is structural not as theorized by classicaland Keynesian framework. The poverty gap theory by Foster et al. (1984) inequality and poverty target are income distribution rather than per capital income. Kuznets (1995) investment is key to increasing income of the poor and raising expenditure. Most studies also focused on oil prices and inflation (Okwanya et al., 2015; Omolade et al., 2019; Rotimi and Ngalawa 2017). However, these studies failed to substantially segregate the effect of pre-tax and post-tax subsidy on inflation. The study will add insight to investigate the long and short run equilibrium effect of pre-tax and post-tax subsidy on inflation and ca causality direction. It investigates how fiscal policy tool affect monetary target.

2. Literature Review

There is dearth with mixed evidences on the relationship between subsidy and inflation Omotosho (2019) in a study used time series to estimate the macroeconomic implications of oil price shocks and the extant fuel subsidy regime for Nigeria spanned 2010 to 2018 and applying the error variance decompositions approach. The result of the study showed that that fuel subsidy removal leads to higher macroeconomic instabilities. Bello (2020) used Vector Autoregressive Model to estimate the effect of PMS Subsidy on poverty using Nigerian data set span 1981-2016, PMS subsidy has no much significant effect on poverty.

Ghosh (2022) used data on India to investigate the relationship between subsidy on Diesel and inflation using VAR based macroeconomic model and employing 78 quarterly data spanned 1997-98 Q1 to 2016-17 Q2. Thus this covers the period of diesel subsidy reforms and pricing policy in Indian economy the result of the study show that diesel subsidy reform improves growth by reducing inflation. In a recent study, Auktor and Loewe (2021) in their study on Subsidy reforms in the Middle East and North Africa used data on Morocco, Egypt and Iran between 2010 and 2017 to investigate the effect of subsidy on poverty. The authors reported that subsidy spending could trigger inflation and reduce human welfare thus strategic reforms are needed to be implemented to reduce social unrest.

Harun et al. (2018) used data on Malaysia to impact of fuel subsidy removal policy on input costs of production sectors in Malaysia applying the Input-output Price Model. The

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result of the study revealed that fuel subsidy removal policy led to an increase in fuel prices by 32 % on average input costs of production sectors.

Auktor and Loewe (2021) sample Middle East and North Africa (MENA) countries Morocco, Egypt and Iran to estimate the effect of subsidy reform and implication on social contract span 2010 to 2017. Analysis revealed that countries of studies have different reforms and different social contract such as cash transfer scheme.

Rehman and Khan (2015) sampled data set on to estimate the determinant of food prices on Pakistan between 1990–2013 applying the Vector Error Correction model and Johansen co-integration test. The result indicates a long run relationship between food prices and food export and subsidy

Dennis (2006) investigate the implication of fossil fuel subsidy removal on household welfare in developing counties, the authors report that welfare implications are unambiguously positive for government. However, the results are mixed for private households, although in an overwhelming majority the results also are positive. However, even in the cases where the welfare implications are negative for private households the result shows that it is possible for governments to carry out the reforms in such a way as to be welfare improving to house- holds incomes by compensating them with some of the fiscal savings gained from the subsidy reform.

There are important lessons to be derived in different subsidy reforms undertaken across countries. For instance, the Factsheet (2014) records the effect of subsidy removal on Zambian economy in 2013, according to records, fuel subsidy removal causes low-income earners to fall in term of welfare by averagely, 29.9 percent indicating a welfare loss in their average income. However, the high income earners welfare is lost by 12 percent, resulting from fuel subsidy removal. in same vein, household savings declined by 19 percent. It therefore recommends that there should be a strategic measure for compensating for the poor.

IMF (2021) suggested social protection strategies but debt sustainability has been an issue in the context borrowing to support for subsidy and by implication, a huge debt profile result to debt overhang and compelling nations to pay debt servicing over a long period of time. Since subsidies accrued has implication on public debt profile and crowd out budgetary position of countries to undertake productive investment in especially human capital development and infrastructure, it become even more worrisome for policy makers across the globe to design alternative measures of cushioning or mitigating the plight of population who subsidy is given to. Therefore, so much debt burden and fiscal cost emanates from energy source subsidy and it pertinent for countries to choose among alternatives of subsidies. Thus to complement for increased energy subsidies, countries employed measures such as scaling-up of cash transfer programs. Some of the strategic plans to roll out subsidy has implication on sustainability and effects on fiscal policy response, nations have consolidated on reforms to support the poor. Mauritania, Egypt for instance created a cash transfer policy program. Similarly, Jordan plans to hike electricity tariffs and develop new energy sources with lower generation costs. Morocco adhered to comprehensive subsidy reform with cash transfer program. Sudan embraced social protection program and reduced subsidy on oil. Tunisia also removed subsidy on energy and supporting household with cash transfer policy program. Lastly, Yemen policy is to cut down energy subsidies by gradually hiking up fuel prices and to strengthen support to the poor through an expansion of the Social Welfare Fund.

Considering the regional distribution of subsidy, evidences shows that sub Saharan African region pre tax subsidy stood at $19.3 billion which is averagely 1.6% of its GDP, in another development, advanced economies pre tax subsidy had reached almost $25.4 billion which is 0.1% of its GDP. In Central and Eastern Europe and Commonwealth of Independent States

total pre-tax subsidy remained $72.1 billion which is 1.7% of its GDP. In the same vein, record posits that for Emerging and Developing Asia, it has pre tax subsidy estimated at $102.3 billion which is 0.9% its GDP. For Latin America and Caribbean, total pre-tax subsidy is $36.2 billion which is 0.6% GDP (IMF, 2021).

3. Methodology

This study spanned 2003 to 2019 using panel data set. The rationale for using pre-tax subsidy data is due to the linear effect on energy price which affect macroeconomic indices. The post-tax subsidy addresses the issue of environmental and externalities and it also covers the price gap that has continued to awaken lingering issues in subsidy reform The data used is the secondary data set retrieved from (IMF, 2021). Sample countries used in this study are as follows Angola, Ecuador, Gabon, Iraq, Kuwait, Libya, Saudi Arabia, United Arab Emirate, Venezuela and Nigeria and this is justified due to availability of data on countries selected

3.1. Model specification

The popular price gap model borrowed from IMF (2021) is important for choice selection of variables explaining inflation. The price gap model captures the difference between domestic prices and international prices. This study will adopt and modify price gap model including GDP in the model.

$$PG = RP - BP \tag{1}$$

The price gap parameter is denoted by PG, RP denotes retail or consumer price of a specific product, and BPdenotes product's benchmark price. The measure of pre-tax subsidy measure the extent to which retail (consumer) prices are lower than the benchmark price. Symbolically it can be expressed as:

$$perunit_{it} = -PG_{it} = BP_{it} - RP_{it}$$
$$\text{IF} \quad RP < BP = 0 \text{ otherwise} \tag{2}$$

When tax on the energy product is measured below the desirable taxation levels, this can result to increase in post-tax subsidy. The latter is derived as the gap which exists between the benchmark price augmented by the desirable taxation denoted by T^* and the consumer price. However, post tax subsidy expressed mathematically as

$$perunit_{it} = \alpha_0 + \alpha_i BP_{it} + T_{it} - RP_{it},\ IF\ RP < BP + T^* = 0 \tag{3}$$

can be measured as total cost of subsidies obtained by multiplying the per unit subsidy with the estimated consumption volume over a certain period of time under consideration e.g., one quarter or one year.

$$\text{INF}I_{it} = \alpha_0 + \alpha_i \text{Presub}_{it} + \beta_i \text{postsub}_{it} + \beta_2 \text{GDP}_{it} + + \varepsilon_{it} \tag{4}$$

However, to ensure that the objective of the study is estimated, the Vector Autoregressive (VAR) model is expressed as:

$$X_t = \alpha + \sum_{j=1}^{p} X_{t-j} \emptyset_j + u_t \tag{5}$$

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where X_t is the vector of independent variables employed in the study.

3.2. Estimation procedures

Firstly, due to heterogeneity of panel data set, it tests the hypothesis that there is no any significant relationship between pre-tax subsidy and inflation, so also, there is no any relationship between post tax subsidy and inflation. To solve for this hypothesis, the descriptive statistics and inferential statistics are used which explains the mean and standard deviation is employed, the inferential statistics is applied as well to justify and validate the causes of inflation linked to structural issue not as postulated by classicalist and Keynesian or Phillip curve hypothesis. The macroeconomic time series are known to be non-stationary so the unit root test was tested using the Fisher-Type test using ADF suggested by Maddala and Wu (1999), Choi (2001) and Hadri (2000). Fundamentally, when series are stationary and integrated of order one 1(1), it is followed by use of VECM and VAR. When series are of 1(1) and 1(0), the ARDL approach is employed. Maddala and Wu (1999) argued that series converge to a long-run value, in that form, co-integration or long run is established.

More so, Madala and Wu (1999) in their study proposed the use of the Fisher (P) test which is based on combining the P-values of the test-statistics for unit root in each cross-sectional unit.

The generalized ARDL $(p, q_1, q_2, \dots, q)$ model is expressed as:

$$y_{it} = \sum_{j=1}^{p} \delta_i \, y_{i,t-j} + \sum_{j=0}^{q} \beta'_{ij} \, x_{i,t-j} + \Phi + e_{it} \tag{6}$$

In this case, y_{it} mean dependent variable $(\beta'_{it})'$ is a k^xI vector that are allowed to be purely $\mathrm{I}(0)$ or $\mathrm{I}(1)$ or cointegrated δ_{ij} is the coefficient of lagged dependent variable called scalars; $\beta_{ij}$are k^xI coefficient of vectors; Φ is the unit specific fixed effects; $i = 1, 2, \dots, N; t = 1, 2, \dots, T; p, q$ are optional lagged orders; e_{it} is the error term or white noise.

There parameter ARDL $p, q_1, q_2, \dots, q_T$ error correction model is specified as:

$$\Delta y_{ij} = \theta_i \left(y_{i,t-1} - \lambda'_i X_{i,t} \right) + \sum_{j-1}^{p-1} \xi_{ij} \, \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \beta'_{ij} \, \Delta X_{i,t-j} + \varphi_i + \, e_{it} \tag{7}$$

where $\theta_i = -(1 - \delta_i)$ is group specific speed of adjustment coefficient (expected) that $(\theta_i < 0)$

$\lambda'_i = vactor\ of\ long - run\ relationship$

$ECT = [Y_{i,t-1} - \lambda'_{i,t}]$ is the error correction term

ξ_{ij}, β'_{ij} are the short-run dynamic coefficients

3.3. Justification of applying autoregressive distributed lag model (ARDL)

Firstly, the panel autoregressive distributed lag model has distinct attribute of allowing the lag value of the dependent variable to be included in the model, by so doing, lag of inflation is also an explanatory variable or previous value of inflation has implication on current rate of inflation. This method evaluates policy reform to ascertain whether the monetary or fiscal policy tool is effective or not.

Secondly, it allows the investigation of heterogeneous panel accounting for country specificity. Individual country groups are estimated and also homogeneously.

Thirdly, the technique allows for convergence of series to a long-run value, in that form, co-integration or long run and short run as well.

Thus the technique seeks to answer the following null hypotheses:

HO: *There is no long run and short run relationship between pre-tax and post-tax subsidy on inflation.*

HO: *There is no any causality between pre-tax and post subsidy and inflation*

4. Results

The following table (Table 1) shows the mean of the samples and deviation from the mean and normality distribution.

Table 1: The descriptive statistics of the samples

Variable	INFLA	PRESUB	GDP	POSTSUB
Mean	10.7908	6.287412	3.89277	13.38159
Std. Dev	25.53804	11.38743	7.499473	23.47087
Variance	652.1914	129.6735	56.2421	550.882
Min	-2.093333	0	-15.67141	0
Max	254.9485	53.33	54.15778	122.99
Skewness	6.814307	2.629645	.8021384	2.996436
Kurtosis	60.01119	9.478493	18.40361	11.8437
Obs	150	170	160	170

Source: authors computation using STATA

The mean value for inflation is 10.7 and the deviation from the sample mean is 25.5. Similarly, pre tax subsidy has a mean of 6.28 while standard deviation from the sample mean is 11.38. For GDP, the mean of the sample is 3.89 and the deviation from the sample mean is 7.4 while post tax subsidy has a mean of 13.3 and the deviation from the sample mean is 23.47. In term of skewness, all series in the table have positive signs indicating that they are all positively skewed. This is because negatively skewed, implies that the negatively skewed variable has more falls than rises thus will have a flat surface. For kurtosis, the null hypotheses for the Jarque-Bera normality test for the variables can only be rejected. None of the series have value less than 3.

After applying the Augmented Dickey Fuller (ADF) stationary test approach, the series GDP is stationary at level value while pre tax subsidy and post-tax subsidy are stationary at differenced values and integrated of order one (Table 2). Thus, series are 1(0) and 1(1).

The assumption of the pooled mean result in panel A states that the long run coefficients are the same across all the groups that consist the sample. The upper part of the table shows the long run coefficients. In the long run pre tax subsidy has a positive impact on inflation at 5% significant value. GDP has a negative effect on inflation in the long run at 10% significant value while post tax subsidy has a negative effect on inflation at 1% significant value.

The lower part of the table panel B indicates short run coefficients. The assumption of the pooled mean group states that the short run coefficients and the error variances are not the same for all countries that make the panel. The error correction term shows that there is a long run co-integration among the coefficients and any deviation or disequilibrium in the long run can be corrected at 47% speed of adjustment.

Table 2: Pooled mean group, mean group and dynamic fixed effect estimation

Panel A	**PMG**	**MG**	**DFE**
presubs	0.27125**	8.669558**	-1.520879**
	0.1848148	11.50637	2.06566
Gdpg	-0.0593408*	1.972078**	4.793102***
	0.0897692	1.987707	1.604713
postsubs	-0.2004739***	-7.672523**	0.4583079*
	0.0873734	6.325196	0 .9536718
Panel B			
presubs	3.553921**	0.1328148*	0.2722468**
	3.633745	1.499035	3776766
Gdpg	-0.2733341**	-0.1834517*	-0.7378393***
	0.34577	0.3096653	0.1992282
postsubs	-1.819377 **	5.793546**	-0.0909401*
	1.975226	2.932216	0.2070651
constant	3.180533***	5.793546***	2.088775**
	1.084781	2.932216	2.253489
Ec	-0.4790518***	-0.609082***	0.2199344***
	0.1446062	1456003	0.027104
Number of obs	160		
Number of groups	10		

*Notes *** ** denotes 1% 5% 10% statistical significance*
Source: authors computation using STATA

The result (Table 3) also shows that the post-tax subsidy has a long run causal impact on inflation at 1% level of significance. However, it also indicates that there is no short run causality in the model.

Table 3: Hausman MGPMG Sigmamore

	Mg	**Pmg**	**(b-B) differential**	**sqrt(diag(V_b-V_B)) S.E.**
presubs	8.669558	0.27125	8.398308	26.95704
Gdpg	1.972078	-0.0593408	2.031419	4.656027
postsubs	-7.672523	-0.2004739	-7.472049	14.81871

Note: b = consistent under Ho and Ha; obtained from xtpmg; B = inconsistent under Ha, efficient under Ho; obtained from xtpmg

Source: authors computation using STATA

The rule of thumb is that if p-value is higher than 0.05, then run PMG otherwise MG should be estimated:

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.86

Prob>chi2 = 0.8356

If the probability value of Hausman test is higher than 0.005 we cannot reject the null hypothesis that PMG is the most efficient estimation under the null. Therefore, p-value at 0.8356 indicates that PMG is the efficient estimator under the null hypothesis of slope homogeneity thus the null hypothesis cannot be rejected.

5. Discussion

This study Employ the pmg prefix to determine the relationship between pre-tax, post-tax subsidy and GDP on inflation. The assumption is that in the long run all coefficients are homogenous in the group that makes the sample. But the short run coefficients and error variances are not the same. For instance, the result for Angola shows that deviation from long run can be corrected at 60% as confirmed by Harun et al. (2018) but contrary to the findings

by Dennis (2006). For Ecuador deviation from long run is corrected at 46% and the result of short run coefficients indicates that pre tax subsidy is positive and significant at 1% while post tax subsidy is negative and significant at 1%. The result for Gabon shows that deviation from long run is corrected at 13%. In this country, post tax subsidy has a negative effect on inflation and significant at 1%.the result for Iraq revealed that deviation from long run is corrected at 59%. In Kuwait error correction mechanism is 69% and pre tax subsidy has a positive impact on inflation and significant at 1% level. For Libya, the result shows that deviation from long run can be corrected at 10%. In Saudi Arabia, the result shows that deviation is corrected at 45% GDP has a positive effect on inflation and significant at 1%. For united Arab Emirate, deviation from long run is corrected at 19% and GDP has a positive effect on inflation and it is significant at 1%. In Venezuela, there is no co-integration to long run equilibrium. Lastly, In Nigeria, the error correction mechanism shows that deviation from long run disequilibrium is corrected at 70%. The short run coefficients indicate that pre tax subsidy is negative but significant at 10%, GDP is negative but significant at 10% while post tax subsidy has a positive effect on inflation and significant at 10%. This study also employed time series data set on Nigeria to investigate whether a long run exist among series. Employing the Augmented Dickey Fuller test, series indicates 1(1) and non 1(2) thus the auto regressive distributed lag model (ADRL) is employed. We employed the recommended co-integration test proposed by Pesaran et al. (2001) which states the Null hypothesis of no co-integration and the alternative hypothesis of presence of co-integration. Pesaran et al. (2001) it is ideal to perform the co-integration test on level variable equation and not the first difference. The rule of thumb ADRL bound test is we reject the null hypothesis at 1% 5% 10% level of significance if the F statistical value is greater than the critical value at the upper bound 1(1), then we can take it as there exist co-integration. We reject the null hypothesis and estimate the long run relationship (ECM). However, where the F Statistics is lower than the critical value for lower bound 1(0), we cannot reject the null hypothesis of no co-integration in this case and that results to employing the short run estimate. In any case, where the F statistics fall between the lower bound 1(0) and upper bound 1(1) we see our result as inconclusive.

Table 4: ARDL Bounds Test

	[I_0] L_1	**[I_1] L_1**	**[I_0] L_05**	**[I_1) L_05**	**[I_0] L_025**	**[I_1) L_025**	**[I_0] L_01**	**[I_1) L_01**
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61
t	-2.953							
F	12.527							

Note: H0: no levels relationship; accept if F < critical value for I(0) regressors; reject if F > critical value for I(1) regressors
Source: Pesaran et al. (2001)

Table 5: Critical Values (0.1-0.01), t-statistic, Case 3

[I_0] L_1	**[I_1] L_1**	**[I_0] L_05**	**[I_1] L_05**	**[I_0] L_025**	**[I_1] L_025**	**[I_0] L_01**	**[I_1] L_01**
-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37

Note: accept if t > critical value for I(0) regressors; reject if t < critical value for I(1) regressors

The result above shows that our F statistics is greater that the critical value at upper bound 1(1). This informed us to reject the null hypothesis of no co-integration and accept the alternative hypothesis of co-integration. The result indicates that there is a long run relationship and have a form of linear fashion combination and in any case, where there is shock in the short run, it can affect the movement in the individual series which will eventually make the series to have long run convergence over time. Pre-tax subsidy, post-tax

subsidy and inflation have a long run relationship in Nigeria. This confirms with findings by Ghosh (2021).

6. Conclusions

Classicalist and Keynesian framework as conceived may not adequately explain the cause of inflation in countries depending on importation as the structural framework does. This shows that upcoming researches on the area need to conceive the issue from structural perspective. A limitation associated with this study is its inability to explore comparison between oil and no oil exporting nations, this will be a further research area in future. Subsidy reform agenda in developing nations for the past two decades has been prioritize as major way of cushioning the rising price of products on final consumer. To this extent, the policy reform agenda is employed to close the pricing gap. Although the level of reform by nations differs among developing countries sampled in this study, the outcome of result of coefficients and error correction mechanism varies across groups that make the panel.

This study employed the autoregressive distributed lag model to estimate the role of subsidy on inflationary pressure are heterogeneous across panel and the following conclusions are made: (i) pre-tax subsidy has a positive insignificant effect on inflation in the long run. This clearly shows that a fund directed towards pre tax subsidy is not as large as post tax subsidy. Thus, it effects on inflation is not significant; (ii) GDP has negative insignificant effect on inflation in the long run; (iii) post-tax subsidy has negative and statistical significant effect on inflation in the long run. Post tax subsidy reduces inflation to an extend that is why most country whose major export is oil spends heavily on post tax subsidy. However, without caution can affect the financial hub and fiscal sustainability of a nation; (iv) on causality relationship. The result also revealed that there is a unidirectional causality running from GDP to inflation.

The post-tax subsidy especially and pre-tax subsidy have so much implication on fiscal trajectory hence nations must realize that despite huge capital investment to cover the price gap, the effect is not felt on inflation. This is the case of sabotage and scam as most nations rejects the policy reform. Countries have resorted to social welfare program in an effort support for welfare of a people. There is need to build on sound resilient economic policies to increase GDP growth so as to reduce inflation in the long run, it also shows that nations have made several economic policies to target inflation although have not made much significant progress as a result of economic crisis and trade cycle.

This study is able to look at the effect of pre-tax and post-tax subsidy which other study did not do. More so, the best measure for price gap is pre-tax and post-tax subsidy which other studies could not use.

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References

Acharya, R. H., & Sadath, A. C. (2017). Implications of energy subsidy reform in India. *Energy Policy*, *102*, 453-462.

Auktor, G., & Loewe, M. (2021). *Subsidy reforms in the Middle East and North Africa Strategic options and their consequences for the social contract*. http://hdl.handle.net/10419/232574

Dennis, A. (2016). Household welfare implications of fossil fuel subsidy reforms in developing countries. *Energy Policy, 96*, 597–606.

Factsheet (2014). *Fuel subsidy removal in Zambia*. https://cuts-lusaka.org/pdf/Factsheet-Fuel_Subsidy_Removal_in_Zambia.pdf

Ghosh, P. P. (2022). Impact of India's diesel subsidy reforms and pricing policy on growth and inflation. *Energy Economics*, *113*, 106195.

Bello, K. M (2020). Petroleum Subsidy Reduction and Poverty in Nigeria a Choice between Maintaining the Subsidy or Providing Infrastructural Services Equivalent to the Deadweight Loss. *Asian Development Perspectives*, *11*(1), 70-81.

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *The Econometrics Journal*, *3*(2), 148–161.

Harun, M., Mat, S. H. C., Fadzim, W. R., Khan, S. J. M., & Noor, M. S. Z. (2018). The effects of fuel subsidy removal on input costs of productions: Leontief input-output price model. *International Journal of Supply Chain Management*, *7*(5), 529-534.

Choi, I. (2001). Unit root tests for panel data. *Journal of international money and Finance*, *20*(2), 249-272.

IMF. (2021). *IMF energy subsidy template. IMF. https://www.imf.org/external/np/fad/subsidies/data/subsidiestemplate.xlsx*

Maddala, G. S., & Wu., S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, *61*, 631–652.

Okwanya, I., Moses, O., & Pristine, J. M. (2015). An Assessment of the impact of Petroleum Subsidy on Consumer Price Index in Nigeria. *Global Journal of interdisciplinary social sciences*, *4*(1) 36-39.

Omolade, A. Ngalawa, H., & Kutu, A. (2019). Crude oil price shocks and macroeconomic performance in Africa's oil-producing countries. *Cogent Economics & Finance*, *7*(1), 1607431.

Omotosho, B. S. (2019). Oil Price shocks, fuel subsidies and Macroeconomic (In)stability in Nigeria. *CBN Journal of Applied Statistics*, 10(2) 1-38.

Rehman, F. U., & Khan, D. (2015). The Determinants of food price inflation in Pakistan: an econometric analysis. *Advances in Economics and Business*, *3*(12), 571–576.

Rotimi, M. E., & Ngalawa, H. (2017). Oil Price shocks and economic performance in Africa's Oil Exporting Countries. *Acta Universitatis Danubius*, *13*(5), 1-20.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.

Kuznets, S. (1995). Economic Growth and Income Inequality. *American Economic Review*, *45*(1), 1-28.

Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. *Econometrica: journal of the econometric society*, 761-766.

ARE THERE THE DIFFERENCES IN THE APPROACH TO CSR ACCORDING TO THE MOST IMPORTANT BUSINESS SECTORS IN THE SMES SEGMENT? EMPIRICAL RESEARCH IN THE V4 COUNTRIES

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Abstract:
Research background: Corporate Social Responsibility (CSR) is an important concept that is gradually finding application in the small and medium-sized enterprises (SMEs) segment.
Purpose of the article: The aim of this paper was to define the significant drivers of CSR in the SME segment and to compare these attitudes across the three most important business sectors in the Visegrad Four countries (V4 countries).
Methods: Empirical research, which aimed at identifying the attitudes of SMEs, was conducted in June 2022 in the V4 countries using the "Computer Assisted Web Interviewing" (CAWI Research Method). The total number of respondents in the V4 countries was 1.398. The sample, which only included respondents within the top three sectors in each V4 country, consisted of 995 respondents. The established statistical hypotheses were tested through descriptive statistics and Z-scores at a significance level of $\alpha = 5\%$.
Findings & Value added: Based on the results of the empirical research, some basic conclusions of this study can be formulated. The knowledge of the CSR concept is not at an adequate level within the sample set, which consisted of the three most important business sectors in the V4 countries. This trend is particularly evident in the Czech Republic and Slovakia. The research confirmed that there are no statistically significant differences within the sample in the assessment of knowledge of the CSR concept. A relatively small number of SMEs consider the concept of CSR in the management of the company. This trend is particularly evident in the Czech Republic and Slovakia. Better results were found in Poland and Hungary. The research has shown that there are no statistically significant differences in the attitudes of SMEs within the sample across the V4 countries. SMEs within the sample agree with low intensity with the statement that CSR implementation enables them to gain competitive advantages in the market. The attitudes of SMEs are very similar across the V4 countries. The most statistically significant differences in the attitudes of SMEs within the sample were found when assessing the importance of CSR in the process of recruiting new employees. Some sectors valued significantly more the importance of CSR in this process.

Keywords: small and medium-sized enterprise, Corporate Social Responsibility, business sectors

JEL Classification: M14, L26, D64

1. Introduction

Small and medium-sized enterprises (SMEs) are an important part of the economy in all countries of the world. Due to certain constraints on their business activities, they carry out some activities on a limited scale or in a different, self-contained way.

The situation is similar with regard to the application of Corporate Social Responsibility (CSR). While some authors argue that SMEs' activity in this area is insufficient (Berniak-Wozny et al., 2023) and they have to overcome various obstacles (Wentzel et al., 2023), other authors argue that SMEs have been carrying out some partial CSR activities long before the emergence of this concept, because they are more strongly linked to the region in which they operate, such as charity activities and regional outreach activities.

CSR is one of the basic directions that companies should focus on, because the focus on profit maximization is not sufficient for the current trends in business. SMEs also need to feel the weight of social responsibility. SMEs should pay attention to "improving environmental conditions, healthy competition and equality in the market, treating human resources with dignity and advancing them as the greatest asset of the enterprise, and caring for the whole community, with the local community as the main focus" (Rashiti and Skenderi, 2023; Chi et al., 2023).

This article focuses on the research on the application of CSR in the three most important SME business sectors in the Visegrad Four countries (V4 countries: Czech Republic, Slovakia, Poland and Hungary). SMEs in the V4 countries are mainly engaged in services, trade, manufacturing and tourism. On the one hand, the individual economic sectors in which SMEs operate differ in their specific characteristics, which are conditioned by the area in which they operate. On the other hand, some sectors also share a number of common features.

The originality of this paper lies in the fact that we investigate the attitudes of SME owners/managers towards CSR on the basis of our own empirical research conducted in the V4 countries. The focus of this research is the question to what extent there are different attitudes and approaches of SMEs towards CSR in different business sectors.

The structure of the article is as follows. The first chapter presents the scientific views on the issue. The content of the second chapter is the aim, description of the methodology used and description of the data. The next chapter presents the results of the research and a discussion of them. In the conclusion, the main results of the research are formulated in an integrated form.

2. Literature Review

The view of the meaning and focus of CSR has evolved over a historical framework, and there are therefore a number of quite diverse perspectives on this sphere. Initially, CSR was perceived as a philanthropic idea and practiced mainly by large corporations. Over time, the view that CSR can become a more integral part of corporate strategy has gained ground and can be very important for SMEs, as CSR activities of SMEs can potentially contribute to increasing their competitiveness (Apospori, 2018).

Carroll (1979) defined CSR as the social responsibility of a company which includes the economic, legal, ethical and discretionary expectations that a company has from organizations at any given time.

CSR can be defined as a concept in which firms integrate social and environmental concerns into their business activities and interactions with stakeholders on a voluntary basis (Apospori, 2018). CSR is an ongoing commitment by businesses to behave ethically and contribute to economic development while improving the quality of life of employees and their families, as well as the local community and society as a whole (Rexhepi et al., 2013). CSR can be considered as a practice that sacrifices profits, through a tool for marketing and gaining reputation, to an international self-regulation of private business (Sheehy, 2015).

Castro-Gonzalez et al. (2021) prefer to define CSR in the form of specific organizational activities and corporate policies that take into account stakeholder expectations in the spheres of economic, social and environmental performance. They view CSR as a strategic factor to achieve sustainable development of firms. CSR enables companies to improve not only their profitability but also their social impact, or to influence the attitudes and behaviour of consumers or vendors. In this context Coppa and Sriramesh (2013) emphasize that CSR "seeks corporations to generate profit while creating minimal harm to society and go a step further by contributing to social improvement as well".

According to several authors, the application of the CSR concept can bring SMEs competitive advantages in the market. CSR has the potential to strengthen the competitiveness of SMEs. Aligning regional CSR initiatives with the CSR needs of SMEs is critical to achieving regional sustainable competitiveness (Apospori, 2018). According to the author, the concept of CSR suggests that "companies should seek to optimize their performance by maximizing synergies and minimizing conflicts between economic, social, and environmental objectives." Market-oriented CSR activities have a significant positive impact on increasing the competitiveness of SMEs (Rashiti and Skenderi, 2023). The most important benefits of engaging in CSR are building trust, building relationships with clients and improving image (Berniak-Wozny et al., 2023). According to some authors, CSR has a positive effect on firm performance because it positively influences competitive advantage, reputation, and customer satisfaction (Saeidi et al., 2015) and influences customer recommendation and repurchase behaviour (Perez and del Bosque, 2015). SMEs also perceive a positive relationship between the integration of CSR rules within their business and sustainable business performance (Wentzel et al. 2023).

The current business environment is increasingly being characterized by uncertainty, hypercompetition and rapid technological change, presenting challenging conditions for SME management (Al-Jinini et al., 2019). In this context, CSR plays an important role to motivate the management of SMEs to optimize practices while balancing economic, social and environmental aspects. Of course, SMEs present their CSR policy in relation to the external environment, but the most important area is the approach to their own employees.

According to Gorny (2019), incorporating CSR principles into an organisation's strategy will help to increase its social capital. In particular, it highlights the need to create favourable working conditions for employees that translate into work comfort, which is an integral part of efforts to perform work effectively. In this context, several authors emphasize the importance of human capital, as higher business performance is positively related to a higher level of both intellectual capital and innovation culture (Dabic et al., 2019; Gomezelj and Smolcic, 2016). SMEs with employees who develop their knowledge and skills are more likely to have higher growth and profitability (Gomezelj and Antonic, 2015) or represent an important resource that influences the identification and exploitation of international opportunities (Buzavaite and Korsakiene, 2019). Positive perceptions of CSR reduce employee turnover in a firm. According to the authors, employee turnover is a key issue that can threaten the survival of a company, either by reducing its revenues or increasing its costs (Castro-Gonzalez et al., 2021). Song et

al. (2023) emphasize the importance of sustainable human resource management because it plays a moderating role between corporate environmental ethics and environmental commitment and positively influences corporate environmental ethics and employee environmental commitment.

The most important business areas for SMEs in the V4 countries are services, trade, manufacturing and tourism. The services sector has gradually become the dominant sector in advanced economies (Ogujiuba et al., 2023) Services can take many forms, e.g. financial services, software services, tourism services and many other areas. The typical characteristics of services are that they are intangible, extremely labour intensive, cannot be warehoused, and are highly heterogeneous as their quantity and quality are directly dependent on the provider. Applying the concept of CSR to services means that the services provided are economically efficient as well as socially beneficial and environmentally acceptable.

The trade sector focuses on the exchange of goods or services between economic agents. Trade matches the supply of goods and services with the demand in this area. The trade sector helps to increase competition and provides a greater variety of goods and services to customers. Strong competition in the trade market generates optimal prices for customers. CSR in the trade sector should focus on taking care of employees and minimizing negative impacts on the environment (Huttmanova and Valentiny, 2019).

Manufacturing is oriented towards expanding the range of goods. As part of the transformation process, manufacturers convert inputs into desired outputs in the form of products that are demanded in the market. Compared to services, trade and tourism, the production process generally requires more technological support, consumes more raw materials and produces more negative externalities.

Tourism has a significant position in the economy of many countries and its importance is growing worldwide. The essence of tourism is the mobility of people, which is determined by various motives, primarily aimed at gaining new experiences (recreation, discovering new places, cultures and natural beauties, etc.). Service quality and tourist satisfaction are the basis for long-term tourism development (Amoah et al., 2023). In the tourism industry, increased attention has been paid to the implementation of CSR principles, yet many SME owners/managers experience various barriers in this area, such as lack of financial resources or lack of time and necessary knowledge. However, increased stakeholder pressure requires tourism businesses to respond to demands for more sustainable behavior in the sector (Santos, 2023). This study aims to investigate the significant drivers of CSR in the top three business sectors in each of the V4 countries.

3. Methodology

The aim of the paper was to define the significant CSR factors in the SME segment and to compare these attitudes within the three most important business sectors in the V4 countries.

The empirical research, which aimed at identifying the attitudes of SMEs, was conducted in June 2022 in the V4 countries. Data collection was carried out by the external agency MNFORCE using the "Computer Assisted Web Interviewing" (CAWI Research Method). The questionnaire could be completed by the owner or the top manager of the SME.

In the Czech Republic, the total number of respondents was 347. The structure of respondents in terms of company size was as follows: 45.2% micro enterprises, 30.8% small enterprises and 23.9% medium enterprises. The largest number of firms were engaged in services 138 (39.8%) and manufacturing 72 (20.7%), followed by the following areas: 60

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(17.3%) trade, 32 (9.2%) construction, 11 (3.2%) transport, 7 (2.0%) agriculture, 3 (0.9%) tourism and 24 (6.9%) respondents indicated other business sector.

In the Slovak Republic, the total number of respondents was 322. The structure of respondents in terms of company size was as follows: 51.9% micro enterprises, 26.7% small enterprises and 21.4% medium enterprises. The largest number of firms were in services 129 (40.1%) and trade 79 (24.5%), followed by the following areas: 42 (13.0%) manufacturing, 37 (11.5%) construction, 7 (2.2%) transport, 3 (0.9%) agriculture, 3 (0.9%) tourism, and 22 (6.9%) respondents indicated other business sector.

In Poland, the total number of respondents was 381. The structure of respondents in terms of company size was as follows: 47.2% micro enterprises, 27.8% small enterprises and 25.0% medium enterprises. The largest number of firms were in tourism 110 (28.9%) and manufacturing 78 (20.5%), followed by the following: 56 (14.7%) trade, 49 (12.8%) services, 31 (8.1%) construction, 13 (3.4%) transport, 17 (4.5%) agriculture, and 27 (7.1%) respondents indicated other business sector.

In Hungary, the total number of respondents was 348. The structure of the respondents in terms of company size was as follows: 50.0% micro enterprises, 28.2% small enterprises and 21.8% medium enterprises. The largest number of firms were in tourism 110 (31.6%) and trade 69 (19.8%), followed by the following: 52 (14.9%) services, 34 (9.8%) manufacturing, 23 (6.6%) transport, 19 (5.5%) agriculture, 13 (3.5%) construction, and 29 (8.3%) respondents indicated other business sector.

In this article, we will assess the respondents' attitudes according to the three most important business sectors in each V4 country. In the Czech Republic these will be the following sectors of the economy: services, manufacturing and trade. In Slovakia, services, trade and manufacturing. In Poland, tourism, manufacturing and trade. In Hungary, tourism, trade and services. These sectors make up the sample of 995 respondents that will be the subject of research for this study.

Based on previous research and qualitative analysis of the literature reviewed, statements were established that appropriately characterize the importance of CSR in the SME sector:
ST1: I am familiar with the concept of corporate social responsibility (CSR).
ST2: I take the concept of CSR into account when managing a company.
ST3: Implementing the CSR concept enables our company to gain competitive advantages in the market.
ST4: CSR enables our company to attract new employees.

Based on the method of expert estimation, we set the following statistical hypotheses:
H1: There are no statistically significant differences in respondents' positive attitudes by the three most important sectors across the V4 countries when evaluating ST1.
H2: There are no statistically significant differences in respondents' positive attitudes by the three most important sectors across the V4 countries when evaluating ST2.
H3: There are no statistically significant differences in respondents' positive attitudes by the three most important sectors across the V4 countries when assessing ST3.
H4: There are no statistically significant differences in respondents' positive attitudes by the three most important sectors across the V4 countries when assessing ST4.

The statistical hypothesis was tested through descriptive statistics, Z-score at $\alpha = 5\%$ significance level. If the p-value is greater than or equal to 0.05 the null hypothesis is confirmed. If the p-value is less than 0.05 the null hypothesis is rejected. Calculations were made using freely available software on the internet (Z Score Calculator, n.d.).

4. Results and Discussion

The following tables (Table 1-8) present the results of the research, including the verification of each scientific hypothesis.

Table 1: ST1 research results the three the most important sectors in the V4 countries

ST1: I am familiar with the concept of corporate social responsibility (CSR).	**CR** S/M/Tr 138/72/60	**SR** S/Tr/M 129/42/79	**PL** CR/V/O 110/78/56	**HU** T/Tr/S 110/69/52
1. I completely agree	20/23/12	24/8/14	42/43/26	39/33/27
2. I agree	59/27/17	46/14/32	48/27/20	56/29/23
Total 1+2	79/50/29	70/22/51	90/70/46	95/62/50
Percentage of positive responses	57/69/**48**	54/52/65	82/90/82	86/90/**96**
Arithmetic mean	58	**57**	85	**91**

Note: Czech Republic – CR; Slovak Republic – SR; Poland – PL; Hungary – HU; services – S; trade – Tr; manufacturing – M; tourism – T.
Source: own research

Table 2: Statistical calculations of ST1 by the three most important sectors in the V4 countries

Z score: p-value:			
CR: S/M**;** S/Tr; M/Tr	0.0854	0.2460	**0.0139**
SR: S/M; S/Tr; M/Tr	0.8337	0.1443	0.1936
PL: T/M; T/Tr; M/Tr	0.1336	0.9601	0.2041
HU: T/Tr; T/S; Tr/S	0.4902	0.0574	0.1902

Source: own research

The lowest proportion of positive responses was recorded in the trade sector in the Czech Republic (48%) and the highest proportion of positive responses was recorded in the services sector in Hungary (96%). The average value of positive responses to ST1 ranges from 57% in Slovakia to 91% in Hungary. Interestingly, many respondents in the Czech Republic and Slovakia did not take a position on this statement. In the Czech Republic this was up to 27% of respondents and in Slovakia even more respondents (30%). Does this mean that these SMEs do not know the concept of CSR?

H1 was confirmed. The empirical research confirmed that there are no statistically significant differences in the positive attitudes of respondents according to the three most important sectors in the V4 countries when evaluating ST1. The only exception was the comparison of the manufacturing and trade sectors in the Czech Republic (p-value = 0.0139).

SMEs operating in manufacturing were significantly more likely to agree with ST1 compared to trading firms.

Table 3: ST2 research results the three the most important sectors in the V4 countries

ST2: I take the concept of CSR into account when managing a company.	**CR** S/V/O 138/72/60	**SR** S/V/O 129/42/79	**PL** CR/V/O 110/78/56	**HU** C/O/S 110/69/52
1. I completely agree	15/19/9	19/7/8	31/38/18	35/32/25
2. I agree	59/25/20	48/18/32	52/28/25	55/29/22
Total 1+2	74/44/29	67/25/50	83/66/43	90/61/47
Percentage of positive responses	54/61/**48**	52/59/63	75/85/77	82/88/**90**
Arithmetic mean	**54**	58	80	**87**

Source: own research

The lowest proportion of positive responses was recorded in the trade sector in the Czech Republic (54%) and the highest proportion of positive responses was recorded in the services sector in Hungary (90%). The average value of positive responses to ST1 ranges from 54% in the Czech Republic to 87% in Hungary. Many respondents in the Czech Republic (93 respondents) and Slovakia (86 respondents) did not take a position on this statement.

Table 4: Statistical calculations of ST2 by the three most important sectors in the V4 countries

Z score: p-value:			
CR: S/M**;** S/Tr; M/Tr	0.2983	0.4965	0.1416
SR: S/M; S/Tr; M/Tr	0.3898	0.1096	0.6818
PL: T/M; T/Tr; M/Tr	0.1260	0.8493	0.2501
HU: T/Tr; T/S; Tr/S	0.2380	0.1585	0.7263

Source: own research

H2 was confirmed. The empirical research confirmed that there are no statistically significant differences in the positive attitudes of respondents according to the three most important sectors across the V4 countries when evaluating ST2. The only exception was the comparison of the manufacturing and trade sectors in the Czech Republic (p-value = 0.0139). SMEs operating in manufacturing were significantly more likely to agree with ST2 compared to trading firms.

Table 5: ST3 research results the three the most important sectors in the V4 countries

ST3: Implementing the CSR concept enables our company to gain competitive advantages in the market.	**CR** S/V/O 138/72/60	**SR** S/V/O 129/42/79	**PL** CR/V/O 110/78/56	**HU** CR/O/S 110/69/52
1. I completely agree	21/15/7	27/6/19	33/34/20	41/28/21
2. I agree	44/30/23	41/18/31	43/30/21	46/30/22
Total 1+2	65/45/30	68/24/50	76/64/41	87/58/43
Percentage of positive responses	**47**/62/50	53/57/63	69/82/73	79/**84**/83
Arithmetic mean	**53**	58	75	**82**

Source: own research

Table 6: Statistical calculations of ST3 by the three most important sectors in the V4 countries

Z score: p-value:			
CR: S/M**;** S/Tr; M/Tr	**0.0340**	0.7039	0.1499
SR: S/M; S/Tr; M/Tr	0.6171	0.1362	0.5093
PL: T/M; T/Tr; M/Tr	**0.0444**	0.5823	0.2187
HU: T/Tr; T/S; Tr/S	0.4122	0.5892	0.8415

Source: own research

The lowest proportion of positive responses was recorded in the services sector in the Czech Republic (47%) and the highest proportion of positive responses was recorded in the trade sector in Hungary (84%). The average value of positive responses to ST1 ranges from 53% in the Czech Republic to 82% in Hungary. Interestingly, many respondents in the Czech Republic and Slovakia did not take a position on this statement. In the Czech Republic up to 36% of respondents could not take a position on this statement. In Slovakia, 34% of SMEs could not take a position on this statement.

H3 was confirmed. The empirical research confirmed that there are no statistically significant differences in the positive attitudes of respondents according to the three most important sectors in the V4 countries when assessing ST3. In two cases, the p-value was lower than the set criterion of 0.05. In the Czech Republic, we found statistically significant differences when comparing the services and manufacturing sectors (the manufacturing sector significantly more agreed with ST3) and in Poland also the manufacturing sector significantly more agreed with ST3 compared to the tourism sector.

The lowest proportion of positive responses was recorded in the trade sector in the Czech Republic (47%) and the highest proportion of positive responses was recorded in the services sector in Hungary (90%). The average value of positive responses to ST4 ranges from 53% in the Czech Republic to 84% in Hungary. Interestingly, many respondents in the Czech Republic and Slovakia did not take a position on this statement. In the Czech Republic as many as 102 respondents could not take a position on this statement. In Slovakia it was 90 respondents.

Table 7: ST4 research results the three the most important sectors in the V4 countries

ST4: CSR enables our company to attract new employees.	**CR** S/V/O 138/72/60	**SR** S/V/O 129/42/79	**PL** CR/V/O 110/78/56	**HU** CR/O/S 110/69/52
1. I completely agree	13/15/13	21/6/18	35/31/22	31/30/22
2. I agree	54/30/15	42/19/37	47/38/24	54/28/25
Total 1+2	67/45/28	63/25/55	82/69/46	85/58/47
Percentage of positive responses	49/62/**47**	49/59/70	74/88/82	77/84/**90**
Arithmetic mean	**53**	59	81	**84**

Source: own research

Table 8: Statistical calculations of ST4 by the three most important sectors in the V4 countries

Z score: p-value:			
CR: S/M**;** S/Tr; M/Tr	0.0549	0.8103	0.0688
SR: S/M; S/Tr; M/Tr	0.2301	**0.0033**	0.2627
PL: T/M; T/Tr; M/Tr	**0.0183**	0.2713	0.3030
HU: T/Tr; T/S; Tr/S	0.2713	**0.0444**	0.3077

Source: own research

H4 was partially confirmed. The empirical research confirmed that there are largely no statistically significant differences in the positive attitudes of respondents according to the three most important sectors in the V4 countries when assessing ST4. However, in three cases the p-value was below the set criterion of 0.05. In Slovakia, we found statistically significant differences when comparing the services and trade sectors (the trade sector significantly more agreed with ST4), in Poland the manufacturing sector significantly more agreed with ST4 compared to the tourism sector, and in Hungary the services sector significantly more agreed with ST4 compared to the tourism sector.

The results of the empirical research can be summarized as follows.

Knowledge of the CSR concept is relatively low in the Czech Republic and Slovakia. It can be concluded that there are no statistically significant differences between the three most important SME business sectors in the individual V4 countries. A relatively small number of SMEs take the CSR concept into account when managing a company. This trend is particularly evident in the Czech Republic and Slovakia. Better results were found in Poland and Hungary. Empirical research has shown that there are no statistically significant results when comparing the three most important sectors across the V4 countries. Thus, it can be argued that the attitudes of SMEs doing business in the top three sectors in the V4 countries have similar attitudes towards the acceptance of CSR in management. Firms in the V4 countries agree with relatively low intensity with the statement that the implementation of CSR enables them to gain competitive advantages in the market. This trend is particularly evident in the Czech Republic and Slovakia. Empirical research has shown that there are no statistically significant differences in the attitudes of SMEs towards ST3 across the V4 countries.

SMEs in the V4 countries (sample) agreed with relatively low intensity that CSR enables them to attract new employees. This trend prevails in the Czech Republic and Slovakia.

When assessing the ST4 attitude, we found the most significant differences when comparing the top three sectors in the V4 countries. These differences were observed in Slovakia, Poland and Hungary. Some indication of a trend can be seen if we compare the tourism sector with the other sectors in Poland and Hungary. The tourism sector was significantly less likely to agree with the statement that CSR enables a company to attract new employees.

The research results show that some SMEs are not yet fully aware that the implementation of CSR in their business activities can bring them various competitive advantages in the market, which are presented by several authors in their studies (Apospori, 2018; Rashiti and Skenderi, 2023; Berniak-Wozny et al. 2023; Saeidi et al. 2015; Perez and del Bosque, 2015; Wentzel et

al. 2023). It would be advisable to communicate these options to SME representatives in each country. The research findings follow the findings of Wentzel et al. (2023) who state that SMEs face challenges in implementing CSR in all areas of management levels related to the organization and business environment and Berniak-Wozny et al. (2023) who state that SMEs engage in CSR activities to a limited extent. In this context, there is clearly a need to pay more attention to this issue in the communication of professional and governmental spheres with SME representatives.

5. Conclusions

The aim of this paper was to define the significant factors of CSR in the SME segment and to compare these attitudes across the three most important business sectors in the V4 countries. Based on the results of the empirical research, some basic conclusions of this study can be formulated. The knowledge of the CSR concept is not at an adequate level within the sample set, which consisted of the three most important business sectors in the V4 countries. This trend is particularly evident in the Czech Republic and Slovakia. The research confirmed that there are no statistically significant differences within the sample in the assessment of knowledge of the CSR concept.

A relatively small number of SMEs consider the concept of CSR in the management of the company. This trend is particularly evident in the Czech Republic and Slovakia. Better results were found in Poland and Hungary. The research has shown that there are no statistically significant differences in the attitudes of SMEs within the sample across the V4 countries. SMEs within the sample agree with low intensity with the statement that CSR implementation enables them to gain competitive advantages in the market. The attitudes of SMEs are very similar across the V4 countries. The most statistically significant differences in the attitudes of SMEs within the sample were found when assessing the importance of CSR in the process of recruiting new employees. Some sectors valued significantly more the importance of CSR in this process.

The limitations of this research can be seen in the limited, albeit representative, sample of respondents, as the research was conducted only in the V4 countries. It can also be assumed that the current political situation in the world (the war in Ukraine and the deteriorating security situation in the world) and the worsening economic situation (high inflation, rising energy prices, etc.) may have influenced the attitudes of SMEs. However, it can be assumed that the results of this research will enrich the knowledge base in the field of CSR application in the SME segment.

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References

Al-Jinini, D. K., Dahiyat, S. E., & Bontis, N. (2019). Intellectual capital, entrepreneurial orientation, and technical innovation in small and medium-sized enterprises. *Knowledge and Process Management*, *26*(2), 69-85.

Amoah, J., Egala, S.B. Keelson, S., Bruce, E., Dziwornu, R., & Duah, F. A. (2023). Driving factors to competitive sustainability of SMEs in the tourism sector: An introspective analysis. *Cogent Business & Management*, 10(1), 2163796.

Apospori, E. (2018). Regional CSR Policies and SMEs' CSR Actions: Mind the Gap - The Case of the Tourism SMEs in Crete. *Sustainability, 10*(7), 2197.

Berniak-Wozny, J., Kwasek, A., Gasinski, H., Maciaszczyk, M., & Kocot, M. (2023). Business Case for Corporate Social Responsibility in Small and Medium Enterprises- Employees' Perspective. *Sustainability, 15*(2), 1660.

Buzavaite, M., & Korsakiene, R. (2019). Human Capital and the Internationalisation of SMEs: A Systemic Literature Review. *Entrepreneurial Business and Economics Review*, *7*(3), 125-142. https://doi.org/10.15678/EBER.2019.070307

Carroll, A. B. (1979). A Three-Dimensional Conceptual model of Corporate performance. *Academy of Management Review*, *4*(4), 497–505.

Castro-Gonzalez, S., Bande, B., & Vila-Vazquez, G. (2021). How Can Companies Decrease Salesperson Turnover Intention? The Corporate Social Responsibility Intervention. *Sustainability, 13*(2), 750.

Chi, H. P. H., Kiet T. N., & Duc C. T. (2023). Business practices of trade and service firms: Evidence from Vietnam. *Journal of the Knowledge Economy*, early access.

Coppa, M., & Sriramesh, K. (2013). Corporate social responsibility among SMEs in Italy. *Public Relations Review*, *39*(1), 30-39.

Dabic, M., Laznjak, J., Smallbone, D., & Svarc, J. (2019). Intellectual capital, organisational climate, innovation culture, and SME performance: Evidence from Croatia. *Journal of Small Business and Enterprise Development*, *26*(4), 522-544.

Gomezelj, O, D., & Antonic, B. (2015). Employees´ knowledge determinants in SMEs: The case of Slovenia. *Journal of Business Economics and Management*, *16*(2), 422-444.

Gomezelj, O, D., & Smolcic, J., D. (2016). The influence of intellectual capital on innovativeness and growth in tourism SMEs: empirical evidence from Slovenia and Croatia, *Economic Research-Ekonomska Istraživanja*, *29*(1), 1075-1090.

Gorny, A. (2019). Application of the CSR guidelines to improve the working environment. *9th International Conference On Manufacturing Science And Education (MSE 2019): Trends In New Industrial Revolution, 290,* 1-7.

Huttmanova, E., & Valentiny, T. (2019). Assessment of the Economic Pillar and Environmental Pillar of Sustainable Development in the European Union. *European Journal of Sustainable Development*, *8*(2), 289-298.

Ogujiuba, K. K., Ebenezer O., Boshoff, E. Agholor, I. & Ogujiuba, C. (2023). SMEs, Success, and Capital Startups: Evidence from the Service Sector in South Africa. *Administrative Sciences, 13*(5), 127.

Perez, A., & del Bosque, I. R. (2015). Corporate social responsibility and customer loyalty: Exploring the role of identification, Satisfaction and type of company. *Journal of Services Marketing*, *29*(1), 15-24.

Rashiti, M., & Skenderi, N. (2023). Impact of Corporate Social Responsibility as Competitive Factor on Small and Medium Businesses in Kosovo. *QUALITY-Access to Success, 24*(192), 261-270.

Rexhepi, G., Kurtishi, S., & Bexheti, G. (2013). Corporate Social Responsibility (CSR) and Innovation The drivers of business growth? *Second International Conference On Leadership, Technology And Innovation Management (2012)*, *75*, 532-541.

Saeidi, S. P., Sofian, S., Saeidi, P., Saeidi, S. P., & Saaeidi, S. A. (2015). How does corporate social responsibility contribute to firm financial performance? The mediating role of competitive advantage, reputation, and customer satisfaction. *Journal of Business Research*, *68*(2), 341-350.

Santos, E. (2023). From Neglect to Progress: Assessing Social Sustainability and Decent Work in the Tourism Sector. *Sustainability, 15*(13), 10329.

Sheehy, B. (2015). Defining CSR: Problems and Solutions Article. *Journal of Business Ethics, 131*(3), 625-648.

Song, W., Ma, Y., Fan, X., & Peng, X. (2023). Corporate environmental ethics and employee's green creativity? The perspective of environmental commitment. *Corporate Social Responsibility and Environmental Management, 30*(4), 1856-1868.

Wentzel, L., Fapohunda, J.A., & Haldenwang, R. (2023). A Corporate Social Responsibility (CSR) Model to Achieve Sustainable Business Performance (SBP) of SMEs in the South African Construction Industry. *Sustainability, 15*(13), 10007.

Z Score Calculator. (n.d.). *Z Score Calculator for 2 Population Proportions*. https://www.socscistatistics.com/tests/ztest/default2.aspx

SLOVAK LABOUR LANDSCAPE: EXAMINING THE RELATIONSHIP BETWEEN GOVERNMENT EXPENDITURES AND UNEMPLOYMENT

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Abstract:
Research background: We all regard unemployment as a negative phenomenon. It can have a negative impact on the individual but also on society as a whole. In an effort to reduce unemployment, governments around the world are spending considerable sums of money on financing active labour market policy instruments that help unemployed people to reintegrate into the labour market. It is therefore highly desirable for individual governments to know whether the level of government spending on active labour market policy instruments can influence the unemployment rate in their country. The analysis of the relationship between unemployment rates and government expenditure is crucial not only for policymakers but also for all parties invested in the prosperity of the nation.
Purpose of the article: The main aim of this paper is to assess the correlation between government expenditures on active labour market policy and the unemployment rate in Slovakia.
Methods: In order to assess the impact of government expenditure on active labour market policy on the unemployment rate in the Slovak Republic, we use correlation analysis, specifically the Pearson correlation coefficient. The data needed for this analysis come from publicly available databases, and we focus our analysis on the period 2009-2021.
Findings & Value added: The Pearson correlation coefficient value provides information about the strength of relationship between government expenditure on active labour market policy on the unemployment rate. In this case, the value of the correlation coefficient was -0.469, i.e. it was an indirect moderate linear relationship. Based on the result of the statistical significance test of the correlation coefficient to be zero, i.e. statistically insignificant, and hence government expenditure spent on ALMP instruments and the unemployment rate in the Slovak Republic are uncorrelated.

Keywords: unemployment; Pearson's correlation; active labour market policy; Slovakia; government expenditures

JEL Classification: J08; J60

1. Introduction

Unemployment, an enduring economic challenge faced by nations worldwide, serves as an indicator of a country's fiscal and social well-being (Abouelfarag and Qutb, 2021). Unemployment is a multifaceted issue with extensive ramifications that extend beyond the confines of the employment sector. The ramifications of unemployment extend beyond the individual level, encompassing communities and societies at large (Fiori et al., 2016).

An increasing body of scientific research has established that job insecurity has adverse effects on a variety of parts of life (Fiori et al., 2016; Svabova et al., 2019). The psychological impacts of unemployment have been explored, for example, by Lim (2010), de Witte et al. (2012), the health impacts of unemployment have been addressed by Ronchetti and Terriau (2020), on self-perceived health (Ronchetti and Terriau, 2019), on mental health (Thill et al., 2019; Cygan-Rehm et al., 2017; Amin et al, 2023; Drydakis, 2015), health of young people (Vancea and Utzet, 2017), the impact of unemployment on mental disorders, physical health and quality of life is examined in detail by Subramaniam et al. (2021), assessing the impact of unemployment on commercial firms is examined in a study by Zazdravnykh (2023).

Governments are faced with the intricate task of devising policies that promote economic expansion while also addressing the fundamental elements that contribute to unemployment. Government spending functions as a critical tool of fiscal policy, providing the government with the ability to regulate aggregate demand. Subsequently, employment levels, the distribution of national income, and economic growth rates are influenced by this control (El-Baz, 2016).

To alleviate unemployment, numerous initiatives are implemented in various nations as part of labour market policies. A common classification for these labour market indicators is between active and passive (Zielinski, 2015). Active labour market policies (ALMP) are widely implemented in order to improve the employment prospects of individuals who are unemployed (Crepon and Van Den Berg, 2016). Active labour market policies aim to retain employees, entice them to participate in the workforce, increase their wages and productivity, and improve labour market operations (Wisniewski, 2022). ALMP endeavours to address deficiencies in the labour market (Karasova et al., 2018). Passive labour market tools, which are designed to aid individuals in their job search and mitigate the risk of sudden income loss, have a defensive nature (Fossati et al., 2021).

A significant proportion of state expenditures are devoted to active labour market measures (Crepon and Van Den Berg, 2016). Constantly monitoring the quantity and effectiveness of these particular expenditures is an absolute needed (Banociova and Martinkova, 2017).

This article examines the relationship between government expenditures and unemployment, concentrating on the context of Slovakia. Slovakia, being a significant participant in the European Union, encounters the same economic obstacles that impact developed and emerging economies on a larger scale. The analysis of the relationship between unemployment rates and government expenditure is crucial not only for policymakers but also for all parties invested in the prosperity of the nation. The main aim of this paper is to assess the correlation between government expenditures on active labour market policy and the unemployment rate in Slovakia.

The structure of the paper is as follows, after an introduction to the problem addressed, followed by a review of the literature, followed by a description of the methods and data used in this study. The Results section presents the most important findings, i.e. the results of our investigation along with testing and validation of the hypothesis. The Discussion section compares the results of our study with those of studies dealing with similar issues and the last section, Conclusion, contains a brief summary of the whole paper.

2. Literature Review

There are now several academic studies that assess the impact of government spending on reducing unemployment in a country. Such an evaluation is also the focus of a recent study by Abouelfarag and Qutb (2021), who sought to examine the impact of government spending on unemployment in Egypt during the period 1980-2017. They use Johansen's cointegration test and an error vector correction model. The study by Yuruk and Acarolgu (2021) seeks to confirm or refute the validity of the Abrams curve hypothesis, which, in a nutshell, states that a large size of the public sector increases the unemployment rate in a country. Since the results of the analysis have shown the invalidity of the Abrams hypothesis, they recommend reducing the financial burden of government spending to fight unemployment in Turkey. For a sustained reduction in unemployment, active employment policies aimed at creating job opportunities should be a priority. Afonso et al. (2021) examined the relationship between government size and unemployment in eight large market economies such as Argentina, Turkey, Brazil and China. Based on the use of panel cointegration and causality, their results suggest the validity of the Abrams curve and demonstrate a long-run relationship between government size and unemployment rate in a country. However, this relationship depends on the methodology by which the size of government is measured. As long as government consumption expenditures and indirect taxes are taken as measures of government size, there is a fairly strong, positive and statistically significant relationship between government size and unemployment.

The impact of government expenditures on unemployment rates in two Baltic countries (Estonia and Latvia) is the subject of a study by Ozmen et al. (2023). Nepram et al. (2021) examine the relationship between government spending and unemployment rates in India using panel data analysis. In addition to government expenditure, the growth rate of state domestic product, level of education or per capita income were also entered as independent variables in this analysis. The study by Mahdavi and Alanis (2013), who take a closer look at selected US states, also examines the relationship between government spending and unemployment rates.

An assessment of the impact of government spending on individual labour market policies (in particular active labour market policies) on unemployment rates in OECD countries is the subject of a study by Hur (2019). He uses panel data for the period 2001-2013 for his analysis. By using panel regression and difference-in-differences analysis, it provides information on the performance of active labour market policies in reproducing unemployment rates. A study by Celikay (2023) looks extensively at social spending and its impact on chronic unemployment in OECD countries. These countries are typically characterised by different spending intensities and therefore it compares the effect of social spending on long-term unemployment rates in these countries. If there is an increase in the share of social spending in GDP, there will be an increase in the share of the long-term unemployed, i.e. those who have been unemployed for 12 months or more, in the total number of unemployed. Among the countries analysed, this interaction is most pronounced in those countries where social spending is high, such as Denmark, Sweden or Austria.

Azam et al. (2016) examined the relationship between military spending and unemployment rates in selected South Asian countries. While examining this long-run relationship, they also considered the impact of various macroeconomic variables such as foreign direct investment, GDP per capita, and population growth rate. The causality results suggest that there is an inverse causality between energy consumption, GDP per capita and population growth rate with unemployment rate in the short run.

The study by Liu et al. (2022) does not only focus on the impact of government spending on unemployment, but also acknowledges other factors that could affect unemployment, namely trade openness and institutional performance. The study focuses on countries belonging to the

Organization of Islamic Cooperation (OIC). As far as public expenditure is concerned, they find that it has an inverse and moreover significant correlation with unemployment in these countries.

3. Methodology

In order to assess the impact of government expenditure on active labour market policy on the unemployment rate in the Slovak Republic, we use correlation analysis. The data needed for this analysis come from publicly available databases such as Eurostat and the OECD database, and we focus our analysis on the period 2009-2021.

One of the variables that enters into our analysis is the unemployment rate. The values of this variable were obtained from the Eurostat database. Eurostat is the statistical office of the entire European Union, whose mission is to provide statistics of the highest possible quality (Eurostat, 2023).

The individual values of the unemployment rate that could be observed in Slovakia during the analysed period are presented in Table 1.

Table 1: Unemployment rate in the Slovak Republic during the period 2009-2021

Year	Unemployment rate [%]
2009	12.00
2010	14.30
2011	13.50
2012	13.90
2013	14.10
2014	13.10
2015	11.50
2016	9.60
2017	8.10
2018	6.50
2019	5.70
2020	6.70
2021	6.80

Source: Eurostat database

The second variable that enters the analysis is the amount of public expenditure that the Slovak government spends on active labour market policy instruments. This data can be obtained as a percentage of GDP. We obtained the GDP from the OECD website and the percentage of expenditure on ALMPs from Eurostat.

The amount of ALMP expenditures incurred by the Slovak government during the period analysed is shown in the Table 2.

We measure the correlation between government spending on ALMPs and the unemployment rate in Slovakia based on the Pearson correlation coefficient because both variables, i.e. the unemployment rate and the amount of government spending on ALMPs, are quantitative variables.

The covariance, due to its value being dependent on the scales of measurements for x and y, is frequently unsuitable as a descriptive measure of association. In order to render it a generally applicable measure of association, standardisation is necessary. The standardized measure of association is precisely the correlation coefficient. Different correlation coefficients exist to account for the unique attributes of dichotomous and ordinal variables, in addition to additional measures of association that can be applied to nominal and ordinal variables (Asuero et al., 2006).

Table 2: ALMP expenditure over the period 2009-2021

Year	GDP [million €]	Expenditure on ALMP [% of GDP]	Expenditures on ALMP [€]
2009	64,095.50	0.25 %	160,238,750.00
2010	68,764.90	0.32 %	220,047,680.00
2011	71,785.80	0.28 %	201,000,240.00
2012	73,649.30	0.25 %	184,123,250.00
2013	74,492.80	0.22 %	163,884,160.00
2014	76,354.50	0.20 %	152,709,000.00
2015	80,126.00	0.19 %	152,239,400.00
2016	81,265.20	0.26 %	211,289,520.00
2017	84,669.90	0.23 %	194,740,770.00
2018	89,874.70	0.24 %	215,699,280.00
2019	94,429.70	0.23 %	217,188,310.00
2020	93,444.10	0.33 %	308,365,530.00
2021	100,255.70	0.17 %	170,434,690.00

Source: own elaboration based on data from Eurostat database and OECD website

The majority of studies in educational and psychological research use correlation coefficients, and the Pearson correlation coefficient in particular, either as the primary mode of analysis to test major hypotheses or as a secondary mode of analysis to provide background information on the relationships between variables of interest prior to or after a more complex statistical analysis (Onwuegbuzie and Daniel, 1999).

The correlation coefficient is generally based on the covariance of random variables and is a measure of linear dependence between variables. It is a statistical measure that expresses the strength of the linear relationship between a pair of variables (Varadaraj et al., 2021).

The correlation coefficient as such is meaningless to us unless we are able to interpret its value correctly. It is a scalar variable, that is, we classify the values of the correlation coefficient into several intervals that will give us the strength of the dependence between the variables, ranging from weak, to moderate, to strong dependence (Taylor, 1990).

One of the most important properties of the correlation coefficient is that it can take values from the interval $r \in \langle -1; 1 \rangle$, whereby the closer the value of the correlation coefficient is to 1 or -1, respectively, the stronger the linear dependence between the variables X and Y will be (Bhuiyan et al., 2021). A correlation coefficient value of 0 indicates no linear relationship between the pair of variables (Ratner, 2009).

If $r > 0$, i.e. the correlation coefficient takes a positive value, the variables X and Y are directly proportional dependent. If $r < 0$, i.e. the correlation coefficient takes a negative value, the variables X and Y are inversely proportional dependent.

To statistically verify the significance of the value of the correlation coefficient, we perform the test of statistical significance of the correlation coefficient. Using this test, the null hypothesis takes the following form:

H_0: The random variables X and Y are linearly independent, i.e. uncorrelated. Thus, the correlation coefficient can be considered as zero.

What can be formally written as:

$$H_0: r = 0 \tag{1}$$

If the null hypothesis is rejected, we accept the validity of the alternative hypothesis, which is as follows:

H_1: The random variables X and Y are linearly dependent. Thus, the correlation coefficient can be considered non-zero.

What can be formally written as:

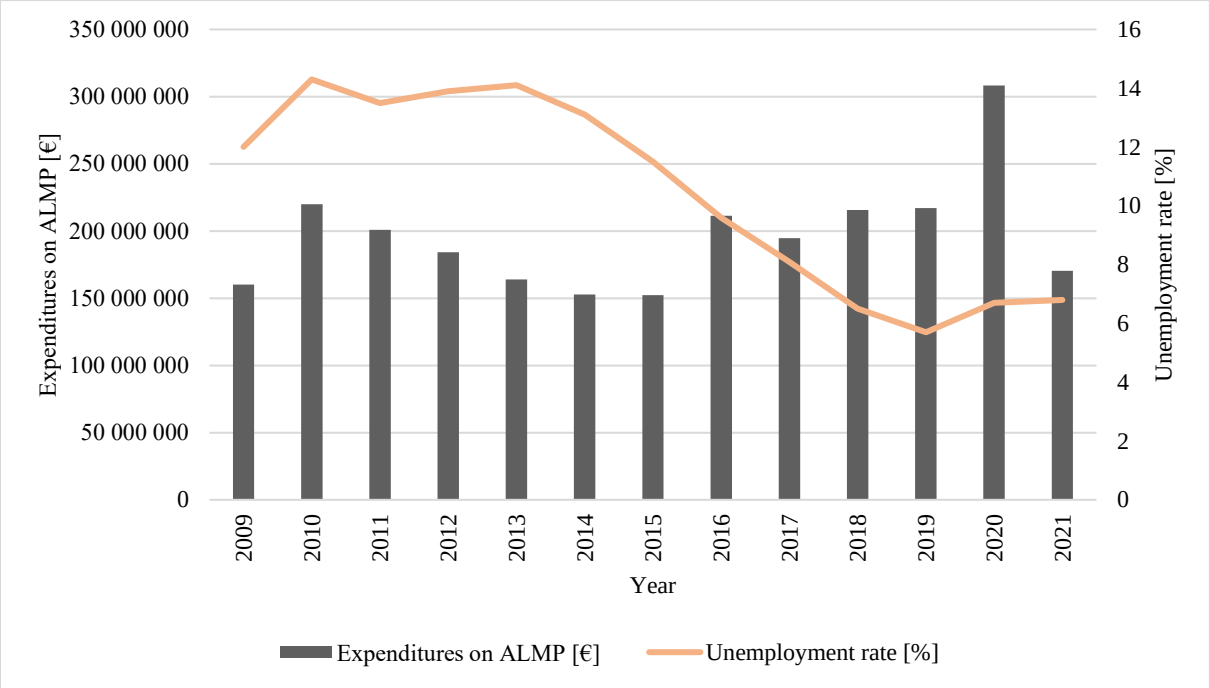
$$H_1: r \neq 0 \tag{2}$$

We test the significance of the correlation coefficient at the significance level $\alpha = 0.05$. The calculations are performed in the statistical software IBM SPSS Statistics version 26.0.

4. Results and Discussion

We used correlation analysis to assess the relative impact of government expenditure on ALMP instruments on the unemployment rate in the Slovak Republic. The actual development of the two variables analysed over the period 2009-2021 is shown in Figure 1.

Figure 1: Development of ALMP expenditures and unemployment rates in Slovakia for the period 2009-2021



Source: own elaboration

For government expenditure on ALMP instruments to have a positive effect on the unemployment rate, i.e. to reduce it, it would mean that the trend of government expenditure and the unemployment rate would be exactly opposite. For government expenditure to have a positive effect on a country's unemployment rate, it would have to be increasing while the unemployment rate is decreasing.

However, Figure 1 shows that movements in government expenditure and the unemployment rate have been different. From 2009-2015, based on the movement of the two variables analysed, we would not be able to say unequivocally that government expenditure has affected unemployment in a "positive" sense. Since 2016, however, the situation is significantly different and the unemployment rate has fallen below 10 %, and there has been an increase in government expenditure during this period.

We have further illustrated the dependence of the unemployment rate on government expenditure on ALMPs with a dot plot for clarity. However, even from this graph, it is not possible to say unequivocally that as government expenditure on ALMPs increases, the unemployment rate in the country would fall.

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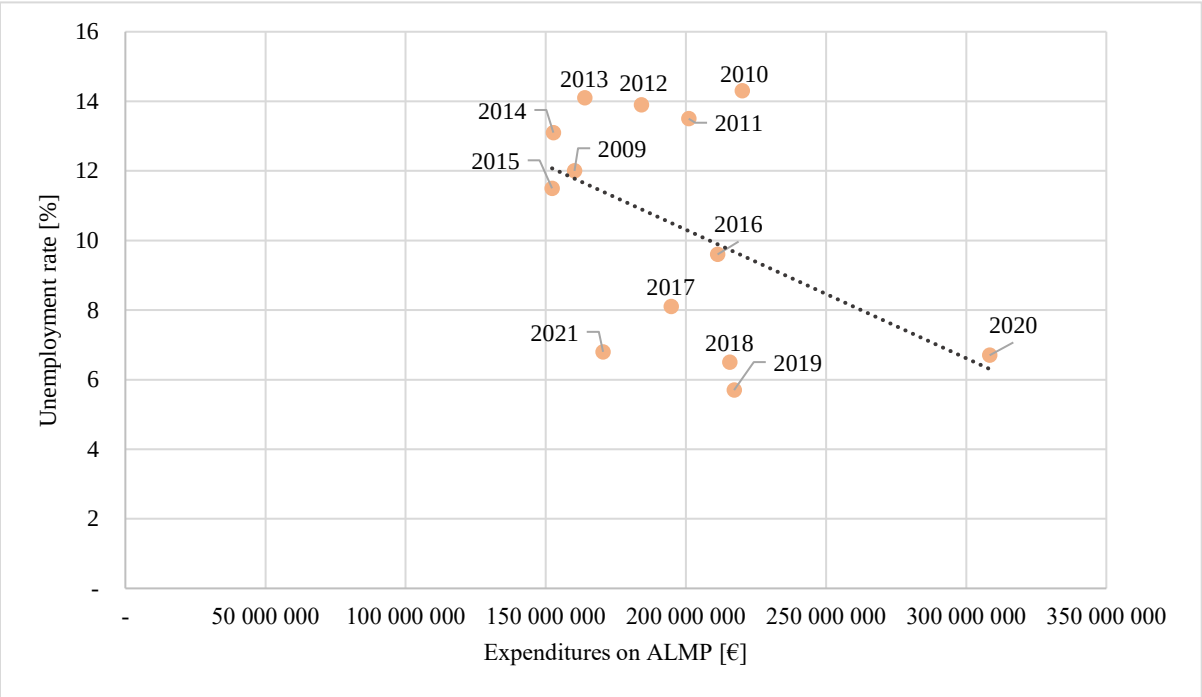
Figure 2: Dependence of the unemployment rate on government expenditure for the period 2009-2021



Source: own elaboration

Since we cannot clearly assess the impact of government spending on ALMPs on the unemployment rate from Figures 1 and 2, the value of the Pearson correlation coefficient, which is reported in the table below, provides information about this correlation.

Table 3: Correlation coefficient and statistical significance test

		Unemployment rate	Expenditures on ALMP
Unemployment rate	Pearson Correlation	1	-0.469
	Sig. (2-tailed)		0.106
	N	13	13
Expenditures on ALMP	Pearson Correlation	-0.469	1
	Sig. (2-tailed)	0.106	
	N	13	13

Source: own elaboration

The value of the correlation coefficient is -0.469, which corresponds to a moderate linear relationship between the unemployment rate and ALMP expenditures. The negative sign of the correlation coefficient indicates an inverse linear relationship between the pair of variables analysed, which can also be seen in Figure 2. Table 3 also contains the p-value of the statistical significance test of the correlation coefficient. Since the p-value (0.106) is greater than our chosen significance level (0.05), we do not reject the null hypothesis that we set in the Methodology section. The value of the correlation coefficient is considered statistically insignificant and hence government expenditure on ALMP and unemployment rate can be considered uncorrelated with each other.

Zulhanafi et al. (2013) in their study concluded that national government spending can affect unemployment to a large extent. If there is an increase in government spending, for example, in order to improve infrastructure, which can lead to an expansion of output and an increase in the demand for the basic factors of production, one of which is labor - employment, that is, there will be a reduction in unemployment. Conversely, if government spending is reduced, the way in which products and services are produced will be reduced, i.e. the demand for the

elements of production will also be reduced, causing unemployment to rise. Saraireh (2020) found that long-term unemployment decreases if the government spends more on infrastructure, health and education. Another important finding was the existence of a negative relationship between government spending and unemployment in Jordan.

Nepram et al. (2021) examined the relationship between government expenditure and unemployment rate in India based on panel data analysis. In addition to government expenditure, the growth rate of state domestic product, education level or per capita income were also entered as independent variables in this analysis. Through their analysis they found that government expenditure increases the unemployment rate.

However, the empirical results of a study by Aboulfarag and Qutb (2021), who used Johansen's cointegration test and an error vector correction model, suggest that government policy fails to reduce the unemployment rate in Egypt. Even the authors showed that an increase in gross government spending causes an increase in the unemployment rate, in the long term.

Azmi (2013) examined the impact of several variables such as unemployment rate, interest rate and government expenditure on GDP in Malaysia. From the correlation matrix developed, a negative relationship can be observed between the unemployment rate and the amount of GDP as the correlation coefficient was at -0.575776.

Kaderabkova and Jasova (2016) examined the relationship between the minimum wage and selected unemployment indicators in Slovakia and the Czech Republic. The average positive value of the correlation coefficient for selected unemployment indicators is 0.56 and the average negative value of the correlation coefficient for selected unemployment indicators is -0.64. That is, the negative correlation coefficient prevails, which confirms the claim that an increase in the minimum wage leads to a decrease in unemployment in the country.

A negative value of the correlation coefficient could also be observed in the study by Gibescu (2013). Which examined the relationship between GDP and unemployment rate in Romania. Its value is -0.819579515, which means a very strong relationship between the indicators. Its negative value means an inverse relationship between the two indicators.

A study by Netoiu et al. (2014) examines the relationship of key labour market indicators using correlation analysis. At the EU level, a strong and direct index dependence of 0.926 was observed between gross minimum wage and social protection, with a very low Sig level, indicating a high level of confidence in our correlation. The relationship between gross minimum wage and poverty in the EU shows a correlation coefficient of 0.933. It shows a strong and direct correlation with the level of these two indicators, with a very low significance level further reinforcing the importance of this correlation. The correlation between social protection and poverty in the European Union shows a correlation coefficient of 0.985. The correlation found in this case is a very strong, direct one. The Sig value was very low, indicating a high level of confidence in our correlation.

5. Conclusions

In this paper, we focused on the assessment of the correlation between the government expenditures that are spent by the Slovak government on the implementation of ALMP instruments and the unemployment rate in the Slovak Republic. For the analysis we worked with available data, which we obtained from Eurostat and OECD databases.

Correlation analysis was used to assess the correlation between pairs of quantitative variables. Since it was not possible to clearly assess the correlation between the variables from the graphical assessment, the Pearson correlation coefficient value provides information about the strength of this relationship. In this case, the value of the correlation coefficient was -0.469,

i.e. it was an indirect moderate linear relationship. To statistically verify the significance of the value of the correlation coefficient, a statistical test was performed and the p-value came out greater than our significance level (0.05), i.e. we did not reject the null hypothesis. Thus, we consider the value of the correlation coefficient to be zero, i.e. statistically insignificant, and hence government expenditure spent on ALMP instruments and the unemployment rate in the Slovak Republic are uncorrelated. Thus, from the above results it can be concluded that the expenditures made by the Government of the Slovak Republic on ALMP instruments aimed at reducing unemployment during the analysed period were not able to influence unemployment to such an extent that the negative value of the correlation coefficient found by us could be considered statistically significant.

The biggest limitation of this study can be considered the fact that we focused our attention only on the Slovak Republic. Therefore, in future research we would like to focus on a number of countries that are in some way interconnected, such as the V4 countries or the countries of the European Union. However, since unemployment in a country does not depend only on the amount of spending on ALMP instruments, it would be useful to investigate the interaction of several variables on unemployment and use, for example, one of the models for panel data.

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Data Availability Statement: Publicly available datasets were analyzed in this study. This data can be found here:

[https://ec.europa.eu/eurostat/databrowser/view/teilm010/default/table?lang=en]

[https://stats.oecd.org/#]

[https://ec.europa.eu/eurostat/databrowser/view/naida_10_gdp__custom_7842452/default/table?lang=en].

Conflicts of Interest: The authors declare no conflict of interest.

References

Abouelfarag, H. A., & Qutb, R. (2021). Does government expenditure reduce unemployment in Egypt?. *Journal of Economic and Administrative Sciences, 37*(3), 355-374.

Afonso, A., Sen, H., & Kaya, A. (2021). Government size, unemployment, and inflation nexus in eight large emerging market economies. *Hacienda Publica Espanola – Review of Public Economics*, (236), 133-170.

Amin, S., Korhonen, M., & Huikari, S. (2023). Unemployment and Mental Health: An Instrumental Variable Analysis Using Municipal-level Data for Finland for 2002–2019. *Social Indicators Research, 166*(3), 627-643.

Asuero, A. G., Sayago, A., & Gonzalez, A. G. (2006). The correlation coefficient: An overview. *Critical reviews in analytical chemistry, 36*(1), 41-59.

Azam, M., Khan, F., Zaman, K., & Rasli, A. M. (2016). Military expenditures and unemployment nexus for selected South Asian countries. *Social indicators research, 127*(3), 1103-1117.

Azmi, F. (2013). An empirical analysis of the relationship between GDP and unemployment, interest rate and government spending. Interest Rate and Government Spending. *Social Science Research Network*, 1-10.

Banociova, A. & Martinkova, S. (2017). Active Labour Market Policies of Selected European Countries and Their Competitiveness. *Journal of Competitiveness, 9*(3), 5–21.

Bhuiyan, M. A. N., Wathen, M., & Rao, M. (2021). Power Comparisons in Contingency Tables. *Journal of Statistical Theory and Practice, 15*(3), 64.

Celikay, F. (2023). Social spending and chronic unemployment: evidence from OECD countries. *Review of Economics and Political Science, 8*(2), 86-107.

Crepon, B. & Van Den Berg, G. J. (2016). Active labor market policies. *Annual Review of Economics, 8*, 521-546.

Cygan-Rehm, K., Kuehnle, D., & Oberfichtner, M. (2017). Bounding the causal effect of unemployment on mental health: Nonparametric evidence from four countries. *Health Economics, 26*(12), 1844-1861.

De Witte, H., Rothmann, S., & Jackson, L. T. (2012). The psychological consequences of unemployment in South Africa. *South African Journal of Economic and Management Sciences, 15*(3), 235-252.

Drydakis, N. (2015). The effect of unemployment on self-reported health and mental health in Greece from 2008 to 2013: a longitudinal study before and during the financial crisis. *Social science & medicine, 128*, 43-51.

El-Baz (2016). Measuring the Efficiency of Public Expenditure in Egypt. *National Planning Institute*, Cairo.

Eurostat (2023). *Who We are?* https://ec.europa.eu/eurostat/web/main/about-us/who-we-are

Fiori, F., Rinesi, F., Spizzichino, D. & Di Giorgio, G. (2016). Employment insecurity and mental health during the economic recession: An analysis of the young adult labour force in Italy. *Social Science & Medicine, 153*, 90–98.

Fossati, F., Liechti, F. & Wilson, A. (2021). Participation in labour market programmes: A positive or negative signal of employability? *Acta Sociologica, 64*(1), 70–85.

Gibescu, O. M. (2013). The Correlation Between Gross Domestic Product And Unemployment, In Romania Starting With 1995. *Romanian Statistical Review*, (7), 90-96.

Hur, H. (2019). Government expenditure on labour market policies in OECD countries: Responding to the economic crisis. *Policy Studies. 40*(6), 585-608.

Kaderabkova, B., & Jasova, E. (2016). Character and Intensity of the Minimum Wage Influence on Unemployment in the Czech Republic and Slovakia. *International Journal of Economic Sciences, 5*(1), 37-49.

Karasova, K., Balaz, V. & Chrancokova, M. (2018). Active Labour Market Policies in Slovakia in 2007-2017. *Economic and Social Development: Book of Proceedings*, 369-379.

Lim, H. E. (2010). Estimating psychological impact of unemployment: The case of Malaysian graduates. *Malaysian Journal of Economic Studies, 47*(1), 33-53.

Liu, Z., Ngo, T. Q., Saydaliev, H. B., He, H., & Ali, S. (2022). How do trade openness, public expenditure and institutional performance affect unemployment in OIC countries? Evidence from the DCCE approach. *Economic Systems, 46*(4), 101023.

Mahdavi, S., & Alanis, E. (2013). Public expenditures and the unemployment rate in the American states: Panel evidence. *Applied Economics, 45*(20), 2926-2937.

Netoiu, T., Carstina, S., & Selisteanu, A. (2014). Correlation analysis between indicators that define the labour market in the European Union. *Procedia Economics and Finance, 8*, 138-143.

Nepram, D., Singh, S. P., & Jaman, S. (2021). The effect of government expenditure on unemployment in India: A state level analysis. *Journal of Asian Finance, Economics and Business, 8*(3), 763-769.

Onwuegbuzie, A. J., & Daniel, L. G. (1999). Uses and misuses of the correlation coefficient. *Research in the Schools, 9*(1), 73–90.

Ozmen, I., Bali, S. & Bekun, F., V. (2023). Is Abrams curve a myth or reality? Evidence from two Baltic countries. *Quality & Quantity.*

Ratner, B. (2009). The correlation coefficient: Its values range between+ 1/− 1, or do they?. *Journal of targeting, measurement and analysis for marketing, 17*(2), 139-142.

Ronchetti, J., & Terriau, A. (2019). Impact of unemployment on self-perceived health: Evidence from French panel data. *European Journal of Health Economics, 20*(6), 879-889.

Ronchetti, J., & Terriau, A. (2020). The impact of unemployment on health. *Revue economique, 71*(5), 815-839.

Saraireh, S. (2020). The impact of government expenditures on unemployment: a case study of Jordan. *Asian Journal of Economic Modelling, 8*(3), 189-203.

Subramaniam, M., Lau, J. H., Abdin, E., Vaingankar, J. A., Tan, J. J., Zhang, Y., Chang, S., Shahwan, S., Shafie, S., Sambasivam, R. & Chong, S. A. (2021). Impact of unemployment on mental disorders, physical health and quality of life: Findings from the Singapore Mental Health Study. *Annals Academy of Medicine Singapore, 50*(5), 390-401.

Svabova, L., Durica, M., Kramarova, K., Valaskova, K. & Janoskova, K. (2019). Employability and Sustainability of Young Graduates in the Slovak Labour Market: Counterfactual Approach. *Sustainability, 11*(16), 4462.

Taylor, R. (1990). Interpretation of the correlation coefficient: a basic review. *Journal of diagnostic medical sonography, 6*(1), 35-39.

Thill, S., Houssemand, C., & Pignault, A. (2019). Unemployment normalization: its effect on mental health during various stages of unemployment. *Psychological Reports, 122*(5), 1600-1617.

Vancea, M., & Utzet, M. (2017). How unemployment and precarious employment affect the health of young people: A scoping study on social determinants. *Scandinavian journal of public health, 45*(1), 73-84.

Varadaraj, K. R., Kumar, S. V., Manjunath, C., & Kumar, M. R. (2021). Study the impact of operational parameters on interface temperature during rotary drilling. *Materials Today: Proceedings, 45*, 412-414.

Wisniewski, Z. (2022). The effectiveness of Polish active labour market policies. *Bulletin of Geography-socio-economic Series*, *56*(56), 125-132.

Yuruk, B., & Acarolgu, H. (2021). An Asymmetric Causality Analysis of the Relationship between Government Expenditure and Unemployment in Turkey. *Journal of Economy Culture and Society*, (63), 93-110.

Zazdravnykh, A. (2023). Market entry in Russian regions: The impact of unemployment. *Terra Economicus.* 21(2), 38-54.

Zielinski, M. (2015). Unemployment and labor market policy in Visegrad Group countries. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *10*(3), 185-201.

Zulhanafi, M., Aimon, H., & Syofyan, E. (2013). Analysis of the factors that affect productivity and unemployment rates in Indonesia. *Journal of Economic Studies*, *2*(3), 85-109.

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DEBT STRUCTURE AND ITS IMPACT ON FINANCIAL PERFORMANCE: AN EMPIRICAL STUDY ON THE ENTERPRISES OPERATING IN THE VISEGRAD GROUP COUNTRIES

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Abstract:
Research background: In recent years, debt financing has gained popularity as companies seek additional resources to fund their expansion and investment initiatives. Monitoring corporate indebtedness is related to corporate debt, which is a crucial aspect of assessing the overall financial health of the enterprise and will occur if an enterprise does not have enough equity. Rising indebtedness can be a difficult financial situation for enterprises in the form of default and an inability to meet their emerging liabilities.
Purpose of the article: Given that the composition of a firm's debt structure holds substantial importance when assessing the financial performance of businesses varying in size, the primary objective of this paper is to perform a comprehensive debt analysis on enterprises operating within the Visegrad Group countries. Subsequently, the authors will explore whether the enterprise's size exerts an influence on the utilization of short-term and long-term debt.
Methods: The Kruskal-Wallis test was used to determine if there were any significant variations in the monitored indebtedness ratios based on firm size.
Findings & Value added: Since there are differences in indebtedness indicators due to firm size, post hoc analysis results indicated that in Visegrad Group countries, the debt structure of small enterprises is significantly different not only from medium-sized but also from large and very large enterprises. Based on the results, the existence of differences between small and very large enterprises can be pointed out. Since some firm-specific features may be considered proxies for default probability, comprehending the effect of particular determinants on the corporate debt structure is crucial since it simplifies the decision-making process of creditors and stakeholders.

Keywords: financial performance; corporate debt structure; firm size; analysis of variance

JEL Classification: D22; G33; L25

1. Introduction

The corporate performance of each enterprise is influenced by its financial performance, which is a significant aspect of every business entity operating in the market (Freeman et al., 2021). The concept of business performance is presently one of the most frequently used terms, and it is no longer clearly defined in theory. The primary reason is the complexity of corporate performance and its very general conclusion. According to Rey-Ares et al. (2021), corporate performance can be identified at the most general level as the overall nature of the enterprise's existence and its success in the future. Corporate performance is understood by Khan and Wang (2021) and Michulek et al. (2023) as a characteristic that describes how a certain activity is carried out by the firm. According to Mazanec (2022), the quantification of selected indicators may be used to assess corporate performance, and this abstract concept is referenced in a variety of situations, as demonstrated by the definitions mentioned. Ullah and Sun (2021), on the contrary, make the point that corporate performance is primarily related to the ability of a firm to maximize the investments made in its business activities. Corporate performance leads to the mistaken belief that only firms reporting a profit from their economic activities can be considered efficient (Kliestik et al., 2022). This viewpoint does not take into consideration the significant fact that corporate performance is assessed from various perspectives, which also fundamentally determine the applied performance evaluation criteria. Nevertheless, the assessment of corporate performance is deemed essential, but due to its complexity, it constitutes a challenging process that relies on values derived from financial accounting (Riyadh et al., 2019; Khan et al., 2020). In the past, the impact of various factors on corporate performance has been examined by numerous authors (Myskova and Hajek, 2020; Yousaf et al., 2021; Durisova et al., 2019). In their study, Dimitric et al. (2019) and Maity et al. (2019) stressed that corporate performance is significantly influenced by age, total asset value, and corporate indebtedness. According to Altaf and Ahmad (2019), the computation of the ratio of short-term debt or long-term debt is the primary method used to assess an undertaking's financial performance. The ratio of total debt as well as the ratio of short-term debt both negatively affect the financial performance of the firm, according to the authors and their conclusions using their panel regression estimate approach. Xu et al. (2021) also used panel data to examine how the capital structure of Chinese agricultural listed companies affected their financial performance. The empirical findings show that while long-term debt ratio has no discernible effect on ROA and ROE, the total debt ratio and short-term debt ratio have a negative impact on the financial performance of Chinese agricultural listed firms.

For instance, it is asserted by Vieira (2017), Shahzad et al. (2015), Grega et al. (2021) and Potkany et al. (2022) that a gradual decline in corporate performance is initiated when the debt ratio is excessively high. Despite numerous studies on the impact of debt financing on corporate performance, contradictory results have been yielded. Indebtedness can currently be regarded as one of the most significant economic concerns for business entities (Stefko et al., 2021) and is an economic term that implies the utilization of external financial sources for the financing of corporate assets (Kovacova et al., 2022). The selection of an appropriate capital structure, such as the choice between equity financing, debt financing, or a combination of both (Nagy and Valaskova, 2022), is considered one of the most challenging decision-making processes because it indirectly influences the enterprise's level of indebtedness (Karas and Reznakova, 2023).

Various determinants that impact corporate capital composition are influenced by corporate indebtedness in different ways (Culkova et al., 2018), such as the prioritization of financing business activities, particularly through debt financing. Corporate growth potential (Malkowska and Uhruska, 2022), the inherent quality of the enterprise itself (Nagy and Lazaroiu, 2022; Nagy

et al., 2023), the change in the environment (Valaskova and Nagy, 2023), and managerial ownership expressed as a percentage of shares owned by owners (Nemteanu et al., 2022; Vatamanescu et al., 2023) at the conclusion of the fiscal year also exert a significant influence on corporate indebtedness (Valaskova et al., 2018). However, one of the most crucial determinants affecting an enterprise's debt is its size. In general, small enterprises encounter limitations when seeking bank loans. As stated by Blazkova and Dvoulety (2019), small enterprises secure debt at considerably higher costs compared to larger ones. Alfaro et al. (2019) emphasize that firm size assumes a pivotal role in determining whether to fund its activities through debt, thus making it another noteworthy determinant of indebtedness. In general, it is assumed that small businesses have a lower proportion of external sources in their passive structure compared to large businesses. The availability and cost of various forms of debt financing have been the subject of research by Cline et al. (2020). These authors concluded that small firms obtain less debt or obtain debt at higher costs than large businesses, which may manifest in their lack of interest in external financing. Chernenko and Sunderam (2014) argues that, among other factors, the reason for the lower debt levels of small businesses may also be their attempt to maintain higher liquidity during financial difficulties. Authors such as Cline et al. (2020), Dvoulety et al. (2021) and Mundi et al. (2022) have also commented on this issue. These authors examined the relationship between a firm size and its debt in the form of long-term obligations, bank loans, and other external financing. They concluded that there is a significant positive relationship between a company's size and its indebtedness. Therefore, the larger the company, the more inclined it is to finance its activities with external sources (Blazek et al., 2023). Cassell et al. (2012) state that large companies are more heavily indebted, which, according to them, is due to better debt diversification and, therefore, a lower risk of business bankruptcy compared to smaller businesses. Such companies are regarded as less risky by banking institutions, and their overall access to loans is generally better (Szyszko and Rutkowska, 2022). Supporters of the trade-off theory also lean towards this assertion, according to which large companies that generate a sufficiently high profit have better creditworthiness, and therefore, banking institutions consider them less risky and do not anticipate sudden financial difficulties caused by insolvency. In contrast to previous authors, Saif-Alyousfi et al. (2020) examined the relationship between a firm size and short-term obligations. They arrived at the conclusion that there is a negative relationship between short-term obligations and the size of the enterprise. The larger the company, the lower the proportion of short-term obligations to total assets. This phenomenon can be explained by the fact that long-term assets, including a portion of current assets tied up in the business in the long term, grow faster than current assets financed by short-term sources. business practices confirm this assertion, showing that small companies have limited access to obtaining long-term bank loans.

The issue of indebtedness and the selection of an appropriate financing method is a matter that enterprises consistently grapple with. In general, debt enhances the return on equity when the interest rate is lower than the enterprise's profit. This phenomenon, known as financial leverage, is associated with debt use. However, it is crucial to note that the involvement of debt also heightens its associated risk (Mouandat, 2022). Consequently, determining the optimal debt structure for the enterprise becomes highly significant. Throughout the 20th century, various theories for optimizing capital structure were gradually developed by scholars in financial management. Models for determining the appropriate capital structures have been a subject of research for many decades. Over time, different capital structure theories have emerged in financial ideology, and these theories have been variably embraced in academic, professional, and practical settings (Cerkovskis et al., 2022). The pecking order theory, trade-off theory, and M&M theory, to some extent, provide explanations for debt structure and

financial decision-making (Myers et al., 1984; Modigliani and Miller, 1958; 1963). However, it is evident that there is no theory that comprehensively elucidates the complete impact of debt structure on financial performance (Kljucnikov et al., 2022; Kristof and Virag, 2022). As the composition of debt structure serves as a crucial metric for evaluating the financial performance of companies of different sizes, the main aim of this paper is to conduct a debt analysis of enterprises operating in the Visegrad Group countries and subsequently investigate whether the size of the enterprise influences the utilization of short-term and long-term debt. This paper contributes to the scientific thought in the field of finance since it deals with the structure of debt-financing and the relationship between the size of the enterprises and their utilization of debt, for which this issue remains largely unexplored, while a debt analysis of enterprises operating in Visegrad Group countries makes it a valuable regional study. At the same time, the paper employs the Kruskal-Wallis test to determine significant variations in monitored indebtedness ratios based on firm size, providing a rigorous and quantitative approach to the research.

The paper is divided into the following sections. The first section, dedicated to a literature review, offers the reader an overview of the fundamental theoretical background of the issue alongside the most relevant and recent publications in the field. The methods employed for achieving the aim of this paper, which involves conducting a debt analysis focused on the detection of statistically significant differences in the values of computed indicators resulting from changes in the evolution of critical indebtedness financial ratios, are expounded upon in the second section. The third section delivers a summary of the outcomes of the prior computation of several chosen debt indicators and their subsequent statistical validation, along with a comparison of the results to those of other appropriate research published worldwide. The most noteworthy discoveries from this study, along with the limitations and for future research on this issue, are presented the end of the paper.

2. Methodology

To analyse the indebtedness of businesses operating in the Visegrad Group countries from 2016 to 2021, this research paper employs three crucial indebtedness indicators and appropriate quantitative methods and examines whether there are any statistically significant differences in the use of long-term and short-term debt due to firm size.

For a comprehensive debt analysis, it was required to use financial characteristics from the ORBIS database, which is recognized as a source of business and financial data on more than 400 million private and public enterprises operating internationally. Financial data on 100,057 firms operating in Visegrad Group countries for the monitored period of 2016–2021 is contained in the database, which formed the basis for a debt analysis. Because not all firms were suitable for the debt indicator calculation, the data from the database had to be appropriately adjusted. Enterprises that did not provide all the required input data for the debt analysis throughout the monitored period were eliminated. The dataset had its outlying values removed in order to improve the informativeness of the results obtained from the calculated debt analysis using Z-Score method. By employing this approach, it becomes possible for the difference between each receive signal strength observation and the time-series mean receive signal strength observation to be determined. Subsequently, the result is divided by the standard deviation of the observation. When the Z-Score is 0, it signifies that the mean of the time-series observation and the receive signal strength observation are considered equal. A positive and a negative Z-Score indicate that the received signal strength measurement is positioned above and below the mean. An outlier status is ascribed to a receive signal strength observation when

its Z-Score value exceeds an established threshold. Generally, the most commonly utilized threshold for outlier detection is ±3, as outlined by Anagnostou et al. (2021). Consequently, in this research paper, any receive signal strength observation with a Z-Score value exceeding ±3 was categorized as an outlier. The final dataset encompasses financial data for 12,816 enterprises (including 6,048 Slovak enterprises, 1,626 Czech enterprises, 3,851 Polish enterprises, and 1,291 Hungarian enterprises). The elementary identification data of these enterprises, such as firm size, legal form, ownership structure, firm age, and economic sector, are summarized in Table 1.

Table 1: Firm-specific features of the sample

COUNTRY	**SK**	**CZ**	**PL**	**HU**
FIRM SIZE				
Small enterprise	2,138	160	460	54
Medium sized enterprise	3,278	789	2,100	623
Large enterprise	534	518	1,045	491
Very large enterprise	98	159	246	123
LEGAL FORM AND OWNERSHIP STRUCTURE				
Private limited companies	5,294	1,043	2,576	1,256
Public limited companies	514	487	484	7
Partnerships	236	88	742	27
Other legal form	4	8	49	1
FIRM AGE				
<10	383	45	222	33
10-20	3,022	441	1,206	285
20-30	2,167	766	1,470	551
30-40	355	317	648	376
40-50	82	43	76	9
50-60	14	9	27	8
>60	25	5	202	29
ECONOMIC SECTOR (NACE CLASSIFICATION)				
A. Agriculture, forestry and fishing	515	178	127	84
B. Mining and quarrying	16	6	22	6
C. Manufacturing	1,291	567	1,178	437
D. Electricity, gas, steam and air conditioning supply	98	42	110	13
E. Water supply; sewerage, waste management, etc.	68	30	218	20
F. Construction	554	126	263	54
G. Wholesale and retail trade, repair of motor vehicles/motorcycles	1,606	337	1,066	366
H. Transportation and storage	540	93	201	100
I. Accommodation and food service activities	124	6	60	17
J. Information and communication	141	43	93	36
K. Financial and insurance activities	9	1	26	9
L. Real estate activities	290	57	171	52
M. Professional, scientific and service activities	405	80	104	39
N. Administrative and support service activities	238	24	69	36
O. Public administration and defence; compulsory social security	2	0	4	1
P. Education	8	4	18	1
Q. Human health and social work activities	86	22	97	6
R. Arts, entertainment and recreation	31	4	15	8
S. Other service activities	26	6	9	6
Total	**6,048**	**1,626**	**3,851**	**1,291**

Source: own elaboration

The final dataset, required for the debt analysis of enterprises operating in the Visegrad Group countries, is comprised of the final data. In accordance with the conditions outlined in the ORBIS database for determining firm size characteristics, a very large enterprise is defined as one where at least one of the following conditions is met: operating revenue ≥ 100 million EUR, total assets ≥ 200 million EUR, and employees ≥ 1,000. A large enterprise is categorized as having an operating revenue ≥ 10 million EUR, total assets ≥ 20 million EUR, and employees ≥ 150. A medium-sized enterprise is one that satisfies at least one of the following criteria:

operating revenue ≥ 1 million EUR, total assets ≥ 2 million, and employees ≥ 15. Enterprises that do not meet these criteria are classified as small enterprises. The majority of enterprises included in the final dataset fall within the medium-sized enterprise category. Conversely, except for Hungary, where small enterprises are underrepresented, the category with the lowest representation is very large enterprises.

The following legal form categories are determined by the ORBIS database. Four ownership structures, namely partnerships, private limited companies, public limited companies, and other legal forms, are utilized by enterprises operating in the Visegrad Group countries. Supplementary legal identities have been legally incorporated into a private limited company, and limited liability for any debts incurred by the enterprise is held by its shareholders (Schiepers, 2023). Enterprises with the legal form of a private limited company constitute the most numerous category within the Visegrad Group countries. A public limited company, often confused with a private limited company (Schmidt, 2013), differs in its ability to offer shares of the enterprise to the general public, potentially benefiting the firm in terms of fundraising (Brandth and Bjorkhaug, 2015). Partnerships, another legal form, are established by a few individuals involved not only in the ownership and decision-making of the business but also in its earnings. Each individual may contribute a distinct specialization to enhance the ability of the enterprise to operate in the market (Giunnane and Martinez-Rodriguez, 2018). The category with the least representation consists of enterprises operating under other legal forms, including branches or solo traders.

Information regarding the number of years on the market is also furnished by the ORBIS database. It is observed that enterprises that have been in operation for the longest period have the smallest share (over 50 years). In Slovakia, dominance is held by firms that have been active on the market for 10–20 years, whereas in the Czech Republic, Poland, and Hungary, the most represented group consists of companies that have been operating on the market for 20–30 years. These enterprises are sufficiently stable and will be able to provide the research with ideal data because they are predominant and have been in the market for more than ten years.

In Slovakia, the category G – Wholesale and retail trade; repair of motor vehicles and motorcycles is the one in which most enterprises operate. The first position is attributed to this category because of the Slovak Republic's reputation in automobile manufacturing. The subsequent sale and provision of services are closely linked to car production. Upon gaining independence, the other countries of the Visegrad Group promptly established themselves as global leaders in the manufacturing industry, with category C – Manufacturing emerging as a significant economic sector. Manufacturing continues to hold a paramount position in these countries today. Conversely, the category with the fewest enterprises in the sample is category O - Public administration and defense; compulsory social security.

The basis for the calculation of debt indicators was financial data (in thousands of euros), and its descriptive statistics, including average, median, standard deviation, minimum, maximum, and coefficient of variation, are summarized in Table 2.

A comprehensive analysis focused on the indebtedness of enterprises operating in the Visegrad Group countries during the monitored period was conducted, involving the utilization of three crucial debt indicators. The formulas required for the subsequent calculation are summarized in Table 3.

The financial analysis concerning the indebtedness of enterprises was conducted using several methodological steps.

1. Firstly, it was required to calculate the individual monitored debt indicators separately for enterprises operating in the Visegrad Group countries within the specified monitoring time frame from 2016 to 2021.

Table 2: Descriptive statistics of input data necessary for indebtedness ratios calculation (6-year average values)

Slovakia						
	avg.	**med.**	**std. dev.**	**min.**	**max.**	**CV**
TOAS	6,364.295	1,250.359	53,599.869	213.984	3,642,422.167	8.422
NCLI	1,296.428	113.667	22,274.006	-7.768	1,761,986.667	17.181
CULI	2,317.172	518.406	11,201.788	-1.858	439,759.978	4.834
Czech Republic						
	avg.	**med.**	**std. dev.**	**min.**	**max.**	**CV**
TOAS	50,092.635	5,232.419	662,325.656	225.441	29,558,304.549	13.222
NCLI	10,725.552	407.448	215,237.257	-93.583	9,776,086.027	20.068
CULI	17,027.526	1,399.297	234,326.955	5.762	10,678,633.074	13.762
Poland						
	avg.	**med.**	**std. dev.**	**min.**	**max.**	**CV**
TOAS	47,432.923	4,169.058	497,685.212	222.773	17,579,560.909	10.492
NCLI	9,803.665	408.799	123,099.366	0.000	4,321,778.872	12.556
CULI	14,022.320	1,363.554	119,076.084	3.082	4,578,111.404	8.492
Hungary						
	avg.	**med.**	**std. dev.**	**min.**	**max.**	**CV**
TOAS	38,714.094	7,119.013	385,881.926	237.772	14,914,156.424	9.967
NCLI	6,800.031	551.032	94,500.500	0.000	3,679,378.276	13.897
CULI	14,100.915	2,478.816	111,370.364	29.245	4,213,824.340	7.898

Note: TOAS Total Assets, NCLI Non-Current Liabilities, CULI Current Liabilities
* values are given in thousands of euros
Source: own elaboration

Table 3: Summarized formulas of indebtedness indicators

Ratio	**Algorithm**
Total indebtedness ratio (TI)	Current and non-current liabilities to total assets
Current indebtedness ratio (CI)	Current liabilities to total assets
Non-current indebtedness ratio (NCI)	Non-current liabilities to total assets

Source: Gajdosikova et al. (2023)

2. Subsequently, normality tests were utilized to determine whether a dataset is well represented by a normal distribution. The use of a statistical test for normality is valuable because distinguishing between systematic deviations from linearity and deviations arising from sample variation can be challenging (Yusuf et al., 2014). The p-values from the normality test are frequently provided in the output of statistical software, with a low p-value suggesting that the sample does not follow a normal distribution. In general, since numerous statistical techniques (such as t-tests and analysis of variance) assume a normal distribution of variables, this parametric hypothesis test is related to nonparametric methods when the data deviates from normality. Nonparametric methods may be required in such cases.
3. To determine whether statistically significant differences exist between two or more groups of an independent variable, the Kruskal-Wallis test, a nonparametric test based on ranking, was employed. The Kruskal-Wallis test is named after Kruskal and Wallis, who jointly developed it in 1952 (Kruskal and Wallis, 1952). When the assumptions necessary for a one-way ANOVA are not met, the nonparametric Kruskal-Wallis test is utilized. In ANOVA, it is assumed that each group follows a normal distribution with approximately equal variance in the scores. The Kruskal-Wallis test, a non-parametric approach for comparing k independent samples (Van Hecke, 2012), is employed to test the equality of medians or even means (Hettmansperger et al., 1998). However, the Kruskal-Wallis test result indicates whether differences exist among the medians of some of the k groups, but it does not specify which groups differ from the others.
4. The groups that differ from each other can be identified using the Bonferroni adjustment. Due to its simplicity, the Bonferroni method is the most commonly employed approach for multiplicity adjustment. The basis for the Bonferroni adjustment is the method initially

proposed by Neyman and Pearson (1928) for aiding decisions in studies involving repetitive sampling, and it is named after the Italian statistician Carlo Bonferroni. However, the method is frequently utilized in research papers to correct probability values when conducting numerous statistical tests in any context, and this application is primarily attributed to Dunn (1961). The Bonferroni correction was developed to address the issue that as the number of tests increases, the probability of a type I error also increases, falsely indicating the existence of a significant difference when there is none. Consequently, the Bonferroni adjustment is applied to the probability values associated with each individual test to maintain a 0.05 level of significance across all tests.

3. Results and Discussion

The structure of the corporate financial resources, impacting its financial stability, is the primary focus of a debt analysis. Within the debt analysis, the combination of equity and debt was monitored through debt indicators, which were observed to decrease debt repayment from sold assets (Gomes et al., 2023). Additionally, the ability of enterprises to bear indebtedness between 2018 and 2020, both before and after the COVID-19 pandemic, was assessed.

Table 4: 6-year average values of selected indebtedness indicators for enterprises operating in the Visegrad Group countries

	Slovakia			**Czech Republic**		
	TI	**CI**	**NCI**	**TI**	**CI**	**NCI**
Small enterprise	0.632	0.471	0.161	0.519	0.281	0.238
Medium-sized enterprise	0.622	0.485	0.137	0.497	0.337	0.160
Large enterprise	0.603	0.468	0.135	0.507	0.389	0.118
Very large enterprise	0.619	0.471	0.148	0.572	0.457	0.115
	Poland			**Hungary**		
	TI	**CI**	**NCI**	**TI**	**CI**	**NCI**
Small enterprise	0.484	0.267	0.217	0.531	0.388	0.143
Medium-sized enterprise	0.520	0.381	0.139	0.513	0.393	0.120
Large enterprise	0.517	0.394	0.123	0.542	0.431	0.111
Very large enterprise	0.536	0.396	0.140	0.606	0.491	0.115

Source: own elaboration

The total indebtedness ratio is an indicator of indebtedness that compares current and non-current liabilities to total assets, and its complementary indicator is the self-financing ratio. In Slovakia, the total indebtedness averaged around 61.9%, with small enterprises achieving the highest level of indebtedness. Conversely, the lowest level of corporate debt was observed in large Slovak enterprises, which, on average, utilize 60.3% of their debt to finance their corporate assets. In the case of the Czech Republic, the average debt level from 2016 to 2021 was 52.4%. Notably, very large enterprises primarily employed debt financing for their business activities, with levels reaching as high as 57.2%. The lowest debt level, at 49.7%, was observed among medium-sized enterprises in the Czech Republic. Consequently, these firms predominantly used equity financing for their activities compared to debt financing. A firm with a high amount of equity is frequently associated with stability and independence, whereas an enterprise with a low proportion of equity is generally related to financial instability (Dabi et al., 2023). Due to the average debt level of 48.4%, which indicates the lowest debt use in Poland when considering firm size, small enterprises are also significantly more inclined to use equity financing. Very large enterprises in Poland had the highest levels of debt during the monitored period, using up to 53.6% of debt as financing, similar to the Czech Republic. In Hungary, the average corporate debt level reached 54.8% during the monitored period. Medium-sized enterprises achieved the lowest debt level, utilizing 0.513 € of debt to finance 1 € of corporate

assets, while very large enterprises were, on average, indebted to the extent of 60.6%. According to Michalski et al. (2018), the optimal level of indebtedness for enterprises is considered to range from 50% to 75%. Simultaneously, from a pure risk perspective, lower debt ratios are regarded as more favorable, whereas a higher debt ratio renders the enterprise less likely to secure borrowing (Miskufova et al., 2022). The presence of risk is associated with an enterprise having too little debt, while a lower total indebtedness ratio value implies greater creditworthiness (Bhattacharya and Sharma, 2019). The current indebtedness ratio and non-current indebtedness ratio, which have been examined and assessed by numerous authors (Valaskova et al., 2021; Valls Martinez et al., 2020), ought to be employed for capital structure monitoring when the firm has a significant reliance on debt. In Slovakia, all firms categorized by size predominantly utilize short-term debt for financing, with levels ranging from 46.8% to 48.5%, but these enterprises also do not neglect the use of long-term debt in the range of 13.5% to 16.1%. In Slovakia, large enterprises utilized both short-term and long-term debt financing to various extents. Medium-sized enterprises, on the contrary, had the greatest level of short-term debt on average, while small enterprises predominantly supported their business activities through long-term debt. In the Czech Republic, firms also preferred financing their activities primarily through short-term debt, with very large enterprises using it at a level of 45.7% and small enterprises at 28.1%. Conversely, financing through long-term debt was widely favored by small businesses in the Czech Republic, reaching up to 23.8%, while very large enterprises had the lowest long-term indebtedness, averaging 11.5%. In Poland and Hungary, the utilization of short-term and long-term debt is similar across different firm size categories, as all companies primarily use short-term debt for financing, with levels ranging from 26.7% to 39.6% in Poland and from 38.8% to 49.1% in Hungary. These enterprises also did not disregard long-term debt, which falls within the range of 12.3% to 21.7% in Poland and 11.1% to 14.3% in Hungary. Small enterprises in both countries utilized the least short-term debt for financing, and they also made the most use of long-term debt. On average, the highest proportion of short-term debt is observed in very large enterprises, and in terms of long-term indebtedness, medium-sized enterprises least prefer financing their business activities through long-term debt.

The main aim of conducting a more extensive debt analysis of enterprises operating in the Visegrad Group countries was to ascertain whether statistically significant differences could be observed in the utilization of long-term and short-term debt based on factors such as firm size (small, medium-sized, large, and very large enterprises) or the individual values of the indicators differ significantly.

Firstly, the confirmation of dataset normality was necessitated using the Kolmogorov-Smirnov and Shapiro-Wilk tests, despite the rejection of the assumption of a normal distribution in the test results. Subsequently, the Kruskal-Wallis test was employed to assess whether statistically significant differences could be detected among the calculated ratios pertaining to firm size, as it does not necessitate a normal distribution of the dataset, in contrast to an equivalent one-way ANOVA, and is also less susceptible to the influence of outliers. The results of the Kruskal-Wallis test, which examined statistically significant differences in debt ratios concerning firm size, are summarized in Table 5. Based on the findings, statistically significant differences were observed between all debt indicators in Slovakia, the Czech Republic, and Poland. In Hungary, statistically significant differences were detected between all debt ratios except for the non-current indebtedness ratio.

Due to the presence of statistically significant differences among several indebtedness ratios, a post hoc analysis was conducted as the subsequent step. The outcomes of the post hoc analysis revealed which debt ratios concerning firm sizes were identified as the most statistically significant. The results of the pairwise comparison of sizes are presented in Table 6. In Slovakia,

Table 5: The output of the Kruskal-Wallis test concerning the firm size for enterprises operating in the Visegrad Group countries

	Slovakia			**Czech Republic**		
	TI	**CI**	**NCI**	**TI**	**CI**	**NCI**
Kruskal-Wallis H	13.054	11.116	15.087	31.128	110.522	139.997
Asymp. Sig.	0.005	0.011	0.002	0.000	0.000	0.000
	Poland			**Hungary**		
	TI	**CI**	**NCI**	**TI**	**CI**	**NCI**
Kruskal-Wallis H	20.921	108.233	119.789	43.137	38.895	4.067
Asymp. Sig.	0.000	0.000	0.000	0.000	0.000	0.254

Source: own elaboration

statistically significant differences were identified between small and large enterprises, specifically between two carefully analyzed debt ratios, as well as between medium-sized and large enterprises and between small and medium-sized enterprises. In the context of the Czech Republic, statistically significant differences were primarily observed between small and very large enterprises, medium-sized and very large enterprises, and also between large and very large enterprises. Notably, differences in the current indebtedness ratio were identified across all compared pairs of firm sizes. In Poland, distinctions were primarily noted between small and medium-sized enterprises, small and large enterprises, and small and very large enterprises, based on the pairwise comparison results. In Hungary, statistically significant differences were primarily observed between small and very large enterprises, medium-sized and very large enterprises, and large and very large enterprises.

Generally, the main difference between short-term and long-term debt is the repayment period. Any debt due within one year is considered short-term debt (Lofton and Kioko, 2021), whereas any debt due beyond one year is classified as long-term debt (Amosh et al., 2022), and this repayment period can have a significant impact on the interest rate paid by the firm. Short-term debt typically has a higher interest rate than long-term debt because of the higher risk taken by lenders (Khoo and Cheung, 2022).

The relationship between business size and short-term debt can be influenced by several factors, such as the industry (Erhemjamts et al., 2010), financial strategy (Liang et al., 2015), and the specific circumstances of the business (An et al., 2021). Typically, short-term debt can be obtained on more favourable terms by larger corporations in the capital markets because of their size and established creditworthiness. On the contrary, Bagwell (2023) argues that smaller businesses may encounter difficulties in accessing capital markets and may have fewer choices for short-term financing. According to Tanaka (2006), traditional bank loans or trade credit from suppliers may be more relied upon by them. Another crucial factor is creditworthiness (Gubareva and Borges, 2022). Stronger credit ratings are typically held by larger enterprises, leading to lower interest rates and more favorable terms for short-term debt. It was found by De Marco et al. (2021) that an increase in bank-specific capital requirements resulted in a reduction in corporate debt and investment, but only for firms with short bank relationships. Munoz-Cancino et al. (2022) concluded in their study that the assessment of creditworthiness by credit rating agencies often involves considerations of size, financial stability, and the track record of larger firms. Smaller enterprises sometimes have lower credit scores or limited credit histories, which leads to greater limitations and higher interest rates when they apply for short-term debt. The securing of financing may require them to rely on personal guarantees or collateral. Maes et al. (2019) in their study point to the fact that the relationship between the size of the company and the level of indebtedness is also influenced by working capital needs. Strategically, short-term debt can be employed by large corporations with diverse operations to manage their working capital needs. Through these corporations, their financial resources can

Table 6: The output of the pairwise comparison concerning the firm size for enterprises operating in the Visegrad Group countries

Slovakia						
		Test Statistic	**Std. Error**	**Std. Test Statistic**	**Sig.**	**Adj. Sig.**
TI	Small-Large	324.923	91.779	3.540	0.000	0.002
CI	Medium-sized-Large	259.453	87.855	2.953	0.003	0.019
NCI	Small-Medium-sized	176.612	55.293	3.134	0.001	0.008
	Small-Large	281.422	91.779	3.066	0.002	0.013
Czech Republic						
		Test Statistic	**Std. Error**	**Std. Test Statistic**	**Sig.**	**Adj. Sig.**
TI	Small-Very large	-193.575	60.603	-3.194	0.001	0.008
	Medium-sized-Very large	-251.252	45.940	-5.469	0.000	0.000
	Large-Very large	-253.030	47.821	-4.915	0.000	0.000
CI	Small-Medium-sized	-202.926	-4.210	0.000	0.000	0.000
	Small-Large	-338.237	49.999	-6.765	0.000	0.000
	Small-Very large	-572.448	60.603	-9.446	0.000	0.000
	Medium-sized-Large	-135.312	30.623	-4.419	0.000	0.000
	Medium-sized-Very large	-369.522	45.940	-8.044	0.000	0.000
	Large-Very large	-234.211	47.821	-4.898	0.000	0.000
NCI	Small-Medium-sized	256.873	48.199	5.329	0.000	0.000
	Small-Large	492.398	49.995	9.849	0.000	0.000
	Small-Very large	528.990	60.597	8.730	0.000	0.000
	Medium-sized-Large	235.525	30.620	7.692	0.000	0.000
	Medium-sized-Very large	272.117	45.936	5.924	0.000	0.000
Poland						
		Test Statistic	**Std. Error**	**Std. Test Statistic**	**Sig.**	**Adj. Sig.**
TI	Small-Medium-sized	-263.855	85.434	-3.088	0.002	0.012
	Small-Very large	-399.201	99.778	-4.001	0.000	0.000
	Large-Very large	-230.893	68.486	-3.371	0.001	0.004
CI	Small-Medium-sized	-834.418	85.434	-9.767	0.000	0.000
	Small-Large	-837.495	88.533	-9.460	0.000	0.000
	Small-Very large	-963.686	99.778	-9.658	0.000	0.000
NCI	Small-Medium-sized	757.987	85.434	8.872	0.000	0.000
	Small-Large	957.269	88.533	10.813	0.000	0.000
	Small-Very large	689.780	99.778	6.913	0.000	0.000
	Medium-sized-Large	199.282	45.096	4.419	0.000	0.000
	Large-Very large	-267.489	68.486	-3.906	0.000	0.001
Hungary						
		Test Statistic	**Std. Error**	**Std. Test Statistic**	**Sig.**	**Adj. Sig.**
TI	Small-Very large	-219.911	70.977	-3.098	0.002	0.012
	Medium-sized-Very large	-273.544	41.677	-6.563	0.000	0.000
	Large-Vary large	-229.608	42.113	-5.452	0.000	0.000
CI	Small-Very large	-282.450	70.977	-3.979	0.000	0.000
	Medium-sized-Very large	-253.874	41.677	-6.091	0.000	0.000
	Large-Vary large	-198.450	42.113	-4.712	0.000	0.000

Source: own elaboration

be harnessed to optimize cash flow, and gaps between revenue collection and expenses can be bridged using short-term debt. For smaller businesses, the primary utilization of short-term debt may be for covering immediate working capital needs, such as payroll or inventory purchases. Ughetto et al. (2017) concluded that engagement in extensive financial management strategies may not be possible due to their lack of a financial cushion or liquidity. Zeitun and Goaied (2022) argued that the influence on the relationship between business size and short-term debt can be exerted by the industry in which a company operates. Regardless of firm size, seasonal businesses often heavily depend on short-term debt to finance inventory build-up during peak seasons. According to Huang et al. (2023), risk management represents another crucial factor.

Short-term debt, when utilized for risk management purposes like interest rate hedging, may be employed by large businesses with more intricate financial structures. Such strategies can be engaged in by them due to their possession of resources and financial expertise. In contrast, smaller companies may place greater emphasis on their day-to-day operational requirements and possess limited capacity for managing financial risk through short-term debt, which is also confirmed by Bontempi et al. (2020) in their research findings. The investigation conducted by Koralun-Bereznicka (2018) aimed to determine whether the relationship between capital structure and its main determinants is also influenced by firm size and debt maturity. Panel data models were employed to compare the influence of the principal factors on leverage among three size categories of firms and different debt measurement criteria to detect the effects of size and debt maturity on these associations. The results reveal that the financing decisions made by small firms tend to align more with the pecking-order theory, whereas medium and large-sized firms tend to adhere to the trade-off theory's predictions regarding leverage. It was also observed that the trade-off theory is more applicable to short-term debt, while the pecking-order theory is better suited to long-term debt.

The relationship between firm size and long-term debt is also influenced by many factors. Similar to the relationship between short-term debt and firm size, long-term debt can be considered a critical determinant of access to capital markets (D'Mello and Gruskin, 2021). According to Jadiyappa et al. (2021), access to capital markets is often more straightforward for larger enterprises, which can issue long-term debt under more favorable terms due to their size and established creditworthiness. Bradford et al. (2013) also state that bond issuance and securing long-term loans at lower interest rates can be accomplished with relative ease. Smaller enterprises, that Knill (2013) focused on in his study, might encounter difficulties in accessing capital markets for long-term debt, resulting in limited options. Generally, these enterprises may rely more on bank loans, personal financing, or alternative sources of long-term funding. Similar to the link between short-term debt and firm size, the importance of creditworthiness is emphasized with regard to long-term debt. Larger firms tend to have stronger credit ratings, leading to lower interest rates and more advantageous terms for long-term debt (Asgharian et al., 2018). Based on the research results, consideration of creditworthiness by credit rating agencies often involves the assessment of the size, financial stability, and track record of larger corporations. Lower credit ratings or limited credit histories may be associated with smaller companies, resulting in higher interest rates and stricter terms when seeking long-term debt. Personal guarantees or collateral might need to be provided by them to secure financing. The utilization of long-term debt can also be influenced by investor confidence, examined by Haque et al. (2011) in their research, with the size of the firm playing a pivotal role. Larger enterprises often inspire greater investor confidence, facilitating capital raising through long-term debt offerings. Well-established, larger enterprises are more likely to attract institutional investors and bondholders. Smaller businesses may need to put in extra effort to build investor confidence and attract long-term investors, potentially relying more on relationships with local banks and investors (Kozak and Wierzbowska, 2022). Strategic financing is another important aspect (Allen and Letdin, 2020), with larger enterprises frequently employing long-term debt strategically to finance major capital projects, acquisitions, or expansion plans. In can be concluded that these enterprises possess the financial resources and expertise to engage in long-term financial planning. Smaller businesses may be more cautious with long-term debt, using it primarily for essential growth initiatives or to address long-term financing needs while avoiding excessive debt to minimize financial risk. Furthermore, the relationship between firm size and long-term debt can be influenced by the industry in which a company operates. The investigation of debt as a financing source among small- and medium-sized enterprises,

specifically the impact of short-term debt, long-term debt, and profitability on the utilization of this debt, was carried out by Yazdanfar and Ohman (2017), with industry affiliation being a notable explanatory variable. For instance, companies in capital-intensive industries, irrespective of their size, often depend more on long-term debt to finance significant investments in infrastructure and equipment.

Although there are overarching patterns in the relationship between firm size and short-term or long-term debt, the particular strategy for debt financing can exhibit substantial variation across enterprises. Short-term debt may be relied upon more extensively by smaller firms to address immediate operational requirements, whereas large enterprises might employ it strategically for a range of financial objectives. Conversely, when it comes to the utilization of long-term debt, large enterprises often enjoy a broader array of options and more favorable terms because of their size and financial stability, whereas small enterprises may find it necessary to exercise greater caution and ingenuity in securing long-term financing.

4. Conclusions

The financial situation of every firm must be considered to compete in the market. Financial analysis is employed to ascertain financial performance, and its primary objective is the examination of not only the strengths and weaknesses of the firm but also the level of its financial health. The analysis employs ratios, which are used to provide more detailed information about the corporate financial health and to determine the level of indebtedness or the reason for its financial difficulties. A comprehensive debt analysis is focused on the primary use of corporate debt to finance its business activities. In the real economy, it is not possible for all corporate assets to be financed with equity or only with debt. The main objective of debt analysis is to determine the ideal combination of equity and debt financing. Nevertheless, for the overall assessment of the capital structure, the most crucial factor is the selection of an appropriate ratio between equity and debt financing, which is a fundamental requirement for the high-quality development of the firm and its healthy financial growth. Several studies have been conducted on preferences for debt financing, but the results are often contradictory. Debt financing represents an appealing option for enterprises to fund their business activities, but there is a risk of potential distress if the balance sheet is weaker. Furthermore, firms have the option of borrowing money through long-term as well as short-term debt. The repayment period and interest rate should be considered when deciding on the type of debt to be used.

It has been proven that the composition of the corporate capital structure is influenced by several determinants that affect the use of long-term and short-term debt in various ways. An analysis of variance was employed in this paper to examine the impact of the firm size of the enterprise operating in the Visegrad Group countries on the debt ratios themselves during the period 2016–2021 and to determine if there were statistically significant differences in the individual indebtedness ratios depending on the firm sizes (small, medium-sized, large, and very large enterprises) or if the individual values of the indicators differed significantly. Despite statistically significant differences identified in the calculated indebtedness indicators regarding the size of the firms operating in the Visegrad Group countries, the Kruskal-Wallis test confirmed the impact of firm size on debt ratios. Due to the statistically significant differences between debt ratios, post hoc analysis results indicated that in Slovakia, the statistically significant differences between small and large enterprises, specifically between two carefully examined debt ratios, as well as between large and medium-sized enterprises and between small and medium-sized enterprises, were all identified. In the Czech Republic, statistically significant differences primarily occurred between small and very large enterprises, medium-

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sized and very large enterprises, as well as between large and very large enterprises. Notably, differences in the current indebtedness ratio were identified across all compared pairs of firm sizes. Based on the pairwise comparison results, differences between small and large enterprises, small and medium-sized enterprises, and small and medium-sized enterprises were primarily determined in Poland. In Hungary, statistically significant differences mostly occurred between small and large enterprises, medium-sized and very large enterprises, and large and very large enterprises. Based on the results, one of the most significant factors affecting the capital structure is firm size. It should be highlighted that no theory can forecast how a firm size could impact its leverage.

The following limitations should be emphasized regardless of the contribution of this paper to the existing literature. The scope of the paper, which only focuses on the cultural and political affiliations of four Central European countries, affects the extent to which the findings may be applied. Future research should consider this phenomenon in additional alliance countries (using panel data analysis) or over a longer time horizon than that set for this research in order to determine whether there will be differences in the findings and to enable greater generalization and applicability.

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References

Al Amosh, H., Khatib, S. F., Alkurdi, A., & Bazhair, A. H. (2022). Capital structure decisions and environmental, social and governance performance: Insights from Jordan. *Journal of Financial Reporting and Accounting*.

Alfaro, L., Asis, G., Chari, A., & Panizza, U. (2019). Corporate debt, firm size and financial fragility in emerging markets. *Journal of International Economics*, 118, 1-19.

Allen, L., & Letdin, M. (2020). The cost of debt for REITs: The mortgage puzzle. *Journal of Real Estate Research*, *42*(2), 239-260.

Altaf, N., & Ahmad, F. (2019). Working capital financing, firm performance and financial constraints: Empirical evidence from India. *International Journal of Managerial Finance*, *15*(4), 464-477.

An, J., Kim, K., & Pyun, J. H. (2021). Does debt market integration amplify the international transmission of business cycles during financial crises?. *Journal of International Money and Finance*, *115*.

Anagnostou, E., Dimopoulou, P., Sklavos, S., Zouvelou, V., & Zambelis, T. (2021). Identifying jitter outliers in single fiber electromyography: Comparison of four methods. *Muscle & Nerve*, *63*(2), 217-224.

Asgharian, H., Liu, L., & Larsson, M. (2018). Cross-border asset holdings and comovements in sovereign bond markets. *Journal of International Money and Finance*, *86*, 189-206.

Bagwell, S. (2023). Repudiation and Repression: The Human Costs of Sovereign Default. *Social Sciences*, *12*(3).

Bhattacharya, S., & Sharma, D. (2019). Do environment, social and governance performance impact credit ratings: a study from India. *International Journal of Ethics and Systems*, *35*(3), 466-484.

Blazek, R., Durana, P., & Michulek, J. (2023). Renaissance of Creative Accounting Due to the Pandemic: New Patterns Explored by Correspondence Analysis. *Stats*, *6*(1), 411-430.

Blazkova, I., & Dvoulety, O. (2018). Investigating the differences in entrepreneurial success through the firm-specific factors: Microeconomic evidence from the Czech food industry. *Journal of Entrepreneurship in Emerging Economies*, *11*(2), 154-176.

Bontempi, M. E., Bottazzi, L., & Golinelli, R. (2020). A multilevel index of heterogeneous short-term and long-term debt dynamics. *Journal of Corporate Finance*, *64*.

Bradford, W., Chen, C., & Zhu, S. (2013). Cash dividend policy, corporate pyramids, and ownership structure: Evidence from China. *International Review of Economics & Finance*, *27*, 445-464.

Brandth, B., & Bjorkhaug, H. (2015). Gender quotas for agricultural boards: changing constructions of gender?. *Gender, Work & Organization*, *22*(6), 614-628.

Cassell, C. A., Huang, S. X., Sanchez, J. M., & Stuart, M. D. (2012). Seeking safety: The relation between CEO inside debt holdings and the riskiness of firm investment and financial policies. *Journal of Financial Economics*, *103*(3), 588-610.

Cerkovskis, E., Gajdosikova, D., & Ciurlau, C.F. (2022). Capital structure theories: Review of literature, *Ekonomicko-manazerske spektrum*, *16*(1), 12-24.

Chernenko, S., & Sunderam, A. (2014). Frictions in shadow banking: Evidence from the lending behavior of money market mutual funds. *Review of Financial Studies*, *27*(6), 1717-1750.

Cline, B. N., Fu, X., & Tang, T. (2020). Shareholder investment horizons and bank debt financing. *Journal of Banking & Finance*, *110*.

Culkova, K., Tausova, M., Muchova, M. S., Domaracka, L., & Taus, P. (2018). Indebtedness in chosen industrial sectors with regard to the economic development in the world. *Ekonomicky casopis*, *66*(1), 28-42.

D'Mello, R., & Gruskin, M. (2021). To be or not to be all-equity for firms that eliminate long-term debt. *Journal of Empirical Finance*, *64*, 183-206.

Dabi, R. S. K., Nugraha, Disman, & Sari, M. (2023). Capital structure, financial performance and sustainability of Microfinance Institutions (MFIs) in Ghana. *Cogent Economics & Finance*, *11*(2).

De Marco, F., Kneer, C., & Wieladek, T. (2021). The real effects of capital requirements and monetary policy: Evidence from the United Kingdom. *Journal of Banking & Finance*, *133*.

Dimitric, M., Zikovic, I. T., & Blecich, A., A. (2019). Profitability determinants of hotel companies in selected Mediterranean countries. *Economic research-Ekonomska istrazivanja*, *32*(1), 1977-1993.

Dunn, O. J. (1961). Multiple comparisons among means. *Journal of the American statistical association*, *56*(293), 52-64.

Durisova, M., Tokarcikova, E., Virlanuta, F. O., & Chodasova, Z. (2019). The corporate performance measurement and its importance for the pricing in a transport enterprise. *Sustainability*, *11*(21).

Dvoulety, O., Srhoj, S., & Pantea, S. (2021). Public SME grants and firm performance in European Union: A systematic review of empirical evidence. *Small Business Economics*, *57*(1), 243-263.

Erhemjamts, O., Raman, K., & Shahrur, H. (2010). Industry structure and corporate debt maturity. *Financial Review*, *45*(3), 627-657.

Freeman, R. E., Dmytriyev, S. D., & Phillips, R. A. (2021). Stakeholder theory and the resource-based view of the firm. *Journal of Management*, *47*(7), 1757-1770.

Gajdosikova, D., Valaskova, K., Kliestik, T., & Kovacova, M. (2023). Research on Corporate Indebtedness Determinants: A Case Study of Visegrad Group Countries. *Mathematics*, *11*(2).

Gomes, L., Pereira, C., & Coelho, M. (2023). Determinants of Indebtedness in Expanding Portuguese Hotels. *Sustainability*, *15*(10).

Grega, D., Ambrus, T., Matejovic, A., Sutorova, M., & Kolar, J. (2021). Analysis of the effectiveness of the pharmacy network. *Farmacia*, *69*(4), 799-805.

Gubareva, M., & Borges, M. R. (2022). Governed by the cycle: interest rate sensitivity of emerging market corporate debt. *Annals of Operations Research*, *313*(2), 991-1019.

Guinnane, T. W., & Martinez-Rodriguez, S. (2018). Choice of Enterprise Form: Spain, 1886-1936. *Journal of Law Economics & Organization*, *34*(1), 1-26.

Haque, F., Arun, T. G., & Kirkpatrick, C. (2011). Corporate governance and capital structure in developing countries: A case study of Bangladesh. *Applied Economics*, *43*(6), 673-681.

Hettmansperger, T. P., Mottonen, J., & Oja, H. (1998). Affine invariant multivariate rank tests for several samples. *Statistica Sinica*, *8*(3), 785-800.

Huang, J., Kombate, B., Li, Y., Kouadio, K. R., & Xie, P. (2023). Effective risk management in the shadow of COVID-19 pandemic: The evidence of Indonesian listed corporations. *Heliyon, 9*(5).

Jadiyappa, N., Sisodia, G., Joseph, A., Shrivastsava, S., & Jyothi, P. (2021). Creditors' governance, information asymmetry and debt diversification: evidence from India. *International Journal of Managerial Finance*, *17*(2), 282-302.

Karas, M., & Reznakova, M. (2023). A novel approach to estimating the debt capacity of European SMEs. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *18*(2), 551-581.
Khan, I., & Wang, M. (2021). Evaluating corporate performance and bank productivity in China: the moderating role of independent directors. *Sustainability*, *13*(6).
Khan, M. T., Saif, N., Al-Jabri, Q. M., & Rahman, H. U. (2020). Impact of accrual reversals on corporate performance: evidence from emerging economy. *International Journal of Managerial and Financial Accounting*, *12*(3-4), 328-341.
Khoo, J., & Cheung, A. W. K. (2022). Managerial ability and debt maturity. *Journal of Contemporary Accounting & Economics*, *18*(1).
Kliestik, T., Sedlackova, A. N., Bugaj, M., & Novak, A. (2022). Stability of profits and earnings management in the transport sector of Visegrad countries. *Oeconomia Copernicana*, *13*(2), 475-509.
Kljucnikov, A., Civelek, M., Krajcik, V., Novak, P., & Cervinka, M. (2022). Financial performance and bankruptcy concerns of SMEs in their export decision. *Oeconomia Copernicana*, *13*(3), 867-890.
Knill, A. M. (2013). Does foreign portfolio investment reach small listed firms?. *European Financial Management*, *19*(2), 251-303.
Koralun-Bereznicka, J. (2018). Firm size and debt maturity as indirect determinants of capital structure: evidence form European panel data. *Applied Economics Letters*, *25*(18), 1319-1322.
Kovacova, M., Krajcik, V., Michalkova, L., & Blazek, R. (2022). Valuing the Interest Tax Shield in the Central European Economies: Panel Data Approach. *Journal of Competitiveness*, *14*(2), 41-59.
Kozak, S., & Wierzbowska, A. (2022). Did the COVID-19 pandemic amplify the positive impact of income diversification on the profitability of European banks?. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *17*(1), 11-29.
Kristof, T., & Virag, M. (2022). What drives financial competitiveness of industrial sectors in Visegrad Four countries? Evidence by use of machine learning techniques. *Journal of Competitiveness*, *14*(4), 117-136.
Kruskal, W. H., & Wallis, W. A. (1952). Use of ranks in one-criterion variance analysis. *Journal of the American Statistical Association*, *47*(260), 583-621.
Liang, G., Lutkebohmert, E., & Wei, W. (2015). Funding liquidity, debt tenor structure, and creditor's belief: an exogenous dynamic debt run model. *Mathematics and Financial Economics*, *9*(4), 271-302.
Lofton, M. L., & Kioko, S. N. (2021). The use of short-term debt by general-purpose governments. *Public Budgeting & Finance*, *41*(4), 71-93.
Maes, E., Dewaelheyns, N., Fuss, C., & Van Hulle, C. (2019). The impact of exporting on financial debt choices of SMEs. *Journal of Business Research*, *102*, 56-73.
Maity, B., Suresh, V., & Baidya, M. K. (2019). Performance of Indian Cement Industry: Drivers, Models and Empirics. *Global Economy Journal*, *19*(2).
Malkowska, A., & Uhruska, M. (2022). Factors affecting SMEs growth: the case of the real estate valuation service industry. *Oeconomia Copernicana*, *13*(1), 79-108.
Mazanec, J. (2022). The impact of working capital management on corporate performance in small–medium enterprises in the Visegrad group. *Mathematics*, *10*(6).
Michalski, G., Blendinger, G., Rozsa, Z., Cierniak-Emerych, A., Svidronova, M., Buleca, J., & Bulsara, H. (2018). Can we determine debt to equity levels in non-profit organisations? Answer based on Polish case. *Engineering Economics*, *29*(5), 526-535.
Michulek, J., Gajanova, L., Krizanova, A., & Nadanyiova, M. (2023). Determinants of improving the relationship between corporate culture and work performance: Illusion or reality of serial mediation of leadership and work engagement in a crisis period?. *Frontiers in Psychology*, *14*.
Miskufova, M., Jencova, S., & Petruska, I. (2022). Dependence of ROS on financial indicators using threshold regression models, *Ekonomicko-manazerske spektrum*, *16*(2), 49-60.
Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review*, *48*(3), 261-297.
Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: a correction. *American Economic Review*, *53*(3), 433-443.
Mouandat, S. R. (2022). Is Foreign Debt Management in Gabon Efficient?. *Management Dynamics in the Knowledge Economy*, *10*(1), 82–94.
Mundi, H. S., Kaur, P., & Murty, R. L. N. (2022). A qualitative inquiry into the capital structure decisions of overconfident finance managers of family-owned businesses in India. *Qualitative Research in Financial Markets*, *14*(3), 357-379.
Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics*, *13*(2), 187-221.

Myskova, R., & Hajek, P. (2020). Mining risk-related sentiment in corporate annual reports and its effect on financial performance. *Technological and Economic Development of Economy*, *26*(6), 1422-1443.

Nagy, M., & Lazaroiu, G. (2022). Computer vision algorithms, remote sensing data fusion techniques, and mapping and navigation tools in the Industry 4.0-based Slovak automotive sector. *Mathematics*, *10*(19).

Nagy, M., & Valaskova, K. (2022). The Growth of Research in Earnings Management Phenomenon. *Management Dynamics in the Knowledge Economy*,*10*(4), 360-375.

Nagy, M., Lazaroiu, G., & Valaskova, K. (2023). Machine Intelligence and Autonomous Robotic Technologies in the Corporate Context of SMEs: Deep Learning and Virtual Simulation Algorithms, Cyber-Physical Production Networks, and Industry 4.0-Based Manufacturing Systems. *Applied Sciences*, *13*(3).

Nemteanu, S. M., Dabija, D. C., Gazzola, P., & Vatamanescu, E. M. (2022). Social reporting impact on non-profit stakeholder satisfaction and trust during the COVID-19 pandemic in an emerging market. *Sustainability*, *14*(20).

Neyman, J., & Pearson, E. S. (1928). On the use and interpretation of certain test criteria for purposes of statistical inference: Part I. Biometrika, 175-240.

Potkany, M., Zavadsky, J., Hlawiczka, R., Gejdos, P., & Schmidtova, J. (2022). Quality Management Practices in Manufacturing Enterprises in the Context of Their Performance. *Journal of Competitiveness*, *14*(2), 97-115.

Rey-Ares, L., Fernandez-Lopez, S., & Rodeiro-Pazos, D. (2021). Impact of working capital management on profitability for Spanish fish canning companies. *Marine Policy*, *130*.

Riyadh, H. A., Sukoharsono, E. G., & Alfaiza, S. A. (2019). The impact of corporate social responsibility disclosure and board characteristics on corporate performance. *Cogent Business & Management*, *6*(1).

Saif-Alyousfi, A. Y., Md-Rus, R., Taufil-Mohd, K. N., Taib, H. M., & Shahar, H. K. (2020). Determinants of capital structure: evidence from Malaysian firms. *Asia-Pacific Journal of Business Administration*, *12*(3/4), 283-326.

Schiepers, E. (2023). Symposium Discussion Report: The Private Limited Without Capital and Loyalty Shares in Belgium. *European Company and Financial Law Review*, *20*(1), 58-60.

Schmidt, M. (2013). Equity and liabilities–A discussion of IAS 32 and a critique of the classification. *Accounting in Europe*, *10*(2), 201-222.

Shahzad, S. J. H., Ali, P., Ahmad, T., & Ali, S. (2015). Financial leverage and corporate performance: Does financial crisis owe an explanation?. *Pakistan Journal of Statistics and Operation Research*, *11*(1), 67-90.

Stefko, R., Vasanicova, P., Jencova, S., & Pachura, A. (2021). Management and economic sustainability of the Slovak industrial companies with medium energy intensity. *Energies*, *14*(2).

Szyszko, M., & Rutkowska, A. (2022). Do words transform into actions? The consistency of central banks? communications and decisions. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *17*(1), 31-49.

Tanaka, M. (2006). Bank loans versus bond finance: Implications for sovereign debtors. *Economic Journal*, *116*(510), 149-171.

Ughetto, E., Scellato, G., & Cowling, M. (2017). Cost of capital and public loan guarantees to small firms. *Small Business Economics*, *49*(2), 319-337.

Ullah, S., & Sun, D. (2021). Corporate social responsibility corporate innovation: A cross-country study of developing countries. *Corporate Social Responsibility and Environmental Management*, *28*(3), 1066-1077.

Valaskova, K., & Nagy, M. (2023). Macro-economic development of the EU countries in the context of performance and competitiveness of SMEs. *Business, Management and Economics Engineering*, *21*(1), 124-139.

Valaskova, K., Kliestik, T., & Gajdosikova, D. (2021). Distinctive determinants of financial indebtedness: Evidence from Slovak and Czech enterprises. E*quilibrium. Quarterly Journal of Economics and Economic Policy*, *16*(3), 639-659.

Valaskova, K., Kliestik, T., & Kovacova, M. (2018). Management of financial risks in Slovak enterprises using regression analysis. *Oeconomia Copernicana*, *9*(1), 105-121.

Valls Martínez, M. D. C., Cruz Rambaud, S., & Parra Oller, I. M. (2020). Sustainable and conventional banking in Europe. *PloS one*, *15*(2), e0229420.

Van Hecke, T. (2012). Power study of anova versus Kruskal-Wallis test. *Journal of Statistics and Management Systems*, *15*(2-3), 241-247.

Vatamanescu, E. M., Bratianu, C., Dabija, D. C., & Popa, S. (2023). Capitalizing online knowledge networks: from individual knowledge acquisition towards organizational achievements. *Journal of Knowledge Management*, *27*(5), 1366-1389.

Vieira, E. S. (2017). Debt policy and firm performance of family firms: The impact of economic adversity. *International Journal of Managerial Finance*, *13*(3), 267-286.

Xu, J., Sun, Z., & Shang, Y. (2021). Capital structure and financial performance in China's agricultural sector: a panel data analysis. *Custos E Agronegocio*, *17*(2), 445-463.

Yazdanfar, D., & Ohman, P. (2017). Substitute or complement? The use of trade credit as a financing source among SMEs. *Management Research Review*, *40*(1), 10-27.

Yousaf, M., Bris, P., & Haider, I. (2021). Working capital management and firm's profitability: Evidence from Czech certified firms from the EFQM excellence model. *Cogent Economics & Finance*, *9*(1).

Yusuf, Y. Y., Gunasekaran, A., Musa, A., Dauda, M., El-Berishy, N. M., & Cang, S. (2014). A relational study of supply chain agility, competitiveness and business performance in the oil and gas industry. *International Journal of Production Economics*, *147*, 531-543.

Zeitun, R., & Goaied, M. (2022). The nexus between debt structure, firm performance, and the financial crisis: non-linear panel data evidence from Japan. *Applied Economics*, *54*(40), 4681-4699.