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Dynamic Linkages between Social Expenditures and Economic Growth: the Most Important Conclusions for Central European Countries

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Abstract

The role of the state within the neoliberal system is discussed in the approaches developed for social expenditures. Accordingly, the question of whether the state should stand back or provide the support needed by individuals has shaped the literature on social expenditures. It is thought that the increase in social expenditures affects public expenditures, and public expenditures may indirectly cause budget deficits. In addition, it is said that there is a decrease in social spending during periods of economic growth. All these dilemmas show that the idea that the country needs both producers and consumers while realizing economic growth has been pushed into the background. Here, the analyses of the relationship between social spending and economic growth are the arguments for the accuracy of this assumption.

The aim of this study is to empirically analyze the long-term relationship between the economic growth and social expenditures of eight Central European countries and the causality relationship for 1999 and 2019. In the empirical findings, the cointegration relationship was determined between economic growth and social spending. Based on the findings of the causality analysis, it has been concluded that there is a bidirectional causality relationship between economic growth and social expenditures. Policy proposals are given in the conclusion section of the article.

Keywords: social expenditures, economic growth, political economy, Central European countries, panel data

JEL: H53, I38, F43, O47

Introduction

With industrialization and the social changes that followed, a number of legal and institutional arrangements were realized, led by the UK and then Germany. The reason for these arrangements is shaped by the need for workers that emerged due to industrialization and the fact that the population working in agriculture migrates to the cities in the face of new technologies. The social aid mechanism that the traditional structure contains melted and the need for new institutions emerged instead (Rakıcı and Kurşun 2016, p. 138). In addition, while new needs and interventions that may emerge under new working conditions make the need for new institutions felt, this situation also contributed to the emergence of the welfare state (Özdemir 2007, p. 185).

The welfare state approach is defined as a structure that aims to maintain capitalism in the long term by reducing the effects of the 1929 economic depression. The welfare state process that emerged along with the 1929 economic depression imposed restrictions on the generous spending of states with the crises that emerged in the 1970s (Gümüş 2018, p. 33). Along with globalization, the impact of the welfare state approach still affects the economy today, though not as much as in the past (Rakıcı and Kurşun 2016, p. 135).

While the 1929 economic depression expressed states role control over the economy, the state became responsible for protecting public from conditions such as poverty, unemployment, or disease along with the second World War (Türk 1979, p. 8). The support that must be given by the state was determined by the Beveridge Report (Beveridge 1942). Thus, the effect of the state on the social structure increased, and social expenditures emerged as an extension of the understanding of the welfare state (Ersin and Baş 2019, p. 193).

In brief, social expenditures assumed regulatory roles in all areas of social life. For example, it aimed to intervene in the market on issues arising in education and health, where the free market is insufficient. With these interventions and with economic supports and interventions under state control, it hoped to eliminate the social problems that may arise (Kaymaz 2018, p. 118).

With the transition from the period when state intervention was seen as the solution to problems to the period where the state intervention was seen as the problem, interest in understanding the welfare state also decreased (Özdemir 2007, p. 245). The state's lowering of taxes for capital also led to a reduction in the financial support that pays for social expenditures (Rakıcı and Kurşun 2016, p. 139). Nowadays, there is an increase in social spending. Of course, this increase is incomparable with the peri-

od before 1970, while there is an incompatibility among countries in the rates of increase. The reason for this is related to the various definitions of what social expenditures are.

Today, according to the definition by the Turkish Statistical Institute, social expenditures are classified as spending on education, health, and social protection (Arısoy, Ünlükaplan, and Ergen 2010, p. 400). According to the OECD definition, social expenditures are the income support to the retired and working populations, and health spending and all other social spending other than health (Arısoy, Ünkükaplan, and Ergen 2010, p. 401). The differentiation of these definitions also affects the findings and results of the research.

The same situation is experienced between welfare models and their success. Thus, with the withdrawal of the state after 1980, the impact of the welfare state is not measured only by its social expenditure. At the same time, the economic effects of social expenditures can also lead to differences in the economic growth of different welfare models and the countries where they are applied (Ersin and Baş 2019, p. 194). Thus, the benefit of individuals from social expenditures can also be considered as a social welfare measurement unit.

Two basic approaches have been developed in the relationship between social expenditures and economic growth. The first approach is the classical economic approach, which is the reason behind the 1929 economic depression. According to this approach, the state refrains from economic activities and only intervenes or supports initiatives when necessary. The failure of the classical economic approach caused the rise of Keynesian economics, in which the intervention of the state is at the forefront. This approach led to the emergence of different welfare models with different application areas.

Ferrera (1996) added the Southern European welfare model to Esping-Andersen's (1990) classification of welfare models as a liberal, conservative, and social democratic welfare state. Turkey is a part of this model and is similar to the characteristics of this model. In the South European welfare model, there are irregularities in terms of social expenditures, e.g., fragmented structures, such as the large difference in pensions (Yıldırım and Şahin 2019, p. 2536).

The relationship between social expenditures and economic growth can be seen through its relationship with public expenditures. Accordingly, social spending affects public spending, and public spending affects budget deficits. Thus, during a period of economic growth, a decrease in budget deficits and social expenditures is observed (Ersin and Baş 2019, p. 198).

Finally, when Turkey's social expenditure data is evaluated, its declining social expenditures in 2017 and 2018 are noteworthy. According to TurkStat social protection statistics, the share of social protection expenditures in GDP in 2018 was 11.9%. The share of social protection benefits in GDP is 11.7% (2018 Sosyal Koruma İstatistikleri 2019).

Related literature

Social expenditure is a public expenditure, as seen in studies focusing on the relationship between social expenditures and economic growth. For example, in the study by Kar and Taban (2003) titled "The Effects of Public Expenditure Types on Economic Growth," while examining the impact of social spending on economic growth, public expenditures were classified as health, education, social security, and infrastructure expenditures. Using the cointegration method, it was revealed that education and social security spending had a positive effect on economic growth in Turkey between 1971 and 2000. On the other hand, health expenditures had a negative impact on economic growth.

Following that study, Arısoy, Ünlükaptan, and Ergen (2010) used the concept of social expenditure in their study "Social Expenditures and Economic Growth Relationship: A Dynamic Analysis of The Turkish Economy for The Period 1960–2005." They used cointegration and error correction models to explain social spending like education, health, and social protection, revealing the positive effects of social spending on economic growth.

In another study conducted in Turkey, Romania, and Bulgaria, Altunc and Aydın (2013) drew attention to the increase in public expenditures by using the expression public expenditures instead of social expenditures with the ARDL test approach. They found that economic growth was negatively affected by public expenditures.

Finally, Ersin and Baş (2019) applied Pedroni panel cointegration and DH panel causality tests in their study titled "An Analysis on The Effectiveness of Mediation System in Collective Labor Disputes in Turkey: Examination of the Relationship Between Social Expenditures and Economic Growth in Southern European Welfare Countries". By analyzing the data between 1980–2016, it was revealed that social spending decreased during periods of economic growth. In addition, the causality effect from social expenditures to economic growth is not in question.

In recent studies, it has been suggested that investments in the health sector in Turkey will act as a locomotive for economic growth (Tutar and Ekici 2020). It has been suggested that increasing spending on education will also impact Turkey's economic growth (Cinel 2021). Meanwhile, in a study conducted by Torun, Eroğlu, and Bayrak (2021) on NATO countries, including Turkey, it was concluded that defense spending may negatively affect economic growth. Finally, Alataş and Sarı (2021) revealed that investments in education, health, and economic activities in Turkey are not sufficient in terms of economic growth.

In studies that examine the relationship between economic growth and social expenditures around the world, public expenditures again draw attention. Glomm and Ravikumar (1997) revealed that public spending on education has a positive effect on economic growth. However, the number of studies investigating the relationship between spending on education abroad and economic growth should be increased. For example, Landau (1986) revealed that he could not clearly observe the impact of edu-

cation spending between 1961 and 1976 on economic growth. In addition, Otanı and Villanueva (1989) mentioned that there may be a weak positive relationship between education spending and economic growth. Webber (2002) suggested that the education levels of individuals positively affect the economic growth of the country, while Kutluay Şahin's (2020) study on EU countries revealed that social spending on education has a positive effect on economic growth. There are also examples of Poland and the USA, which state that spending on education has a positive effect on economic growth (Konopczynski 2021; Wing 2021).

Among the studies investigating public spending on health, the study conducted by Kelly (1997) stands out. Using the regression method over seventy-three countries, he revealed that there was no significant relationship between health expenditure and economic growth between 1970 and 1989. However, the same study concluded that public spending might have an impact on economic growth in total. A recent study by Wang and Wang (2021) that focused on OECD countries revealed that higher health expenditure can be avoided as a result of appropriately allocating resources for the health of elderly individuals, and thus a positive contribution to economic growth can be made.

Using a regression method in a study of twelve EU countries for the period 1970–1994, Herce, Sosvilla-Rivero, and De Lucio (2000) revealed that spending on social security (i.e., social protection) positively contributes to economic growth. Accordingly, social protection expenditures positively affect economic growth. By contrast, in a study of fifty-eight countries, Baum and Lin (1993) concluded that social protection spending did not have a significant impact on economic growth. Meanwhile, Devarajan, Swaroop, and Zou (1996) examined forty-three countries for the period 1970–1990 with panel data analysis and OLS and found that social protection expenditures have a negative effect on economic growth under certain conditions. Finally, Ünal and Afşar (2021) concluded that social security spending has a positive effect on economic growth, although they revealed that economic growth does not positively affect social security expenditures. Other recent studies (e.g. Chantzaras and Yfantopoulos 2018; Hajamini and Falahi 2018; Wang et al. 2018; Trofimov 2020) concluded that social spending affects economic growth, although the studies differed in terms of year intervals, analysis methods, and countries analyzed.

Data and research methodology

Data

In this study, the relationship between economic growth and social expenditures between 1999 and 2019 was investigated by selecting eight Central European countries.[1] Social expenditure is taken as its share in GDP, and GDP per capita (current US dollars) is used to represent economic growth. Social expenditures are taken from the OECD database and economic growth data from the World Bank database.

Research methodology and application

In order to select the unit root and cointegration tests for the empirical analysis, first, test the cross-sectional dependence in the countries. When there is a cross-sectional dependence between countries, using unit root (Levin, Lin, and Chu 2002; Im, Pesaran, and Shin 2003) and cointegration tests (Kao 1999; Pedroni 1999), which do not care about cross-sectional dependence, may lead to false results. In addition, when there is no cross-sectional dependence between countries, the unit root (Moon and Perron 2004; Pesaran 2007) and cointegration tests (McCoskey and Kao 1998; Westerlund 2008), used in cross-sectional dependence situations, may lead to errors in analysis results. For this purpose, the cross-sectional dependencies of the countries were tested by the following methods.

$$\text{Breusch and Pagan (1980)}\ \mathrm{CD}_{\mathrm{BP}}: \sum_{\mathrm{i}=1}^{\mathrm{N}-1}\sum_{j=i+1}^{\mathrm{N}}\hat{\rho}_{\mathrm{ij}}^{2}. \tag{1}$$

$$\text{Pesaran (2020)}\ \mathrm{CD}_{\mathrm{LM}}: \left(\frac{1}{\mathrm{N}(\mathrm{N}-1)}\right)^{\frac{1}{2}}\sum_{\mathrm{i}=1}^{\mathrm{N}-1}\sum_{j=i+1}^{\mathrm{N}}(\mathrm{T}\hat{\rho}_{\mathrm{ij}}^{2}-1). \tag{2}$$

$$\text{Pesaran (2020)}\ \mathrm{CD}: \left(\frac{2\mathrm{T}}{\mathrm{N}(\mathrm{N}-1)}\right)^{1/2}\sum_{\mathrm{i}=1}^{\mathrm{N}-1}\sum_{j=i+1}^{\mathrm{N}}\hat{\rho}_{\mathrm{ij}}^{2}. \tag{3}$$

$\hat{\rho}_{\mathrm{ij}}$: the estimates of cross-section correlations between residues.

1 Austria, Czech Republic, Germany, Hungary, Poland, Slovakia, Slovenia, Switzerland.

Table 1. Cross-sectional dependence test results

Variables	Test statistics					
	CD_{BP}		CD_{LM}		CD	
	Statistics	p-value	Statistics	p-value	Statistics	P-Value
GDP	560.172	0.000	71.114	0.000	23.664	0.000
SE	115.813	0.000	11.734	0.000	6.397	0.000

Source: own elaboration.

The cross-sectional dependence test results are presented in Table 1. Based on the results, since CD_{BP}, CD_{LM}, and CD test statistics of the GDP and SE variables were significant at the level of 5%, the cross-sectional dependence was determined by rejecting the zero hypothesis "no cross-section dependency." Since there is a cross-sectional dependence on the variables, the unit root test that should be selected should be one of the second generation unit root tests.

Since there is a cross-sectional dependence on the variables (Table 1), the unit root test to be used in the study should be selected in accordance with cross-section dependency. Therefore, the CADF panel unit root test developed by Pesaran (2007) was used in this study. Cross-sectional extended regression:

$$\Delta x_{it} = z_{it}^{'}\gamma + \rho_i x_{it-1} + \sum_{j=1}^{k_i}\phi_{ij}\Delta x_{it-j} + \alpha_i \overline{x}_{t-1} + \sum_{j=0}^{k_i}\eta_{ij}\Delta\overline{x}_{t-j} + \nu_{it}, \tag{4}$$

where $\overline{x}_t$, x_{it} is the cross-section average and $\overline{x}_t = N^{-1}\sum_{i=1}^{n} x_{it}$. The CADF statistics are averaged when calculating the unit root test across the panel. CIPS statistics are calculated with the formula below.

$$CIPS = t - bar = N^{-1}\sum_{i=1}^{N_i} t_i. \tag{5}$$

Table 2. Panel unit root test results

Variables	CIPS test statistics	
	Level	First differences
GDP	–2.234	–2.667*
SE	–2.275	–3.140*

Note: * indicates the significance at 1%.
Source: own elaboration.

Table 2 presents the panel unit root test results. The null hypothesis of this test is in the form of "the variable has a unit root," and the alternative hypothesis is in the form "the variable is stationary," When the table* is analyzed, since the test statistics of GDP and SE variables are insignificant at 5% level, the zero hypothesis cannot be rejected.

Therefore, the variables have a unit root at the level. When the first difference of the variables was taken, the alternative hypothesis was accepted since the test statistics were significant at the level of 5%. Thus, it was concluded that the variables are stationary in their first differences.

The homogeneity values of the slope coefficients in cointegration equations were analyzed by the delta test developed by Pesaran and Yamagata (2008). The Pesaran and Yamagata (2008) delta test is calculated with the following formulas:

$$\tilde{\Delta} = \sqrt{N}\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}}, \tag{6}$$

$$\tilde{\Delta}_{adj} = \sqrt{N}\frac{N^{-1}\tilde{S} - k}{\sqrt{Var(t,k)}}. \tag{7}$$

$\tilde{\Delta}$ test is used for large samples and $\tilde{\Delta}_{adj}$ test is used for small samples.

Table 3. Cross-sectional dependence and homogeneity tests

	Statistics	p-value
Cross-Sectional Dependence Tests		
CD_{BP}	554.87	0.000
CD_{LM}	70.406	0.000
CD	23.551	0.000
Homogeneity Tests		
$\tilde{\Delta}$	3.927	0.000
$\tilde{\Delta}_{adj}$	4.226	0.000

Source: own elaboration.

In order to choose the panel cointegration test, the cross-sectional dependence and homogeneity test of the panel should be performed. The cross-sectional dependence and homogeneity test results of the panel are given in Table 3. According to Table 3, CD_{BP}, CD_{LM}, and CD test statistics, the 5% level null hypothesis was rejected, and an alternative hypothesis was accepted. Thus, there is a cross-sectional dependence on the panel. The homogeneity test results are also given in Table 3. According to these results, the slope coefficients in the cointegration equation were found to be heterogeneous.

The cointegrated relationship of variables was analyzed using Westerlund's (2008) Durbin-Hausman cointegration test. To apply the Durbin-Hausman test, the variables must be stationary at the first difference. Since the stationarity of the variables was detected at the first difference (Table 2), this condition of the Durbin-Hausman test was satisfied. This test is analyzed by the following formula:

$$DH_G = \sum_{i=1}^{n} \hat{S}_i \left(\tilde{\phi}_i - \hat{\phi}_i \right)^2 \sum_{t=2}^{T} e_{it-1}^2. \tag{8}$$

DH_G test statistics are used in the case of heterogeneity of the sections.

Table 4. Panel cointegration test results

	Statistics	p-value
DH_G	–1.717	0.043

Source: own elaboration.

Table 4 presents the result of the Durbin-Hausman panel cointegration test. Based on the results, the alternative hypothesis was accepted by rejecting "there is no cointegration relation in the variables," which is a null hypothesis of 5%. Thus, it was concluded that the variables are cointegrated.

This study also used Emirmahmutoglu and Kose's (2011) panel causality test. The maximum delayed VAR model in heterogeneous mixed panels ($k_i + d$) used for this test is as follows:

$$x_{it} = \mu_i^x + \sum_{j=1}^{k_i + dmax_i} A_{11,ij} x_{i,t-j} + \sum_{j=1}^{k_i + dmax_i} A_{12,ij} y_{i,t-j} + u_{i,t}^x, \tag{9}$$

$$y_{it} = \mu_i^y + \sum_{j=1}^{k_i + dmax_i} A_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i + dmax_i} A_{22,ij} y_{i,t-j} + u_{i,t}^y, \tag{10}$$

where $dmax_i$ is the maximum degree of integration that can occur in the system for each *i*. In Equation 9, the focus is on the causality test from *x* to *y*, while in Equation 10, the focus is on the causality test from *y* to *x*.

Table 5. Emirmahmutoglu and Kose's panel causality results

	GDP ↛ SE	SE ↛ GDP
Fisher Statistics	45.260	52.260
P-Value	0.000	0.000

Source: own elaboration.

The analysis results of the causality relationship between social expenditure and economic growth using Emirmahmutoglu and Kose's (2011) panel causality test are given in Table 5. Based on Table 5, from economic growth to social expenditure and vice versa, the null hypothesis was rejected, and the alternative hypothesis was accepted. As a result, in the empirical analysis, a two-way causality relationship was found between economic growth and social expenditures.

Concluding remarks

This study investigated the relationship between social expenditures and economic growth of eight Central European countries from 1999 to 2019. The long-term relationship was tested with the help of the Durbin-Hausman cointegration test, while the causality relationship between the variables was analyzed with Emirmahmutoglu and Kose's panel causality test. In the results, the cointegration relationship between social spending and economic growth was determined. Thus, the variables will act together in the long term. As a result of the panel causality analysis, it was concluded that economic growth was the causative of social expenditures and social expenditures were the causative of economic growth. Thus, the growth of these countries' economies will positively affect social expenditures. The implementation of policies to increase social expenditures by countries whose economies are developing will increase demand, which will revive the markets.

In the literature, no study was found that examined the relationship between social spending and economic growth for eight Central European countries. This study found that social spending, which helps the growth of the eight Central European countries, will increase the welfare level of the countries. Along with this study, which is important in terms of contributing to the literature, social expenditures are a factor that will contribute to the development of countries.

Failure to address social spending while determining the policies to increase economic growth runs the risk of not reaching the desired growth figures in the economy. Therefore, policymakers also need to develop policies for social expenditures while shaping economic growth policies. In particular, such policies, which will increase demand, will also allow for the revival of the markets.

Policies to be developed for education expenditure, which is one of the social expenditures that are directly related to social welfare, will affect the welfare of the society in the short term. In addition, considering that spending on education has an effect that will reduce crime in society, the grounds for raising better quality individuals in society will be established.

The support share to be allocated for health expenditure, which represents a significant part of social expenditures, will enable individuals to be more effective within the social system, such as the positive effects it creates in educational institutions. Healthy individuals are important parts of the system in terms of being productive and positively affecting the production system. While diseases prevent individuals from performing their duties in the social and economic system, they may also cause incompatibilities and delays within the system in terms of functionality. For this reason, the social expenditure on health institutions actually serves to make every institution that the individual belongs to become more functional.

Finally, social protection expenditure, another aspect of social expenditure, is also important for the functionality of both the social and economic systems. Aid policies developed within the system are especially necessary for individuals who need pro-

tection. The reason behind the orientation towards policies regarding social protection expenditures around the world is the need to protect individuals from the effects of the globalization of neoliberal policies on the flexibility of markets. Consequently, the active participation of the individual in the production and consumption processes within the economic system is essential for the welfare of the country. It is known that the degree of development of a country results from the well-being of the individuals living in that country. Thus, social spending on the welfare of individuals will positively affect the economic and social development of the country.

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Dynamiczne powiązania między wydatkami socjalnymi a wzrostem gospodarczym: najważniejsze wnioski dla krajów Europy Środkowej

Rola państwa w systemie neoliberalnym jest omawiana w ramach koncepcji opracowanych dla wydatków społecznych. W związku z tym pytanie, czy państwo powinno pozostawać bierne, czy też udzielać obywatelom potrzebnego wsparcia, ukształtowało piśmiennictwo dotyczące zagadnienia wydatków socjalnych. Uważa się, że wzrost wydatków socjalnych wpływa na wydatki publiczne, a wydatki publiczne mogą pośrednio powodować deficyty budżetowe. Ponadto mówi się, że w okresach wzrostu gospodarczego następuje spadek wydatków socjalnych. Wszystko to wskazuje, że teoria mówiąca, że dla realizacji wzrostu gospodarczego państwo potrzebuje zarówno producentów, jak i konsumentów, została zepchnięty na dalszy plan. Analizy relacji między wydatkami socjalnymi a wzrostem gospodarczym są argumentami potwierdzającymi słuszność tego stwierdzenia.

Celem niniejszego opracowania jest empiryczna analiza długookresowego związku między wzrostem gospodarczym a wydatkami socjalnymi ośmiu państw Europy Środkowej oraz związku przyczynowego dla lat 1999 i 2019. Za pomocą badań empirycznych ustalono związek kointegracji między wzrostem gospodarczym a wydatkami socjalnymi. Na podstawie wyników analizy przyczynowości stwierdzono, że istnieje dwukierunkowa zależność między wzrostem gospodarczym a wydatkami socjalnymi. Sugestie dla polityki są podane w końcowej części artykułu.

Słowa kluczowe: wydatki socjalne, wzrost gospodarczy, ekonomia polityczna, państwa Europy Środkowej, dane panelowe

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Institutional Quality and its Impact on FDI Inflow: Evidence from the EU Member States

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Abstract

The aim of the article is to assess institutional quality in 28 EU Member States and to examine the relationship between the quality of institutions and FDI inward stock as % of GDP. This study is structured as follows. Firstly, we reviewed studies dedicated to the relationship between institutional quality and investment attractiveness. Then, we discussed FDI inflow into the EU countries and selected diagnostic variables that later served as the basis for our research in which we used categories of the Global Competitiveness Index. Based on rankings and using statistical methods, in the next stage, we divided the EU Member States into groups representing similar institutional quality. Then we investigated the relationships between groups of countries similar to one another when it comes to institutional quality and groups of countries ranked in ascending order by the value of foreign direct investment inflow measured as FDI inward stock as % of GDP.
The study demonstrated that the EU Member States differ with respect to institutional quality. The results of the statistical analysis have provided grounds to positively verify the hypothesis about a positive relationship between the level of institutional quality and investment attractiveness.

Keywords: FDI, institutions, institutional quality, hierarchical cluster analysis, EU Member States

JEL: F21, F23

Introduction

The answer to the question of why a country is an attractive investment destination for a company seems quite straightforward: firms choose the investment location that involves the highest expected profitability and reduces the riskiness and uncertainty of the investment. But what does it really mean? What exactly do the companies consider? The subject-matter literature highlights a number of different determinants of foreign direct investment (FDI) inflow. Their usual catalog includes the size and growth potential of the host market, economic stability, the degree of openness of the host economy, and income level, government spending, corporate tax rate, human capital and political stability, level of development, and the quality of institutions (Walsh, Yu 2010, p. 4; O'Meara 2015, p. 2; Chanegriha, Stewart, and Tsoukis 2017, pp. 759–776; Dellis, Sondermann, and Vansteenkiste 2017, p. 19). The last one is increasingly more often the main subject of research.

Scholarly interest in the institutional determinants of FDI coincides with the growing body of literature that has focused on governance and economic development (Buchanan, Le, and Rishi 2012, p. 81). It indicates, inter alia, that institutional quality (IQ) significantly differs for countries at different levels of economic development (Jabri, Brahim 2015, pp. 2001–2012; Bailey 2018, pp. 139–148). Usually, it is higher in developed economies than in emerging markets or developing countries. The subject-matter literature mostly claims that "a certain optimal level of institutional development is a prerequisite for the materialization of the growth-enhancing effect of FDI" (Yeboua 2020, p. 2) and that the host country's IQ "affects profitability, and institutionally strong countries can attract foreign investors by offering high returns" (Sabir et al. 2019, p. 4). In other words, countries in which IQ is higher can attract more capital, and poor-quality institutions hinder FDI inflow, acting like a tax and therefore are a cost to FDI (Buchanan, Le, and Rishi 2012, p. 82).

The principal goal of the article is to assess institutional quality in 28 EU Member States and to examine the relationship between IQ and FDI inward stock as % of GDP. To achieve this goal, we used various statistical methods, i.e., k-means clustering, hierarchical cluster analysis, contingency analysis, descriptive statistics, normality plots with tests, and M-estimators. The hypothesis states that there is a positive relationship between the level of institutional quality and investment attractiveness of EU countries measured with the value of FDI inward stock as % of GDP.

This study is structured as follows. Firstly, we reviewed studies dedicated to the relationship between IQ and investment attractiveness. Then, we discussed FDI inflow into the EU countries and selected diagnostic variables that later served as the basis for our research in which we used categories of the Global Competitiveness Index. In the next stage, we divided the EU Member States into groups representing similar IQs. Then we investigated the relationships between groups of countries similar to one another when it comes to IQ and groups of countries ranked in ascending order by the value of FDI inflow measured as FDI inward stock as % of GDP.

The article sheds more light on the discussion about the relevance of IQ as a factor that determines FDI inflow. The added value of this article is derived from grouping 28 EU Member States based on their similarity regarding IQ and demonstrating that it impacts the size of FDI inflow. We proposed an original set of indicators for these countries that help in identifying their IQ. The results from this study are useful for policymakers. Our findings make it possible to formulate policy implications that stress the role of IQ as an important determinant in attracting FDI inflows.

Literature review

The history of research studies conducted by economists and experts in management, international economics, and international business in the pursuit of understanding the factors that impact the location decisions of enterprises with foreign capital is a long-standing one. Nielsen, Asmussen, and Weatherall (2017, pp. 62–82) made an overview of 153 studies published in renowned scientific journals over the period 1976–2015 that were devoted to determinants of location choices made by MNEs. Their authors focused predominantly on the relationship between location choices and some attributes of the host country's economy, e.g., the size of its domestic market, taxes, salaries and wages, infrastructure, human capital resources, and the quality of the institutional framework. We decided to concentrate on the last one.

Institutions can be seen from diverse perspectives, as can the factors that impact their quality (Alonso and Garcimartín 2013, pp. 206–226; Kunčič 2014, pp. 135–161; Lehne, Mo, and Plekhanov 2014, pp. 1–22; Grabowski and Self 2020, pp. 1–12). The multiplicity of research approaches to the issue is stressed by Rodríguez-Pose (2013, p. 1037), who argued that "defining institutions is notoriously difficult and the current literature on the topic does not agree on a common definition". The same can be said about measuring IQ across different territorial contexts. For instance, in our analysis, we rely on the approach adopted by the World Economic Forum. Since 1979, it has published the Global Competitiveness Index (GCI), with IQ being one of its key pillars. As with any other such measures, these indicators are also imperfect and can be approached critically, but in our opinion, they represent the most comprehensive and measurable set of variables that capture IQ and are one of the best measures available.

The impact of institutional quality as a location factor that can stimulate or discourage FDI inflows was already indicated by Dunning (1980) in his eclectic paradigm. Later, many scholars dealt with these issues, most frequently demonstrating that better institutions in host countries help attract more FDI inflows (Tun, Azman-Saini, and Law 2012; Ullah, Khan 2017, pp. 1030–1050). According to Stachowiak (2007, p. 47), institutional differences between countries can be sources of comparative advantage because some activities are more institution-intensive than others, which may generate increased trade and capital flows. Multinational companies will be seeking to ex-

ploit the above-mentioned comparative advantage of a given country by which they will contribute to the growth of FDI.

Researchers agree that institutions – be it regional, national, or even supranational – shape the nature of business by providing the framework of opportunities and constraints within which economic activity takes place (Nielsen, Asmussen, and Weatherall 2017, pp. 62–82), which implies that the quality of the host country's institutions should impact FDI location decisions. Thus, countries planning to attract more foreign capital should provide an appropriate institutional environment, e.g., in terms of political stability, property rights, or low levels of business uncertainty and risk. Moreover, according to many researchers, a higher IQ means that the consumer market of the country in question is more active and efficient, and consumer demand ensures the profitability of the investment projects carried out in this country (Aibai et al. 2019, p. 3278).

On the other hand, poor institutional quality can be an obstacle to FDI inflows, as it represents a threat to the investment and increases the cost of doing business (Aziz 2018, p. 111). Avoiding problems with regulatory, bureaucratic, and judicial hurdles, property rights, enforceable contracts, or performance and content requirements will be seen as positive by foreign investors; however, one needs to bear in mind that bribery and corruption are obviously more invasive in emerging markets than in developed economies (Dumludag 2009, p. 28).

While we can find in the subject-specific literature devoted to developing countries a broad consensus around the assertion that institutional quality is important to attract FDI, for developed countries, the claim is not so obvious (Dellis, Sondermann, and Vansteenkiste 2017, p. 6). Remarkably, researchers' attention is usually focused on developing and transitioning countries (Jabri, Brahim 2015, pp. 2001–2012), while developed economies are rarely examined in this context. In addition, the impact of IQ on FDI inflows is rarely investigated in parallel for developed and developing countries (Peres, Ameer, and Xu 2018, pp. 626–644).

The relationship between IQ and FDI inflows is illustrated in the literature by many factors, such as a political regime (Madani and Nobakht 2014, pp. 75–82; Moon 2019, pp. 1256–1277), corruption (Türedi 2018, pp. 151–172), tax policies (Ade, Rossouw, and Gwatidzo 2021, pp. 55–77), intellectual property rights (Hammami 2019, pp. 861–871), quality of the educational system (Miningou and Tapsoba 2017), security (Essien et al. 2015), public and private sector transparency (Seyoum and Manyak 2009, pp. 187–206), government effectiveness (Sedik 2012), and even political parties (Bellinger and Son 2018, pp. 712–731). Most works reveal positive relationships between IQ and FDI; however, there are studies in which a set of institutional factors is statistically non-significant for attracting FDI flows, e.g., control of corruption and the rule of law (Bayar and Alakbarov 2016, pp. 303–308; Abdella, Naghavi, and Fah 2017, pp. 32–38), the quality of democracy, and political instability (Madr and Kouba 2015, pp. 2017–2026), government effectiveness (Jurčić, Franc, and Barišić 2020, pp. 44–57), or economic freedom (Subasat, Bellos 2011, pp. 2053–2065).

Due to the multiplicity of factors that shape IQ, the literature on its impact upon FDI can be divided into three strands (Kurul and Yalta 2017, pp. 1–10). The first strand mainly focuses on identifying the effects of a specific institutional dimension, such as the influence of corruption or political regimes on FDI. The second strand analyzes the importance of different dimensions of IQ. Finally, the third strand explores the effect of a composite institutional indicator, which is constructed by combining different dimensions of institutional variables.

The relationship between institutional quality and FDI inflow

The principal goal of the study is to assess the relationship between the inflow of foreign direct investment and the institutional quality of countries. The study was based on statistical data for 28 EU Member States.[1] The empirical part consisted of three stages. In the first stage, based on the in-depth literature review, we selected variables that, to the best of our knowledge, best describe institutional quality. Partial indicators (20 variables) for 28 EU Member States were taken from the Global Competitiveness Index database. In the second stage, using statistical methods of cluster analysis (i.e., k-means clustering, hierarchical cluster analysis), we identified countries of similar institutional quality. Based on that, we divided the EU Member States into: (1) five groups of countries similar to one another regarding institutional quality and (2) four groups of countries ranked in ascending order by the value of foreign direct investment inflow measured as FDI inward stock as % of GDP. In this case, we used UNCTAD data. In the last stage of the study, we investigated the relationships between them. The results allowed us to verify the hypothesis that there is a positive relationship between institutional quality and investment attractiveness of countries measured with the value of FDI inward stock as % of GDP.

The European Union is often seen by investors as one entity, even though the Member States differ greatly from each other regarding their ability to attract FDI. The UK, the Netherlands, Germany, Ireland, and France are the most effective at successfully competing for foreign investors. In 2018, the total value of the FDI inward stock exceeded almost twice the value of FDI stock in all the other countries covered by the study taken together (UNCTAD 2019). However, the values look different when we consider the FDI inward stock as % of GDP. Then, we see that Cyprus and Malta are the undisputed leaders (respectively, 1716% and 1416%). Ireland, Luxembourg, the Netherlands, and Belgium managed to attract FDI stock equivalent of more than 100% of their GDP. At the bottom of the ranking is Greece, with a share of FDI stock in GDP of ca. 16% (UNCTAD 2019). It is difficult to find regularities in this ranking that would address, e.g., the impact of the size of the country or EU membership experience.

1 Due to the period covered by the analysis (2018–2019), the UK is included in the study.

As mentioned, in the first stage, we made a preliminary data analysis. The study was conducted for the years 2018–2019 based on 20 partial indicators selected from the Global Competitiveness Index (GCI) for 28 EU Member States (a detailed description of variables is given in the Appendix, Tab. A1). The structure of the study ensured comparability of values of individual indicators that, in addition, provided a detailed description of institutional quality in selected countries. The relatively short time horizon and, consequently, the inability to carry out a panel study was a clear disadvantage of the exercise. The timeframe limitation was forced by the fact that in 2017, the GCI index methodology underwent many changes, meaning that results from before 2017 cannot be put together with indices for later years. Hence, the short time series determined the choice of statistical methods applied in the study.

Among the variables selected for the analysis, the following were the most differentiated: homicide rate, the efficiency of the legal framework in challenging regulations, and the efficiency of the legal framework to settle disputes. On the other hand, the least dispersion (statistically insignificant) amongst the EU Member States was observed for two variables: terrorism incidence and World Press Freedom Index. Most variables exhibited weak asymmetry, meaning that the frequency distributions around the mean were close to a symmetrical distribution. Thus, for the majority of variables (17), we were dealing with symmetrical distributions with little differentiation of results, and thus the use of the arithmetic mean to evaluate them can be considered correct at a substantive level (see Tab. 1). Exceptions were observed for only three variables characterized by very strong asymmetry and kurtosis of the distribution: homicide rate, terrorism incidence, and quality of land administration index.

Table 1. Descriptive statistics of institutional quality variables for 28 EU Member States in 2018–2019

	Mean	Std. Deviation	Skewness	Kurtosis	Range	Coefficient of variation (%)
Organized crime (1–7)	5.33	0.65	–0.70	2.15	3.21	12.25
Homicides per 100,000 population	1.35	1.08	2.68	8.08	4.97	80.12
Terrorism incidence (0 = very high; 100 = no incidence)	97.00	9.55	–4.76	23.81	50.00	9.85
Reliability of police services (1–7)	5.17	0.84	–0.16	–0.74	3.31	16.29
Social capital (0–100, high)	54.92	6.66	–0.14	–1.44	21.24	12.13
Open Budget Data score (0–100, best)	62.09	17.36	–1.33	3.57	84.68	27.96
Judicial independence (1–7)	4.71	1.23	–0.06	–1.27	4.04	26.11
Efficiency of legal framework in challenging regulations (1–7)	3.54	1.09	0.33	–1.19	3.60	30.79
World Press Freedom Index (0 = most free; 100 = least free)	80.38	6.87	–0.34	–0.57	26.83	8.55
Burden of government regulation (1–7)	3.32	0.79	0.19	–0.86	2.94	23.86

Efficiency of legal framework to settle disputes (1–7)	3.85	1.17	0.15	–1.11	3.97	30.42
E-Participation Index (0–1, best)	0.80	0.11	–0.31	–0.65	0.39	14.07
Future orientation of government (1–7)	3.81	0.90	0.21	–0.60	3.61	23.71
Corruption Perception Index (0 = highly corrupt; 100 = very clean)	64.55	14.09	0.19	–1.38	45.00	21.83
Property rights (1–7)	4.99	0.92	0.03	–1.26	3.02	18.39
Intellectual property protection (1–7)	5.05	0.87	–0.09	–1.06	3.22	17.25
Quality of land administration index (0–30, best)	22.73	5.05	–2.04	5.67	24.00	22.21
Strength of auditing and accounting standards (1–7)	5.20	0.75	–0.04	–1.08	2.75	14.42
Extent of conflict of interest regulation (0–10, best)	5.98	1.03	0.67	1.41	4.70	17.29
Extent of shareholder governance (0–10, best)	6.54	0.82	–0.10	–0.06	3.30	12.54

Source: own elaboration based on the Global Competitiveness Index (GCI).

In the second stage of the analysis, using cluster analysis methods, we tried to select countries of similar institutional quality assessed based on 20 partial indicators included in Table 1. Using the k-means algorithm,[2] we distinguished two clusters (Tab. 2).

Table 2. Allocation to clusters based on the k-means algorithm for the 28 EU Member States in 2018–2019

Country	Cluster	Distance
Austria	1	2.493
Belgium	1	3.126
Bulgaria	2	3.813
Croatia	2	3.331
Cyprus	2	2.609
The Czech Republic	2	2.807
Denmark	1	1.629
Estonia	1	3.069
Finland	1	3.358
France	1	3.169
Germany	1	2.478
Greece	2	4.277
Hungary	2	3.163
Ireland	1	3.075
Italy	2	3.532
Latvia	2	2.597

2 Find more: Tan, Steinbach, Kumar 2006, pp. 125–157.

Table 2. (continued)

Country	Cluster	Distance
Lithuania	2	4.563
Luxembourg	1	3.978
Malta	2	5.104
The Netherlands	1	2.533
Poland	2	2.005
Portugal	2	5.813
Romania	2	1.830
Slovakia	2	3.062
Slovenia	2	2.671
Spain	2	3.834
Sweden	1	1.782
United Kingdom	1	3.084

Source: own elaboration (calculations made in PS IMAGO).

The first cluster consists of 12 countries, i.e., Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden, and the United Kingdom. These are mainly the so-called 'old' EU Member States (with the exception of Estonia[3]), most of them situated in the northern part of the continent. The remaining sixteen EU Member States, i.e., mainly the so-called 'new' EU Member States and the countries of Southern Europe, are brought together in the second cluster.

Attention needs to be paid to the analysis of the basic descriptive characteristics presented in Table 3, which unambiguously shows that the descriptive statistics for countries of the first group of clusters, representing similar institutional quality, are higher for most variables. It means that their IQ is higher than that of countries from the second cluster.

Division into only two groups, however, is too general to carry out an in-depth analysis of the relationship between the IQ and investment attractiveness measured with the inflow of FDI. For this reason, in the next stage of the study, we deployed the hierarchical cluster analysis used to detect objects that are similar with regard to specific features in a set of data (Lasek 2002; James et al. 2014).

3 Estonia is the undisputed leader in institutional quality amongst the so-called 'new' EU Member States (see Dorożyński, Dobrowolska, and Kuna-Marszałek 2020, pp. 91–110).

Table 3. Descriptive statistics of institutional quality variables of EU Member States in 2018–2019 by groups identified in cluster analysis

	Group 1					Group 2				
	Mean	Std. Deviation	Coefficient of variation	Skewness	Kurtosis	Mean	Std. Deviation	Coefficient of variation	Skewness	Kurtosis
Organized crime (1–7)	5.65	0.50	0.09	1.15	1.32	5.09	0.67	0.13	–1.09	1.25
Homicides per 100,000 population	1.24	0.74	0.59	1.90	4.17	1.44	1.30	0.91	2.55	6.72
Terrorism incidence (0 = very high; 100 = no incidence)	97.58	3.51	0.04	–1.59	1.27	96.56	12.44	0.13	–3.98	15.89
Reliability of police services (1–7)	5.86	0.41	0.07	0.77	1.39	4.65	0.69	0.15	0.58	0.87
Social capital (0–100, high)	60.03	4.00	0.07	–1.44	1.57	51.09	5.62	0.11	0.81	0.08
Open Budget Data score (0–100, best)	68.91	13.67	0.20	–1.36	3.09	56.97	18.44	0.32	–1.31	4.28
Judicial independence (1–7)	5.94	0.43	0.07	0.20	–0.49	3.79	0.69	0.18	–0.15	–1.15
Efficiency of legal framework in challenging regulations (1–7)	4.62	0.58	0.12	0.42	–1.36	2.74	0.53	0.19	1.04	0.82
World Press Freedom Index (0 = most free; 100 = least free)	85.85	4.37	0.05	–1.02	0.79	76.27	5.39	0.07	–0.44	–0.32
Burden of government regulation (1–7)	3.96	0.61	0.15	–0.55	–0.41	2.84	0.53	0.19	0.21	0.03
Efficiency of legal framework to settle disputes (1–7)	5.00	0.59	0.12	–0.26	–1.18	2.99	0.60	0.20	–0.40	–1.03
E-Participation Index (0–1, best)	0.86	0.08	0.09	–0.28	0.59	0.75	0.11	0.15	0.19	–0.73
Future orientation of government (1–7)	4.62	0.58	0.12	0.27	–0.58	3.21	0.57	0.18	0.25	1.58
Corruption Perception Index (0 = highly corrupt; 100 = very clean)	79.08	5.84	0.07	–0.24	–1.23	53.66	6.08	0.11	–0.22	–1.17
Property rights (1–7)	5.91	0.34	0.06	0.28	–0.35	4.29	0.47	0.11	–0.24	–0.70
Intellectual property protection (1–7)	5.92	0.30	0.05	0.21	–0.22	4.39	0.48	0.11	–0.68	0.48
Quality of land administration index (0–30, best)	24.75	2.40	0.10	0.07	–1.12	21.22	6.00	0.28	–1.61	3.18
Strength of auditing and accounting standards (1–7)	5.88	0.38	0.07	–0.10	0.40	4.70	0.52	0.11	0.44	0.03

Table 3. (continued)

	Group 1					Group 2				
	Mean	Std. Deviation	Coefficient of variation	Skewness	Kurtosis	Mean	Std. Deviation	Coefficient of variation	Skewness	Kurtosis
Extent of conflict of interest regulation (0–10, best)	6.18	1.34	0.22	0.67	−0.04	5.84	0.75	0.13	−0.69	2.03
Extent of shareholder governance (0–10, best)	6.46	1.02	0.16	−0.31	−0.66	6.61	0.66	0.10	0.87	−0.29

Source: authors' own elaboration (calculations made in PS IMAGO).

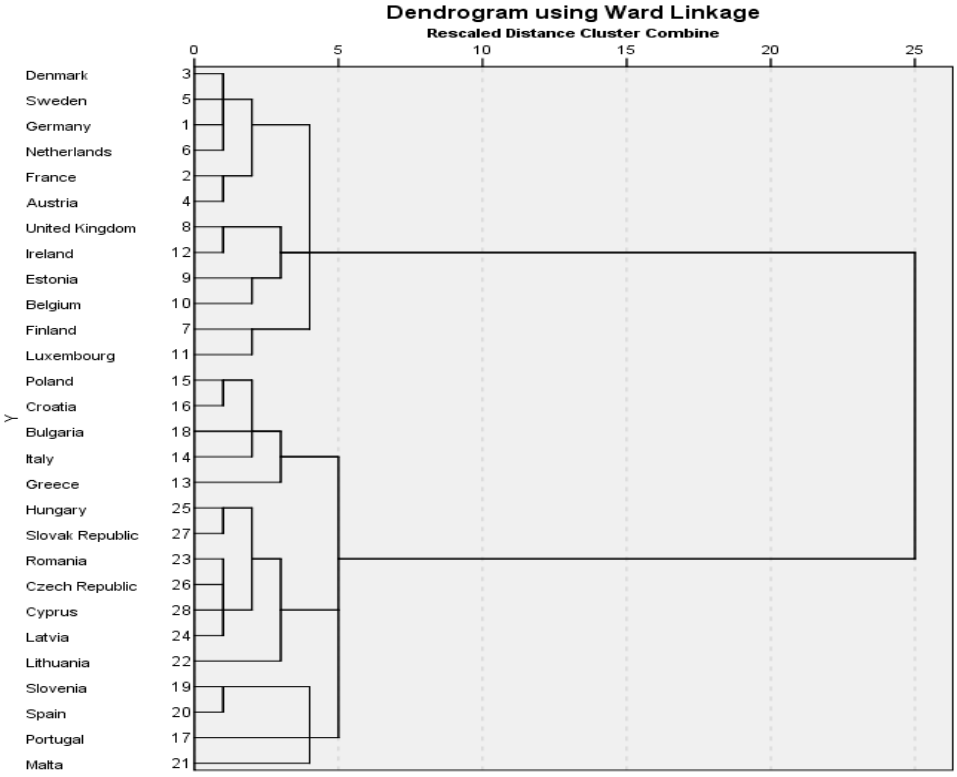

Figure 1. Dendrogram for 28 EU Member States obtained using the Ward method (Ward's linkage)
Source: own elaboration.

Using the Ward method, we obtained a dendrogram revealing a hierarchical structure of a set of objects sorted from the most to the least similar. Thus, we were able to distinguish two principal clusters of the EU Member States that differ in institutional quality and, at the same time, divide the population covered by the study in a more detailed way. Thus, out of the investigated set of 28 EU Member States, we distinguished the five following groups (Figure 1):

- group 1: Denmark, Sweden, Austria, France, Germany, the Netherlands,
- group 2: Belgium, Estonia, Finland, Ireland, Luxembourg, United Kingdom,
- group 3: Croatia, Poland, Bulgaria, Italy, Greece, Portugal,
- group 4: Slovenia, Spain, Malta,
- group 5: Hungary, Slovakia, the Czech Republic, Romania, Cyprus, Latvia, Lithuania.

To compare IQ within the above-distinguished groups, we created a ranking based on the arithmetic mean for each of the 20 partial variables (see Appendix, Tab. A2), where the best value from the point of view of the evaluation of IQ was given 5 and the worst, 1. Next, the results were corrected using weights assigned to each variable in the overall evaluation of the 'institutional quality' pillar of the GCI index. Nota-

bly, the ranking of 20 variables that describe IQ in the five distinguished groups given in Table 4 clearly indicates that countries from groups 1 and 2 exhibit the highest institutional quality. Hence, the leaders are Denmark, Sweden, Austria, France, Germany, the Netherlands, Belgium, Estonia, Finland, Ireland, Luxembourg, and the United Kingdom. They are followed by countries from groups 4 and 5. Members of group 3, i.e., Croatia, Poland, Bulgaria, Italy, Greece, and Portugal, are at the bottom of the ranking, and their performance was assessed as the poorest in 13 out of 20 indicators.

Table 4. Ranking of institutional quality variables of the EU Member States in the years 2018–2019 by groups distinguished based on the dendrogram

Country Group (1–5_)	Group 1	Group 2	Group 3	Group 4	Group 5
Organized crime (1–7)	9.375	15.625	3.125	12.5	6.25
Homicides per 100,000 population	9.375	12.5	6.25	15.625	3.125
Terrorism incidence (0 = very high; 100 = no incidence)	6.25	9.375	3.125	12.5	15.625
Reliability of police services (1–7)	12.5	15.625	3.125	9.375	6.25
Social capital (0–100, high)	62.5	37.5	25	50	12.5
Open Budget Data score (0–100, best)	15.625	12.5	6.25	3.125	9.375
Judicial independence (1–7)	12.5	15.625	3.125	9.375	6.25
Efficiency of legal framework in challenging regulations (1–7)	12.5	15.625	3.125	9.375	6.25
World Press Freedom Index (0 = most free; 100 = least free)	3.125	6.25	15.625	12.5	9.375
Burden of government regulation (1–7)	16.64	20.8	4.16	12.48	8.32
Efficiency of legal framework to settle disputes (1–7)	20.8	16.64	4.16	8.32	12.48
E-Participation Index (0–1, best)	20.8	14.56	8.32	14.56	4.16
Future orientation of government (1–7)	50	62.5	12.5	37.5	25
Corruption Perception Index (0 = highly corrupt; 100 = very clean)	62.5	50	12.5	37.5	25
Property rights (1–7)	16.64	20.8	4.16	12.48	8.32
Intellectual property protection (1–7)	16.64	20.8	4.16	12.48	8.32
Quality of land administration index (0–30, best)	20.8	16.64	4.16	8.32	12.48
Strength of auditing and accounting standards (1–7)	20.8	16.64	4.16	12.48	8.32
Extent of conflict of interest regulation (0–10, best)	8.32	20.8	12.48	16.64	4.16
Extent of shareholder governance (0–10, best)	20.8	4.16	12.48	16.64	8.32
Total points	418.49	404.97	151.99	323.78	199.88

Source: own elaboration (calculations made in PS IMAGO).

In the third stage, having grouped countries into clusters of the most similar institutional quality, we were able to find out about their cointegration with the inflow of FDI measured as FDI inward stock as % of GDP. To this end, we transformed the

FDI as % of GDP variable measured on a quantitative measurement scale into a variable measured on an ordinal scale due to the clear deviation of this variable distribution from the normal distribution as suggested by both the results obtained from the Shapiro-Wilk[4] test and the Q-Q plot with a trend.

Deviation in the distribution of the FDI inward stock as % of GDP variable from the normal distribution is also confirmed by the descriptive statistics, in particular, by the 5% trimmed mean, the confidence interval for the mean, the skewness ratio, kurtosis, and the M-Estimators (see Tab. 5). Under the absence of homogeneity in this collection, we divided the EU Member States into four groups ranked by the FDI inward stock as % of GDP variable in ascending order based on position metrics, such as quartiles.

Table 5. Statistics describing FDI inward stock as % of GDP in the EU Member States in the years 2018–2019

Descriptives	Statistics	Std. Error
Mean	130.0079	59.83729
95% Confidence Interval for Mean – Lower Bound	7.2319	
95% Confidence Interval for Mean – Upper Bound	252.7838	
5% Trimmed Mean	71.2374	
Variance	100254.038	
Std. Deviation	316.62918	
Minimum	15.98	
Maximum	1716.27	
Range	1700.29	
Interquartile Range	46.40	
Skewness	5.001	.441
Kurtosis	25.789	.858
Percentiles 25	33.2025	
Percentiles 50	52.9050	
Percentiles 75	79.6050	
M-Estimators		
Huber's M-Estimator[a]	54.9188	
Tukey's Biweight[b]	47.6765	
Hampel's M-Estimator[c]	50.3650	
Andrews' Wave[d]	47.5541	

[a] The weighting constant is 1.339.
[b] The weighting constant is 4.685.
[c] The weighting constants are 1.700, 3.400, and 8.500
[d] The weighting constants are 1.700, 3.400, and 8.500
Source: own elaboration (calculations made in PS IMAGO).

4 Statistics in the Shapiro – Wilk test is 0.321; df = 28, p = 0.0001.

The groups of countries distinguished by the value of FDI based on quartiles and the distribution by groups of institutional quality of 28 EU Member States allowed us to create a cross table (Tab. 6). From the table, we can learn that countries representing higher institutional quality usually attract more FDI inward stock as % of GDP.

Table 6. EU Member States allocation to groups of institutional quality and FDI inward stock as % of GDP

FDI inward stock as % of GDP	Institutional quality groups					Total
	Group 1 DK, SE, AT, FR, DE, NL	Group 2 BE, EE, FI, IE, LU, UK	Group 3 HR, PL, BG, IT, EL, PT	Group 4 SI, ES, MT	Group 5 HU, SK, CZ, RO, CY, LV, LT	
Group 1 CY, MT, IE, LU, NL, BE, EE	1	4	0	1	1	7
Group 2 HU, SE, PT, CZ, UK, BG	1	1	2	0	2	6
Group 3 LT, RO, PL, AT, HR, LV, ES, SK	1	0	2	1	4	8
Group 4 EL, IT, DE, FI, FF, DK, SI	3	1	2	1	0	7
Total	6	6	6	3	7	28

Source: own elaboration.

To assess the strength of the correlation between the institutional quality category of a country and the value of FDI inflow, we used the contingency coefficient. For the examined sample, the coefficient amounts to 0.595.[5] It means that there is a significant positive correlation[6] between the institutional quality category of a country and FDI inward stock as % of GDP. The results of the above statistical analysis have provided grounds to positively verify the hypothesis about a positive relationship between the level of institutional quality and the investment attractiveness of countries measured with the value of FDI inward stock as % of GDP.

5 Own calculations made using PS IMAGO.

6 The direction of the relationship was assessed based on the distribution of data in the contingency table (Table 6) and the ranking of variables describing institutional quality of the EU Member States (Table 4).

Conclusion

The principal scientific goal of the study was to evaluate the relationship between the inflow of foreign direct investment and the institutional quality of countries. As mentioned above, there is a long list of location-specific attributes that impact foreign direct investment inflow. The dominant view is that countries with better institutional quality can attract more FDI. Poor quality institutions hinder FDI inflow, acting as a barrier to foreign investors unwilling to invest in countries where institutions encourage, e.g., corruption or nepotism. However, there are researchers who did not observe any clear relationship between institutional performance and FDI inflow. Ambiguous and sometimes even contradictory conclusions are, in our opinion, the fundamental reason why in-depth studies on the role of institutions in attracting foreign investors should be conducted.

In our case, the institutional performance of 28 EU Member States was assessed based on the Global Competitiveness Index. Measuring institutional quality remains problematic for many researchers as there is no coherent measure. This is why we tried to develop our own measure, built of 20 partial variables from the first pillar of the GCI 'Institutions'. All of the selected indicators help assess the institutional system of a given country from the point of view of, inter alia, institutions' interference in the economy, and the efficiency, transparency, and quality of administration.

In the group of countries covered by the study, Finland is the undisputed leader when it comes to the quality of institutions. Simultaneously, it turned out that the examined countries can be divided into five groups representing similar institutional quality. Using the hierarchical cluster analysis, we selected five such groups. The institutional quality leaders among the 28 EU Member States are Denmark, Sweden, Austria, France, Germany, the Netherlands, Belgium, Estonia, Finland, Ireland, Luxembourg, and the United Kingdom. The group of the institutional "outsiders" is represented by both the 'old' and 'new' EU Member States, i.e., Croatia, Poland, Bulgaria, Italy, Greece, and Portugal. Poland is the only economy that is not in Southern Europe.

Surprisingly, there is a relatively big difference between the leaders of institutional quality and the group of institutional 'outsiders' in the ranking. The scores for countries from groups 1 and 2 are almost three times higher than those for group 3 (see Tab. 4). Groups 1 and 2 consist almost exclusively of the 'old' EU Member States. Estonia, the leader amongst countries of Central and Eastern Europe in institutional quality rankings, is the only exception here (see Dorożyński, Dobrowolska, and Kuna-Marszałek 2020, pp. 91–110).

When it comes to FDI inward stock as % of GDP, we have found that Cyprus and Malta are at the top of the ranking, followed by Ireland, Luxembourg, the Netherlands, and Belgium, which managed to attract FDI stock equivalent to more than 100% of their GDP. Using various statistical methods, we examined the relationship between institutional quality and FDI inflow. It turned out that there is a statistically

significant relationship between the level of institutional quality and investment attractiveness of countries measured with the value of FDI inward stock as % of GDP. This means that relatively poor institutional quality may have a negative impact on the inflow of FDI.

The study has implications for research and practice. The results will be of interest to policymakers and may have an application value for institutions. An efficient and effective institutional system may importantly contribute to boosting the investment attractiveness of countries and impact FDI flows.

The limitation of the study is its relatively short time horizon and, consequently, the inability to deploy more sophisticated quantitative instruments and measures. Hence, the short time series determined the choice of statistical methods applied in the study. The future research agenda should focus on solving the problem of limited data in order to be able to employ, e.g., panel data analysis.

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Jakość instytucjonalna i jej wpływ na zagraniczne inwestycje bezpośrednie: przykład państw członkowskich Unii Europejskiej

Celem artykułu jest ocena jakości instytucjonalnej w 28 państwach członkowskich UE oraz próba oceny zależności pomiędzy jakością instytucjonalną a poziomem napływu zagranicznych inwestycji bezpośrednich (ZIB). Opracowanie ma następującą strukturę. Po pierwsze, dokonaliśmy przeglądu badań poświęconych związkom między jakością instytucjonalną a atrakcyjnością inwestycyjną. Następnie omówiliśmy napływ ZIB do krajów UE i wybraliśmy zmienne diagnostyczne, które posłużyły za podstawę do dalszej analizy. W tym celu posłużyliśmy się miernikami Globalnego Indeksu Konkurencyjności. W kolejnym etapie wykorzystując rankingi i metody statystyczne podzieliliśmy państwa członkowskie UE na grupy o zbliżonym poziomie jakości instytucjonalnej. Następnie zbadaliśmy zależności między podobnymi do siebie grupami krajów oraz grupami państw uszeregowanych według wartości napływu ZIB jako % PKB.

Badanie wykazało, że państwa członkowskie UE różnią się wyraźnie pod względem jakości instytucjonalnej. Wyniki analiz statystycznych dały podstawę do pozytywnej weryfikacji hipotezy o pozytywnym związku między poziomem jakości instytucjonalnej a atrakcyjnością inwestycyjną.

Słowa kluczowe: ZIB, instytucje, jakość instytucjonalna, hierarchiczna analiza skupień, państwa członkowskie Unii Europejskiej

Appendix

Table A1. Descriptions and names institutional quality indicators

Name of variable	Description	Scale
Business costs of organized crime	Response to the survey question "In your country, to what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on businesses?"	[1 = to a great extent, imposes huge costs; 7 = not at all, imposes no costs]
Homicide rate	Number of intentional homicides.	per 100,000 population
Terrorism incidence	Assesses the frequency and severity of terror attacks.	The scale ranges from 0 (highest incidence) to 100 (no incidence)
Reliability of police services	Response to the survey question "In your country, to what extent can police services be relied upon to enforce law and order?"	[1 = not at all; 7 = to a great extent]
Social capital	Score on the Social Capital pillar of the Legatum Prosperity Index™, which assesses social cohesion and engagement, community and family networks, and political participation and institutional trust.	The scale ranges from 0 (low) to 100 (high)
Budget transparency	Assesses the amount and timeliness of budget information that governments make publicly available.	The scale ranges from 0 (low) to 100 (best)
Judicial independence	Response to the survey question "In your country, how independent is the judicial system from influences of the government, individuals, or companies?"	[1 = not independent at all; 7 = entirely independent]
Efficiency of legal framework in challenging regulations	Response to the survey question "In your country, how easy is it for private businesses to challenge government actions and/or regulations through the legal system?"	[1 = extremely difficult; 7 = extremely easy]
Freedom of the press	Score on the World Press Freedom Index, which measures the level of freedom available to journalists.	The scale ranges from 0 (good) to 100 (very bad)
Burden of government regulation	Response to the survey question "In your country, how burdensome is it for companies to comply with public administration's requirements (e.g., permits, regulations, reporting)?"	[1 = extremely burdensome; 7 = not burdensome at all]
Efficiency of legal framework in settling disputes	Response to the survey question "In your country, how efficient are the legal and judicial systems for companies in settling disputes?"	[1 = extremely inefficient; 7 = extremely efficient]
E-Participation	Score on the E-Participation Index, which assesses the use of online services to facilitate the provision of information by governments to citizens.	The scale ranges from 0 to 1 (best)

Name of variable	Description	Scale
Future orientation of government	Average of the responses to the following four Executive Opinion Survey questions: 1) "In your country, how fast is the legal framework of your country in adapting to digital business models (e.g., e-commerce, sharing economy, fintech, etc.)?"; 2) "In your country, to what extent does the government ensure a stable policy environment for doing business?"; 3) "In your country, to what extent does the government respond effectively to change (e.g., technological changes, societal and demographic trends, security and economic challenges)?"; and 4) "In your country, to what extent does the government have a long-term vision in place?".	[1 = not fast at all; 7 = very fast] For the last three questions, the answer ranges from 1 (not at all) to 7 (to a great extent).
Incidence of corruption	Score on the Corruption Perceptions Index, which measures perceptions of corruption in the public sector. This is a composite indicator.	The scale ranges from 0 (highly corrupt) to 100 (very clean)
Property rights	Response to the survey question "In your country, to what extent are property rights, including financial assets, protected?"	[1 = not at all; 7 = to a great extent]
Intellectual property protection	Response to the survey question "In your country, to what extent is intellectual property protected?"	[1 = not at all; 7 = to a great extent]
Quality of land administration	Score on the quality of land administration index, which assesses the reliability of infrastructure, transparency of information, geographic coverage, land dispute resolution, and equal access to property rights.	The scale ranges from 0 to 30 (best)
Strength of auditing and reporting standards	Response to the survey question "In your country, how strong are financial auditing and reporting standards?"	[1 = extremely weak; 7 = extremely strong]
Conflict of interest regulation	Score on the extent of conflict of interest regulation index, which measures the protection of shareholders against directors' misuse of corporate assets for personal gain.	The scale ranges from 0 to 10 (best)
Shareholder governance	Score on the extent of shareholder governance index, which measures shareholders' rights in corporate governance.	The scale ranges from 0 to 10 (best)

Source: own elaboration based on GCI.

Table A2. Mean value of institutional quality variables of the EU Member States in the years 2018–2019 by groups distinguished based on the dendrogram

Country Group (1–5)	Group 1	Group 2	Group 3	Group 4	Group 5
	Mean	Mean	Mean	Mean	Mean
Organized crime (1–7)	5.37	5.93	4.71	5.54	5.23
Homicides per 100,000 population	0.96	1.52	0.91	0.77	2.18
Terrorism incidence (0 = very high; 100 = no incidence)	97.48	97.69	91.09	99.65	99.93
Reliability of police services (1–7)	5.69	6.04	4.47	5.35	4.49
Social capital (0–100, high)	60.84	59.22	49.36	59.84	48.82
Open Budget Data score (0–100, best)	70.51	67.31	56.41	56.39	57.69
Judicial independence (1–7)	5.79	6.09	3.57	4.03	3.88
Efficiency of legal framework in challenging regulations (1–7)	4.51	4.72	2.54	3.16	2.72
World Press Freedom Index (0 = most free; 100 = least free)	86.40	85.31	73.15	77.54	78.41
Burden of government regulation (1–7)	3.88	4.03	2.59	3.06	2.96
Efficiency of legal framework to settle disputes (1–7)	5.10	4.90	2.50	3.44	3.21
E-Participation Index (0–1, best)	0.88	0.85	0.82	0.85	0.66
Future orientation of government (1–7)	4.61	4.62	2.87	3.81	3.24
Corruption Perception Index (0 = highly corrupt; 100 = very clean)	80.00	78.17	52.17	58.00	53.07
Property rights (1–7)	5.81	6.02	4.01	4.71	4.35
Intellectual property protection (1–7)	5.83	6.02	4.14	4.73	4.47
Quality of land administration index (0–30, best)	24.92	24.58	18.83	19.50	24.00
Strength of auditing and accounting standards (1–7)	5.89	5.86	4.30	5.08	4.86
Extent of conflict of interest regulation (0–10, best)	5.68	6.67	5.90	6.43	5.53
Extent of shareholder governance (0–10, best)	7.23	5.68	6.82	7.03	6.24

Source: own elaboration (calculations were made in PS IMAGO).

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The Development and Transformation of the Bank Card Market as an Imperative for Digitalization: the Case of Central and Eastern European Countries

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Abstract

The purpose of this study is to determine the development trends of the major determinants of the bank card market in eight countries of Central and Eastern Europe in the period from 2010 to 2019. Continuing a study carried out in 2018, further comparative analysis of the "Bank Cards Market Index" proposed earlier and based on a system of interrelated indicators of bank payment cards, ATMs and POS-terminals, was carried out. We provide an overview of the rankings of Ukraine, Belarus, Moldova, Russia, Romania, Poland, Hungary, Slovakia using international ranking systems such as "The Legatum Prosperity Index," "Doing Business," "The Index of Economic Freedom," and the "Bank Cards Market Index." Further studies of three international ranking systems, as well as the "Bank Cards Market Index," again confirmed the similarity of the development models of the bank card market in Poland and Ukraine. To study the impact of the digitalization of economics and Covid–19 on the bank card market, a deeper analysis of two cases (Poland and Ukraine, as two similar bank card markets) was carried out using the "Digital Evolution Index." In the course of the research, it was

concluded that the "Bank Cards Market Index" can be successfully used for further research of the banking sector of different countries. Also, the growth trend of cashless payments in the bank card market and the possible transformation of the market under the influence of Covid–19, and the global digitalization of economics were noticed. Taking into account the above trend, further studies of the system of interrelated indicators of bank payment cards, ATMs, and POS terminals should be carried out using the "Digital Evolution Index" or other international indexes that characterize the level of digitalization of the economy in the researched countries.

Keywords: bank, Poland, Ukraine, bank cards, indicators, ranking of countries, index, digital economy, digitalization

JEL: G15, G21, O12

Introduction

The ranking of Central and Eastern European Countries (CEECs) to assess the development of the banking sector is one of the topics discussed in the academic literature. The bank cards market of former socialist states, including Ukraine, Russia, Belarus, and Moldova, and European Union members (Romania, Poland, Hungary, Slovakia) is diverse. This diversity can be considered an opportunity for cooperation between CEECs to implement the best practices in different banking sectors, which is reflected in the constantly increasing interest in this phenomenon from management scholars.

Klement et al. (2016, pp. 115–126) estimated the economic and business rank of Slovakia, including an analysis of the position of some European Union countries. They also gave specific recommendations for focusing on the position of Slovakia among its closest competitor regions (i.e., the neighboring V4 countries of Poland, Hungary, and the Czech Republic).

Following this line of investigation, Ramskyi et al. (2017, pp. 163–174) analyzed the relationship between banking system transformation and the effective development of the Ukrainian economy. They determined that Ukraine's integration into the European Union was a way to strengthen the business environment. Based on evidence from Russian firms on the German market and ways to solve them, Panibratov et al. (2018, pp. 106–122) described the problems of entry modes and the liability of the effects of foreignness. They expressed the idea that exporters and investors experience significant negative effects from the lack of proper institutional and business knowledge of the host financial market.

In the paper about the bank cards market, Sobolieva-Tereshchenko (2018, pp. 25–44) provided a comparative analysis and investigated the determinants of the estimate for Ukraine and its neighboring countries in Central and Eastern Europe. Additionally, specific recommendations for improving the position of Ukraine in the bank cards market were given, using Poland's experience.

The results of practical research of the development of the bank card market and payment card industry can be found in the papers of Russian authors, including Fe-

dorova, Dorozhkina, Cherkashnev (2016, pp. 58–63) and Khetagurov (2018, pp. 16–24), among others. Meanwhile, a detailed study of the methodological and technological development of the payment card industry can be found in the works of foreign scholars, with the most significant results presented by Van and Linh (2019, pp. 7–16) and Świecka, Terefenko, and Paprotny (2020, pp. 5–13)

This study offers insights into the best European practice and the challenges of the bank cards market between 2009 and 2019. It will guide the strategic and investigation reasoning by identifying the key trends and innovative solutions that allowed some participants of the European bank cards market to be included in the ranking of countries.

The study is structured as follows: first, we provide an overview of existing international methods such as "The Legatum Prosperity Index 2019," "BDO International Business Compass 2019," and "The Index of Economic Freedom 2019," emphasizing the context of markets in neighboring countries such as Belarus, Hungary, Moldova, Poland, Romania, Russia, Slovakia and Ukraine. After that, we present the results of an empirical analysis of the bank cards market. Then, we introduce the research settings, explain the rank method chosen, and make conclusions, followed by a definition of the Bank Cards Market index (BCM Index) and a further ranking of Ukraine and researched countries. Afterwards, we conduct a comparative analysis of two cases (Poland and Ukraine) as two similar bank cards markets. Using this index method, we make conclusion about deepening the cooperation between Ukraine and Poland in the framework of Euro-integration that could contribute to an increase in the development of the bank cards market developing of both countries.

Data, variables and methods

Small and medium enterprises enter the foreign market and face negative effects because of the lack of business knowledge about the operation of digital financial and credit instruments such as bank payment cards. Information on an accessible network of cash withdrawal points and non-cash payment points is very important for organizing work with buyers and suppliers.

Accordingly, it is necessary to study the bank cards market in neighboring countries to understand the potential for the development and digitalization of SME businesses. The purpose of the research is to make a comparative analysis of the bank cards market of Ukraine and neighboring countries to determine the connection between the influence of credit-financial instruments on stimulating business development, digitalization, and the digital transformation.

This study is based on two data sets from 2010 to 2019. The first shows information from the Legatum Prosperity Index, Doing Business, and Economic Freedom Index surveys in Central and Eastern Europe, such as Hungary, Poland, Romania, Slovakia, Belarus, Russia, Moldova and Ukraine.

The second data set is information from the website of the European Central Bank and websites of the central banks of those countries. We used three indicators to make

our own calculations based on data from the banks of these countries. These indicators include information about bank cards, ATM and POS-terminals. Studying the two data sets together, we can obtain a data set to understand the possibility of the bank cards business development in each analyzed country.

The Legatum Prosperity Index™ provides the performance of 167 nations across 65 policy-focused elements, measured by almost 300 country-level indicators. The "Legatum Prosperity Index survey makes the indexes a unique global benchmarking tool for determining a country's economic potential.

The Economic Quality pillar measures how well a state's economy is equipped to generate wealth sustainably and with the full engagement of its workforce. The comparative analysis of the Rank of Economic Quality in CEECs over the ten years is presented in Table 1.

Table 1. Legatum Prosperity Index for CEECs, 2010–2019

Country	LP Country Economic Quality									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belarus	42	54	47	40	41	47	48	42	40	54
Hungary	57	56	59	60	59	54	53	57	44	31
Moldova	96	91	91	86	79	84	84	90	90	101
Poland	36	36	39	41	37	37	37	34	38	39
Romania	63	64	68	84	75	71	71	60	60	40
Russia	77	73	70	72	60	66	66	70	63	43
Slovakia	38	44	48	49	50	50	50	49	37	27
Ukraine	76	76	87	77	77	88	88	84	97	91

Source: Legatum Prosperity Index (2020).

According to the data in the table, between 2010 and 2019, Moldova and Ukraine had the lowest Economic Quality ranking. The highest ranked country was Slovakia.

At the same time, for the majority of countries, 2015–2016 was the most stable period, according to the parameters of Legatum Prosperity Index, while the most non-stable period was the last two years. Between 2018 and 2019, the most volatile countries were Romania (–20) and Russia (–20). The most stable country was Poland (+1).

The most well-known and popular methodology for assessing the establishment and support of business is "Doing Business," conducted by an international network of public accounting, tax, consulting and business advisory firms which perform professional services among 190 countries across all continents.

"Doing Business" is an annual report that studies the regulations that improve doing business and those that constrain it. It presents quantitative indicators on business regulation and the protection of property rights, which can be compared across 190 economies. It measures aspects of regulation that affect 11 areas of the life of a business, and the indicators are used to analyze economic outcomes and identify the results of business reforms.

Thus, the best conditions for business development in 2019 according to the "Doing Business" Index Rank were in Russia (31st place), Poland (33rd) and Belarus (37th), which can be a benchmark for Ukraine (71 Rank) on determination of the potential of business development. Table 2 shows the attractiveness of Ukraine and other CEECs in 2010–2019 according to the "Doing Business" Rank.

Table 2. "Doing Business" Index for CEECs, 2010–2019

Country	Doing Business									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belarus	58	91	69	58	63	57	44	37	38	37
Hungary	47	46	51	54	54	54	42	41	48	53
Moldova	94	99	81	83	78	63	52	44	44	47
Poland	72	59	62	55	45	32	25	24	27	33
Romania	55	65	72	72	73	48	37	36	45	52
Russia	120	124	120	112	92	62	51	40	35	31
Slovakia	53	43	48	46	49	37	29	33	39	42
Ukraine	142	149	152	137	112	96	83	80	76	71

Source: World Bank Group (2018; 2019).

As the table shows, in this period, the analyzed countries increased their rankings, with the exception of Hungary (+6), which had the most negative dynamic. The most volatile countries were Russia (–89) and Ukraine (–71). Ukraine has a very good positive dynamic; over ten years, the country improved its "Doing Business" rank from 142nd in 2010 to 71st in 2019.

The "Index of Economic Freedom" methodology for assessing and supporting business conducted among 180 countries in the World is also popular. It uses 12 indicators to calculate the world rank for every country the index. The 12 indicators that make up the economic freedom score are equally weighted in determining the rankings. Table 3 presents the Index of Economic Freedom results for the period 2010–2019.

Table 3. Index of Economic Freedom for CEECs, 2010–2019

Country	EF Economic Freedom									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belarus	48.7	47.9	49.0	48.0	50.1	49.8	48.8	58.6	58.1	57.9
Hungary	66.1	66.6	67.1	67.3	67.0	66.8	66.0	65.8	66.7	65.0
Moldova	53.7	55.7	54.4	55.5	57.3	57.5	57.4	58.0	58.4	59.1
Poland	63.2	64.1	64.2	66.0	67.0	68.6	69.3	68.3	68.5	67.8
Romania	64.2	64.7	64.4	65.1	65.5	66.6	65.6	69.7	69.4	68.6
Russia	50.3	50.5	50.5	51.1	51.9	52.1	50.6	57.1	58.2	58.9
Slovakia	69.7	69.5	67.0	68.7	66.4	67.2	66.6	65.7	65.3	65.0
Ukraine	46.4	45.8	46.1	46.3	49.3	46.9	46.8	48.1	51.9	52.3

Source: Miller, Kim, and Roberts (2019).

According to Table 3, Ukraine had the worst Economic Freedom Rank among the analyzed countries every year during the ten years. This indicator varied from 46.4 in 2010 to 52.3 in 2019. At the same time, the Economic Freedom Rank was highest in Romania (64.2 in 2010 and 68.6 in 2019) and Poland (63.2 in 2010 and 67.8 in 2019).

So, a comparative analysis of the economic and business conditions in CEECs to determine the potential for business development shows that such ratings as "The Legatum Prosperity Index," "Doing Business," and "The Index of Economic Freedom" don't allow us to fully define the potential economic development of the bank cards market.

Empirical results and discussions

Every bank cards market in Central and Eastern Europe has different conditions. First of all, countries need to adapt to the modern business environment for their economic development and investment attractiveness. It is very important for them to understand their place among other competing countries, which can be done based on ranking data. Secondly, foreign companies that do business in other countries have a number of advantages. They can use information about the cards' business environment and high-quality supporting infrastructure combined with a convenient geographic location, which can also be done based on ranking data. Third, the level of distribution of non-cash payments using payment cards is one of the indicators of the development of the global system of cashless payments and the banking system in general.

Thus, two main criteria were identified to assess the key indicators of the bank card market: the existence of cards and the availability of support devices for cash withdrawals and card payments. The first is focused mainly on the issue of bank cards, and the second on the expansion of the number of POS-terminals and ATM networks.

The study was conducted in CEECs: Romania, Moldova, Hungary, Slovakia, Poland, Belarus, and Russia. The countries were ranked in alphabetical order for the analysis. A comparative analysis of the key indicators of the bank cards market among the analyzed countries over the ten years is presented in Table 4.

A comparison of the population of Ukraine and the analyzed countries showed that Poland is the closest indicator for Ukraine. All countries, except for Russia, have significantly smaller populations compared to Ukraine. Over the ten years, the population increased in Russia but decreased in Hungary, Romania, and Ukraine. The population of the other analyzed countries was relatively stable throughout the period.

Ukraine ranks third after Russia and Poland by the number of bank cards. The number of bank cards in Russia (285.8 ml. pcs) significantly exceeds the indicators of all analyzed countries. The number of bank cards in Ukraine (42.2 ml. pcs) is slightly less than in Poland (42.9 ml. pcs)

Table 4. Indicators of bank cards market for CEECs, 2010–2019

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belarus										
Population, ml.	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Cards, ml.pcs.	9.2	9.9	10.4	11.8	12.3	12.3	12.7	13.9	15.0	15.5
ATM, th.pcs.	3.1	3.3	3.7	4.1	4.4	4.4	4.4	4.4	4.2	4.2
POS, th.pcs.	29.6	40.7	56.8	73.6	91.8	111.7	139.6	150.9	160.7	173.2
Hungary										
Population, ml.	10.0	10.0	9.9	9.9	9.9	9.8	9.8	9.8	9.8	9.8
Cards, ml.pcs.	8.9	8.9	8.9	9.0	8.9	9.0	9.0	9.1	9.4	9.4
ATM, th.pcs.	4.8	4.9	4.8	4.8	4.9	4.8	5.0	5.1	5.1	5.1
POS, th.pcs.	66.6	73.7	84.7	90.8	104.9	111.7	121.1	147.5	155.5	157.8
Moldova										
Population, ml.	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.5	3.5
Cards, ml.pcs.	0.8	0.9	1.0	1.2	1.3	1.3	1.5	1.7	1.9	2.0
ATM, th.pcs.	0.8	0.9	0.9	1.0	1.1	1.0	1.0	1.1	1.1	1.1
POS, th.pcs.	7.3	8.0	9.4	10.5	11.5	12.0	15.1	16.6	18.2	20.5
Poland										
Population, ml.	38.5	38.5	38.5	38.5	38.5	38.5	38.4	38.4	38.4	38.4
Cards, ml.pcs.	32.0	32.0	33.3	34.7	36.1	35.2	36.9	39.1	41.2	42.9
ATM, th.pcs.	16.4	17.4	18.2	18.9	20.5	22.1	23.4	23.2	22.9	22.7
POS, th.pcs.	246.5	266.4	289.5	326.3	398.2	463.4	536.2	624.4	786.8	906.6
Romania										
Population, ml.	20.2	20.1	20.1	20.0	19.9	19.8	19.7	19.7	19.5	19.4
Cards, ml.pcs.	12.8	13.3	13.7	14.1	14.5	15.0	16.0	16.4	17.4	18.2
ATM, th.pcs.	10.4	11.0	11.0	10.8	11.5	11.5	11.1	11.1	10.6	10.5
POS, th.pcs.	114.0	124.9	126.3	128.0	130.5	144.4	161.9	193.9	204.4	229.5

Table 4. (continued)

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Russia										
Population, ml.	142.8	143.0	143.2	143.5	143.8	146.4	146.7	146.5	146.9	146.8
Cards, ml.pcs.	144.4	200.2	239.5	248.6	278.5	286.2	315.3	268.5	272.6	285.8
ATM, th.pcs.	116.2	141.9	171.9	188.8	222.8	206.9	201.4	206.3	201.0	202.6
POS, th.pcs.	434.5	528.5	718.0	965.5	1288.7	1489.8	1778.0	2189.1	2588.8	2913.0
Slovakia										
Population, ml.	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.5
Cards, ml.pcs.	5.0	5.3	4.6	4.8	5.0	5.3	5.5	5.2	5.2	5.3
ATM, th.pcs.	2.3	2.4	2.5	2.6	2.7	2.7	2.8	2.7	2.8	2.8
POS, th.pcs.	37.5	38.0	37.5	41.0	46.8	49.6	42.2	49.2	45.3	57.8
Ukraine										
Population, ml.	45.8	45.6	45.5	45.4	45.2	42.8	42.6	42.4	42.2	41.9
Cards, ml.pcs.	29.4	34.9	33.1	35.6	33.0	30.8	32.4	34.9	36.9	42.2
ATM, th.pcs.	30.2	33.0	36.2	40.4	36.6	33.3	33.8	37.0	36.6	35.9
POS, th.pcs.	108.1	123.5	162.7	221.2	203.8	194.5	219.2	251.7	279.0	333.8

Source: own calculations based on data from Banks of analyzed countries: Statistical Data Warehouse (n.d.); Verisk Financial (n.d.); Bank of the Russia (n.d.); The Magyar Nemezeti Bank (n.d.); The National Bank of the Republic of Belarus (n.d.); Narodowy Bank Polski (n.d.); National Bank of Moldova (n.d.); Banca Națională a României (n.d.); Národná Banka Slovenska (n.d.); Slovak Banking Association (2021); National Bank of Ukraine (n.d.), *Cashless Payments*.

According to 2019 data, the number of bank cards is greater than the population in these three countries. The number of bank cards in Ukraine and Poland exceeds the population insignificantly. In Russia, there are two times more bank cards than people. Obviously, every adult in this country has two or three cards. On the one hand, these cards have different specific functions, and on the other, the second and third cards are used rarely.

Comparing the number of ATM network and POS-terminals showed that the Moldova has the fewest while Russia has the most. Ukraine ranks second after Russia by number of ATMs and third after Russia and Poland by number of POS-terminals.

The number of POS-terminals and ATMs increased in all analyzed countries between 2010 and 2019, but terminal growth rates were much higher than the ATM growth rate. During the last ten years, the number of POS-terminals in Belarus and Russia has increased almost six-fold, and in Ukraine and Poland, it has more than tripled. Meanwhile, the number of ATMs increased by 26% in Belarus, 43% in Russia, 16% in Ukraine, and 28% in Poland.

So, it seems that Ukraine has a developed ATM network and large number of POS-terminals among CEECs. The situation with key indicators of the bank cards market in Ukraine is similar to Poland. However, these absolute figures do not reflect the real conditions of the bank cards market. For the comparative analysis of the real conditions on the bank cards market, the estimation of the relative indicators is necessary. The best indicators are capacity and efficiency indicators.

Methodology

The European Central Bank (ECB) publishes the payments statistics in EU countries annually. This data set comprises a number of card and payment card accepting devices. However, this statistic does not contain a common indicator of the bank cards market or a ranking of EU countries. Additionally, this data set does not include information about non-EU countries.

Thereby, to understand the potential development of the bank cards market in CEECs, our investigation of the country ranking will be continued (Sobolieva-Tereshchenko 2018, pp. 25–44). The ECB data set and information from the sites of the National Bank of Ukraine and the central banks of countries were collected for comparative economic research.

Every country in Central and Eastern Europe has its own population, total number of bank cards, and payment card accepting devices. There indicators do not show the real conditions of the bank cards market, the best of which are the relative indicators.

The best criterion of card availability is the number of payment cards per capita, which is defined as the indices of the number of payment cards to the population of every country. The optimal criteria of ATM network are the number of cards per ATM, which is defined as the indices of the number of cards to the number of ATMs

in the country. The best criteria of the number of POS-terminals is the number of cards per POS-terminal, which is defined as the indices of the number of cards to the number of POS-terminals in each country. The comparative analysis of the bank cards market in countries is presented in Table 5.

The comparative analysis of the number of bank cards per capita in 2019 shows that this indicator in Ukraine is lower than in Russia, Belarus, and Poland, but higher than in other countries.

Between 2010 and 2019, the number of cards per capita gradually increased. In general, the increase in the number of bank cards was due to two reasons. Firstly, the number of POS-terminals where you can pay by card increased. Secondly, contactless and tokenized cards were actively issued as additional cards to the classic bank (plastic) cards.

A comparison of the ATM networks showed that Belarus had the largest number of cards per ATM while Ukraine had the fewest. CEECs and Ukraine had approximately the same number of cards, although the number of cardholders using ATMs in CEECs was more than in Ukraine. This indicates the excessive number of ATMs in Ukraine in comparison with CEECs.

Most countries increased the number of cards per ATM during last ten years. Only in Hungary, Slovakia, and Poland did the number of cards per ATM decrease in that period. Thus, Ukraine has the potential to reduce the ATM network, taking into account the average number of people per ATM in CEECs (1850 cards per ATM in 2019). The increased number of cards per ATM will contribute to a decrease in cash turnover and an intensification of the fight against the shadow economy.

In order to extend cashless settlements, countries increase the total number of terminals, reducing the number of cards per terminal. Among CEECs in 2019, Ukraine had the largest number of cards per POS-terminal, (130 cards per POS).

In the period from 2010 to 2019, in all analyzed countries, there was a decrease in the number of bank cards per POS terminal. The number of cards per POS terminal in Ukraine has decreased more than halved over the past ten years – from 270 pcs in 2010 to 130 pcs in 2019.

In 2019, in some European countries (for example, Hungary (0.06), Poland (0.05)) this indicator was much lower, but in others (for example, Belarus (0.09), Moldova (0.10), Slovakia (0.09) and Russia (0.10)) it reflected the average level in CEECs bank card market.

CEECs are helping to develop payment infrastructure as part of Europe's broader efforts to promote cashless payments. Increasing the number of cashless payments makes payments more transparent and fosters economic growth in EU countries. Therefore, Ukraine has the opportunity to increase the number of POS-terminals to extend cashless settlements and withdraw its economy from the shadow. Focusing on the CEECs, it should be noted that the best indicators of using the POS-terminals for payment card transactions is in Hungary and Poland.

Table 5. Comparative analysis of the bank cards market for CEECs, 2010–2019

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belarus										
Cards per capita	0.97	1.04	1.10	1.25	1.30	1.30	1.34	1.46	1.58	1.64
Cards th. per ATM	3.02	2.97	2.82	2.89	2.83	2.80	2.89	3.15	3.53	3.62
Cards th. per POS	0.31	0.24	0.18	0.16	0.13	0.11	0.09	0.09	0.09	0.09
Hungary										
Cards per capita	0.89	0.90	0.90	0.91	0.90	0.91	0.91	0.93	0.96	0.96
Cards th. per ATM	1.85	1.82	1.87	1.86	1.82	1.86	1.79	1.79	1.85	1.84
Cards th. per POS	0.13	0.12	0.11	0.10	0.08	0.08	0.07	0.06	0.06	0.06
Moldova										
Cards per capita	0.23	0.26	0.28	0.32	0.37	0.36	0.43	0.49	0.55	0.57
Cards th. per ATM	1.07	1.07	1.09	1.15	1.20	1.33	1.45	1.58	1.70	1.77
Cards th. per POS	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.11	0.10
Poland										
Cards per capita	0.83	0.83	0.86	0.90	0.94	0.92	0.96	1.02	1.07	1.12
Cards th. per ATM	1.95	1.84	1.83	1.84	1.76	1.59	1.57	1.68	1.80	1.89
Cards th. per POS	0.13	0.12	0.11	0.11	0.09	0.08	0.07	0.06	0.05	0.05
Romania										
Cards per capita	0.63	0.66	0.68	0.71	0.73	0.75	0.81	0.84	0.89	0.94
Cards th. per ATM	1.24	1.21	1.25	1.31	1.26	1.30	1.43	1.48	1.64	1.73
Cards th. per POS	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.08	0.09	0.08
Russia										
Cards per capita	1.01	1.40	1.67	1.73	1.94	1.95	2.15	1.83	1.86	1.95
Cards th. per ATM	1.24	1.41	1.39	1.32	1.25	1.38	1.57	1.30	1.36	1.41
Cards th. per POS	0.33	0.38	0.33	0.26	0.22	0.19	0.18	0.12	0.11	0.10

Table 5. (continued)

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Slovakia										
Cards per capita	0.92	0.99	0.85	0.88	0.93	0.98	1.01	0.95	0.96	0.98
Cards th. per ATM	2.10	2.22	1.83	1.85	1.86	1.94	1.99	1.90	1.88	1.92
Cards th. per POS	0.13	0.14	0.12	0.12	0.11	0.11	0.13	0.11	0.12	0.09
Ukraine										
Cards per capita	0.64	0.76	0.73	0.79	0.73	0.72	0.76	0.82	0.88	1.01
Cards th. per ATM	0.97	1.06	0.92	0.88	0.90	0.93	0.96	0.94	1.01	1.17
Cards th. per POS	0.27	0.28	0.20	0.16	0.16	0.16	0.15	0.14	0.13	0.13

Source: own calculations based on data from Banks of analyzed countries.

Thus, it is recommended to use three criteria for a comparative analysis of the bank cards market to determine the potential for the innovative development of economy in CEECs, i.e., card availability, size of the ATM network, and the number of POS-terminals.

To determine the level of development and transformation of the bank card market as an imperative for digitalization, we propose calculating the Bank Cards Market index (BCM index) in addition to "The Legatum Prosperity Index," "BDO International Business Compass," and "The Index of Economic Freedom".

In the BCM Index, the three components are weighted equally so that the overall score is not biased toward any one component or direction. The purpose of the index is to reflect the bank cards market in every country in a balanced way. The data for each component are provided so that others can study, weight, and integrate them for future investigations.

Data analysis

The comparative analysis of the BCM Index and the obtained ranking of CEECs will greatly foster the cooperation between EC countries, and the development and stability of the banking system. This cooperation will result in accessible online services of European standards that open new possibilities for countries in Central and Eastern Europe and their cardholders.

The goal of the BCM Index is simple: by illustrating how countries have moved toward or away from the number of cards, ATMs, and POS-terminals, we want to help to identify the best pathways of the bank cards market. To achieve this goal, the BCM Index describes the conditions required for development. We describe these conditions as the combination of three variables: the Number of cards per capita, the Number of cards per ATM, and the Number of cards per POS-terminal. Using data for the eight countries over twelve years, we track the journeys made by countries toward or away from the development of the bank cards market.

Each of the three variables has the same significant effect on the state of the payment market. It should be noted that when comparing countries and determining the rating, it is necessary to take into account certain features of each variable of the bank cards market. The highest number of cards per capita and the largest number of cards per ATM is a positive factor, and corresponds to the highest rating. Meanwhile, the highest number of cards per POS-terminal indicates a lack of equipment, and is a negative factor and corresponds to the lowest rating.

Each variable was assigned equal weight because each ranking covers a limited set of variables, which have equal importance. The mean of the three variables yields a country's overall BCM Index score. This scheme allows us to express our views of what is significant to the development of the economy, while also keeping it within the range of evidence available in countries' central banks and from expert opinions.

The total IBCM Index was calculated as the average of the three indicators to determine the state of the Ukrainian bank cards market and compare it with market in CEECs. A comparative analysis of BCM Index based on the variables mentioned above is presented in Table 6.

Table 6. Comparative analysis of the BCM Index for CEECs, 2010–2019

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belarus	3.3	3.0	3.0	3.0	3.0	2.7	2.0	2.3	2.3	2.7
Hungary	4.0	4.0	2.0	2.3	3.0	3.3	3.3	3.0	3.3	4.0
Moldova	5.3	5.7	5.7	6.3	6.3	6.7	6.3	6.3	6.0	6.3
Poland	3.7	3.7	4.3	3.7	3.3	3.0	3.3	3.3	2.7	2.3
Romania	4.7	4.7	5.3	5.0	5.0	5.3	5.7	5.0	5.0	5.3
Russia	5.0	4.7	4.7	4.7	5.0	4.7	4.3	5.0	4.7	5.0
Slovakia	3.3	3.3	4.0	4.0	3.3	3.0	3.7	3.3	4.3	3.7
Ukraine	6.7	7.0	7.0	7.0	7.0	7.3	7.3	7.7	7.7	6.7

Source: own calculations based on data from the central banks of the analyzed countries.

According to the data in the table, taking into account the three proposed criteria, Ukraine was ranked last in the rating during the whole period. Poland came first in 2019, improving its rating from 3.7 to 2.3 between 2010 and 2019. Thus, Ukraine has the potential for development and improvement in comparison with Poland.

We have chosen to focus on the BCM Index in light of the evidence that its development has a positive effect on wellbeing and economic growth in CEECs. This is supported by "The Legatum Prosperity Index," "Doing Business," "The Index of Economic Freedom".

Combining the two data sets together, we created a unique panel dataset from the "The Legatum Prosperity Index," "Doing Business," and "The Index of Economic Freedom" surveys and data from the websites of the central banks of the countries. The data set in 2010, 2014, and 2019 is presented in Table 7.

Table 7. Comparative analysis for the main rank variables for CEECs, 2010–2019

Country	BCM Index proposed by the author			LP Country Economic Rank			Doing Business			EF Economic Freedom		
	2010	2014	2019	2010	2014	2019	2010	2014	2019	2010	2014	2019
Belarus	3.3	3.0	2.7	42	41	54	58	63	37	48.7	50.1	57.9
Hungary	4.0	3.0	4.0	57	59	31	47	54	53	66.1	67.0	65.0
Moldova	5.3	6.3	6.3	96	79	101	94	78	47	53.7	57.3	59.1
Poland	3.7	3.3	2.3	36	37	39	72	45	33	63.2	67.0	67.8
Romania	4.7	5.0	5.3	63	75	40	55	73	52	64.2	65.5	68.6
Russia	5.0	5.0	5.0	77	60	43	120	92	31	50.3	51.9	58.9
Slovakia	3.3	3.3	3.7	38	50	27	53	49	42	69.7	66.4	65.0
Ukraine	6.7	7.0	6.7	76	77	91	142	112	71	46.4	49.3	52.3

Source: own calculations based on data from Tables 1, 2, 3, and 6.

As the table shows, Belarus, Poland and Slovakia have a BCM Index better than other countries between 2010 and 2019. At the same time, according to Economic Rank of "The Legatum Prosperity Index," Belarus, Poland and Slovakia take leading positions. According to the "Doing Business" rank, Hungary, Poland and Slovakia have the best positions. According to the rank of Financial Freedom from "The Index of Economic Freedom," Belarus, Russia, and Ukraine have good conditions for investment.

So, during the last ten years, Poland and Slovakia had the best positions according to the estimate of "The Legatum Prosperity Index," "Doing Business" and the BCM Index proposed by the author. The comparative analysis for "The Legatum Prosperity Index," "Doing Business," "The Index of Economic Freedom," and the "BCM Index" for Poland, Slovakia and Ukraine in 2010, 2014 and 2019 are represented in Figure 1.

The model is a visual representation of how the four indexes are interrelated in Slovakia, Poland and Ukraine. The model of Ukraine and Poland is similar. Thus, we conclude that deep cooperation between Ukraine and Poland in the framework of Euro-integration could help develop the bank cards market of both countries.

In 2020, the challenge of the Covid–19 pandemic and trend of digitalization put pressure on these indicators in many EC countries. European economies are among the most digitally inclusive (measuring gender, class, and geographic inclusion), and six European countries (Norway, Belgium, Switzerland, Austria, Iceland, and Poland) are included in the Digital Intelligence Index top 10. In CEECs, mobile internet access is expanding and has improved rapidly. Over 90% of the population in Poland are covered by 4G mobile networks now, while in Ukraine, 4G access has jumped from 2% to 75% since 2017.

To understand the level of Digitalization in Poland, Slovakia and Ukraine, we additionally studied the Digital Evolution Index (DEI). The DEI created by the Fletcher School at Tufts University (with the support of Mastercard and Data Cash) and combines more than 358 indicators in two scorecards, the Digital Evolution State and Digital Evolution Momentum. Digital Evolution captures the state and rate (momentum) of digital evolution and identifies implications for investment, innovation, and policy priorities. The Digital Evolution Scores of Poland, Slovakia, Ukraine in 2020 are represented in Figure 2.

The graph shows that Poland and Slovakia have a higher state index than Ukraine, while Ukraine has a faster-moving economy in terms of the pace of change in its digital evolution (digital momentum) than Slovakia. Thus, we conclude that the deepening cooperation between Ukraine and Poland in the framework of using the experience of digitalization of the economy can contribute to greater development of the bank cards market in both countries.

According to the National Bank of Poland's report about the payment card market in Poland in Q1 2020, the share of contactless transactions in the value of all card payments was record-breaking. At the end of March 2020, it reached 84.1 percent. The previous record, recorded in the last quarter of 2019, was 81.4 percent. In the first

quarter of 2020, there were 41.2 million different contact payment instruments on the market (plastic cards, virtual cards, stickers, etc.). More than 9 out of 10 card payments in Poland are contactless.

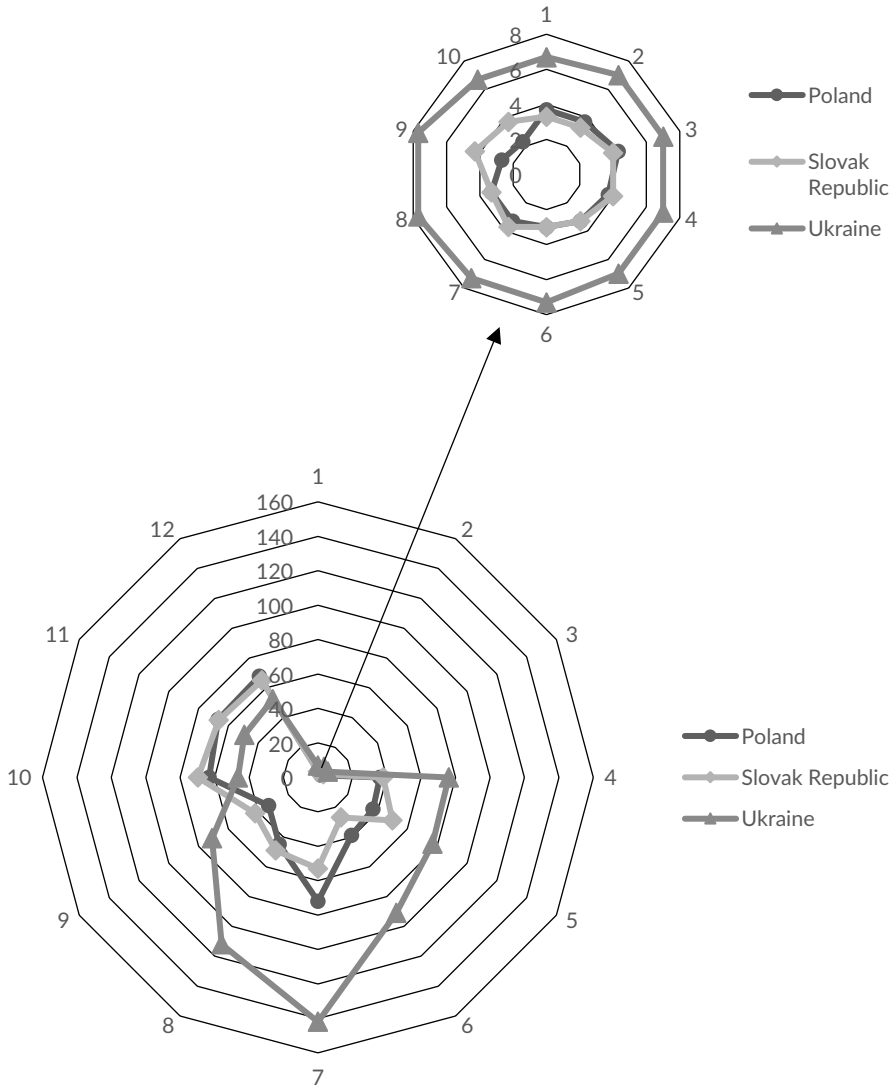

Figure 1. Criteria and indicators of the bank cards market for Poland, Slovakia and Ukraine
Source: own study.

So, the pandemic and quarantine restrictions accelerated the shift in households' payment habits towards cashless settlements, including online payments. Ukrainians are more actively switching to cashless payments and are using electronic commerce services increasingly often. At the same time, there has been a sustainable trend

in which contactless payment instruments and settlements involving their use are increasing in popularity. This trend has mainly resulted from an increase in the value and number of cashless transactions. Thus, the value of cashless transactions stood at UAH 1,550.1 billion, or 55.2% of the total value of all card transactions. In September 2019, it amounted at 49.7% (Undeniable Card Market Trends in 2020).

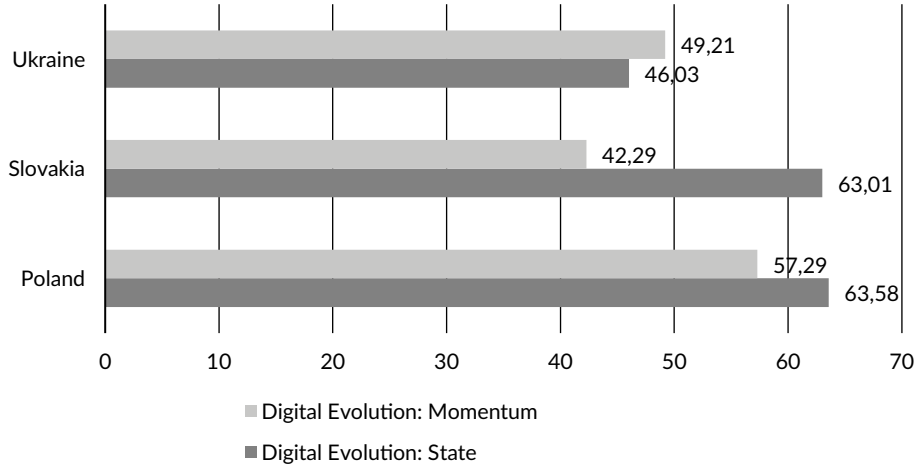

Figure 2. Digital Evolution Scores of Poland, Slovakia, Ukraine
Source: Chakravorti, Chaturvedi, Filipovic, Brewer (2020).

Thus, innovative payment technologies and the relevant infrastructure play a key role in the development of the cashless economy. Ukraine has tremendous potential in implementation of payment innovations in comparison with Poland.

This is why future research in these three variables of the bank cards market will be very important. They will help explain the reasons for success and failure, and identify the challenges that lie ahead in strengthening the bank cards market in CEECs.

The comparison of the bank cards market of Ukraine and Poland

The level of development of the bank cards market has an important place in the banking system's development. However, the level of the bank cards market is a particular concept, and it is obvious that there is no perfect indicator that characterizes it. In the phase of Euro-integration, Ukraine has faced difficult tasks such as implementing and complying with the Basel III regulations in Ukrainian banking system. During digitalization and the challenge of the COVID–19 pandemic, many countries faced the need to implement digital cards, develop contactless payments, and stabilize the banking system.

Ukraine and other countries urgently need solutions. The bank cards market is the most dynamic part of the banking sector. As bank cards combine elements of payment, deposit, credit, and currency-exchange functions, the bank cards market is a simplified model of the banking system.

Comparing the rankings of Ukraine and Poland shows that these countries' models are similar, although the countries are ranked differently according to "The Legatum Prosperity Index," "Doing Business," and "The Index of Economic Freedom". "The Legatum Prosperity Index" and "Doing Business" rank Poland highly, while Ukraine has a low rank. Ukraine has high level of "The Index of Economic Freedom" while for Poland it is low. Therefore, using the experience of Poland, Ukraine has significant potential for economic development, including the development of the bank cards market.

The dynamics of the bank cards market indicators in Ukraine and Poland showed that the variables of the number of cards, the development of the ATM network, and the number of POS-terminals complement each other. In recent years, the relationship between these indicators has become more meaningful. Table 8 represents the changes in the bank cards market indicators in Ukraine and Poland in the years 2010–2019.

Table 8. The dynamics of the bank cards market indicators in Ukraine and Poland, 2010–2019

Years	Population, thousands		Number of bank cards, thousands		ATMs.		POS-terminals	
	Ukraine	Poland	Ukraine	Poland	Ukraine	Poland	Ukraine	Poland
2010	45,783	38,530	29,405	31,984	30,163	16,413	108,140	246,510
2011	45,598	38,538	34,850	32,045	32,997	17,392	123,540	266,429
2012	45,453	38,533	33,106	33,291	36,152	18,188	162,724	289,547
2013	45,373	38,502	35,622	34,659	40,350	18,876	221,222	326,340
2014	45,246	38,484	33,042	36,069	36,596	20,531	203,810	398,172
2015	42,759	38,455	30,838	35,209	33,334	22,143	194,478	463,366
2016	42,591	38,427	32,389	36,874	33,783	23,443	219,241	536,236
2017	42,415	38,422	34,858	39,096	37,003	23,230	251,681	624,434
2018	42,153	38,413	36,949	41,237	36,585	22,885	278,993	786,845
2019	41,902	38,390	42,158	42,854	35,930	22,720	333,840	906,564

Source: data from National Bank of Ukraine (n.d.), *Statistics*; Narodowy Bank Polski (n.d.).

We can see improvements in both countries, although the situation in Poland is much better than in Ukraine. In both countries, the number of bank cards showed frequent fluctuations in indicators between 2010 and 2014, and annual growth between 2015 and 2019. Over the past 10 years, the number of ATMs has increased by 19%, from 30,163 to 35,930 in Ukraine, and in Poland by 38%, from 16,413 to 22,720. During this period, the number of POS terminals increased 3.1 times, from 108,140 to 333,840 in Ukraine, and in 3.7 times in Poland, from 246,510 to 906,564. Although the bank cards market in Ukraine, in particular, the number of POS-terminals, is developing and expanding, the growth rates are still low and insufficient in comparison with Poland.

At the same time, over the last 10 years the population has decreased in both countries: from 45.7 million to 41.9 million (–8.5%) in Ukraine, and from 38.5 million to 38.4 million (–0.5%) in Poland. The indexes proposed and calculated by the authors show that in Poland, the following components are higher compared to Ukraine: the Number of bank cards per capita (1.12) and the Number of cards per ATM (more than 1,880). The same indicators accounted for slightly more than 1,010 and 1,170 in Ukraine, respectively. In this case, a comparative analysis of the relative indicators of the bank cards market is more accurate than the absolute ones.

Table 9. Indices of the bank cards market in Ukraine and Poland, 2010–2019

Years	Cards per capita, pcs.		Cards per ATM.		Cards per POS-terminal.	
	Ukraine	Poland	Ukraine	Poland	Ukraine	Poland
2010	0.64	0.83	975	1949	272	130
2011	0.76	0.83	1056	1843	282	120
2012	0.73	0.86	916	1830	203	115
2013	0.79	0.90	883	1836	161	106
2014	0.73	0.94	903	1757	162	91
2015	0.72	0.92	925	1590	159	76
2016	0.76	0.96	958	1573	148	69
2017	0.82	1.02	942	1683	139	63
2018	0.88	1.07	1010	1802	132	52
2019	1.01	1.12	1173	1886	126	47

Source: own calculations based on data from the National Bank of Ukraine (n.d.), *Statistics*; Narodowy Bank Polski (n.d.).

Table 9 describes the main indexes of bank card market in Ukraine and Poland between 2010 and 2019. The Number of bank cards per POS terminal decreased (or the Number of POS terminals per thousand bank cards increased) in both countries. The Number of bank cards per capita in Ukraine increased from 0.64 to 1.01, meaning that cashless payments had an upward trend during the period. Regarding Poland, the number of bank cards per capita increased from 0.83 to 1.12. So, there was an expansion tendency for cashless payments in Poland, too.

The deepening cooperation between Ukraine and Poland in the framework of Euro-integration could contribute to the development of the bank cards market of both countries. However, it is not a short-term process. For some time, Ukraine has had to overcome many humanitarian (Covid–19, global warming), political (annexation of the Crimea, military operations in Donbas), and economic challenges (euro-integration, digitalization). All these factors will influence the development of the bank cards market in the near future.

Conclusion

The strategies for the development of the bank cards market in every country in Central and Eastern Europe has different directions. This is reflected in the ranking of countries on "The Legatum Prosperity Index," "Doing Business," "The Index of Economic Freedom," and the "BCM Index".

Therefore, it is suggested that countries use the recommended methodology for a rapid review of the bank cards market. Periodic upgrading and in-depth analysis of the "BCM Index" will ensure that the data is always relevant to reliably compare the risks and opportunities of the market. This methodology provides a solid foundation for decision-making about investments and innovations in financial and banking spheres.

Ukraine should therefore seek to achieve a high level of digitalization, a cashless economy, a well-developed payment infrastructure, and the use of innovative payment tools. The pandemic and quarantine restrictions accelerated the change in cardholders' payment habits towards cashless settlements, including online payments. Cardholders are more actively switching to cashless payments and are increasingly using electronic commerce services. At the same time, there has been a sustainable trend in which contactless payment instruments and settlements involving their use are increasing in popularity. In the near future, all this will influence the development of the bank card market.

Finally, future research should be conducted in other developed and developing economies using the same methodology as in the current study to examine whether an association between the BCM Index and the level of economic development is found to be consistent.

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Rozwój i transformacja rynku kart bankowych jako imperatyw cyfryzacji na przykładzie krajów Europy Środkowo-Wschodniej

Celem niniejszego opracowania jest określenie trendów rozwojowych głównych determinant rynku kart bankowych w ośmiu krajach Europy Środkowo-Wschodniej w okresie 2010–2019. Kontynuując badanie przeprowadzone w 2018 r. przeprowadzono dalszą analizę porównawczą zaproponowanego wcześniej „Indeksu Rynku Kart Bankowych" opartego na systemie powiązanych ze sobą wskaźników bankowych kart płatniczych, bankomatów i terminali POS. Przedstawiono przegląd rankingów Ukrainy, Białorusi, Mołdawii, Rosji, Rumunii, Polski, Węgier i Słowacji przy użyciu międzynarodowych systemów rankingowych, takich jak „The Legatum Prosperity Index", „Doing Business", „The Index of Economic Freedom" i „Bank Cards Market Index". Dalsze badania trzech międzynarodowych systemów rankingowych, a także „Bank Cards Market Index" ponownie potwierdziły podobieństwo modeli rozwoju rynku kart bankowych w Polsce i na Ukrainie. Aby zbadać wpływ cyfryzacji gospodarki i pandemii Covid–19 na rynek kart bankowych, przeprowadzono pogłębioną analizę dwóch przypadków (Polski i Ukrainy jako dwóch podobnych rynków kart bankowych) za pomocą „Digital Evolution Index". W trakcie badań stwierdzono, że „Bank Cards Market Index" może być z powodzeniem wykorzystany do dalszych badań sektora bankowego w różnych krajach. Zauważono również trend wzrostowy płatności bezgotówkowych na rynku kart bankowych i możliwą transformację rynku pod wpływem Covid–19 oraz globalną cyfryzację gospodarki. Biorąc pod uwagę powyższy trend, dalsze badania systemu powiązanych wskaźników bankowych kart płatniczych, bankomatów i terminali POS powinny być prowadzone z wykorzystaniem „Digital Evolution Index" lub innych międzynarodowych wskaźników charakteryzujących poziom cyfryzacji gospodarki w badanych krajach.

Słowa kluczowe: Bank, Polska, Ukraina, karty bankowe, wskaźniki, ranking krajów, indeks, gospodarka cyfrowa, cyfryzacja

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Economic Development and Growth in Central and Eastern Europe

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Abstract

The study investigates the economic growth in Central and Eastern Europe in the last 25 years. The economy can be regarded as a substantial topic in any country, but it is even more interesting in developing countries. One of the basic ideas of the European Union is the convergence between member states, namely the reduction of development disparities, which can be achieved through faster economic growth in less-developed countries.
Growth theory is one of the main topics in economics. Its significant importance is because the desire for development is one of the main driving forces of mankind.
The aim of the study is to reveal the crucial differences and common features between the growth paths of the eleven Central and Eastern European member states of the European Union.
After presenting growth theories, the growth performance of the examined Central and Eastern European member states is pinpointed.
During the research, GDP per capita, population, migration, activity rate, employment rate, unemployment rate, foreign direct investment and foreign trade openness are considered.

Keywords: economic indicators, labour market processes, economic growth

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Introduction

The study aims to reveal the economic growth in Central and Eastern Europe between 1995 and 2019. The economy can be regarded as a major topic in any country, but it is even more inspiring in developing countries.

Growth theory is one of the main topics in economics. Its significant importance is because the desire for development is one of the main driving forces of mankind.

Although economic growth is only a piece of this development, in addition to its direct impacts, it can also contribute to other social development approaches.

One of the basic ideas of the European Union is the convergence between member states, namely the reduction of development disparities, which can be acquired through faster economic growth in less-developed countries.

According to Lengyel and Varga (2018), the world economy started to develop rapidly in the 20th century, with developed countries serving as an example for developing countries.

The study is made up of two parts. Firstly, it discusses general issues related to growth theory, and secondly, it examines the growth performance of Central and Eastern European member states between 1995 and 2019 in the light of the growth theories. The surveyed countries include the eleven Central and Eastern European countries of the European Union: Bulgaria, the Czech Republic, Estonia, Croatia, Poland, Latvia, Lithuania, Hungary, Romania, Slovakia and Slovenia.

Although there are substantial differences between the growth paths of the individual countries, similarities also emerge. Each of the surveyed economies can be divided into three main phases over the past 25 years: 1) transformational decline, 2) convergence period, 3) recession.

The study ends with a summary and conclusion in which I also cover the economic growth prospects of the countries.

Literature review

In this chapter, the following concepts, models and approaches are introduced: economic growth, general economic indicators, demographic and labour market processes, foreign direct investment and foreign trade openness.

Economic growth

Creating new jobs and maintaining a growing proportion of GDP (gross domestic product) in a rapidly developing market can be considered an important issue in a modern economy. The high level of progression in developing countries is a significant issue. A modern economic model based on continuous progress can lead to a boom in the economy (Wysokińska 2018).

Krajewska and Krajewski (2020) pointed out that in some countries, the share of employment-related costs is even above 50% of GDP and is characterised by relatively high stability in the long term. High unemployment can lead to the spread of unethical activities. They concluded that the current labour market situation in many countries needs to be changed, and there is a need to introduce legal solutions that strengthen the position of employees in their relations with employers.

Economic and demographic development are closely interrelated, and it is very difficult to determine the cause and consequence of this economic and demographic development. The European population is generally in the process of demographic ageing, with differences from country to country. However, by analysing demographic aspects, some connections between economic convergence and demographic differences can be recognised. The structure of the workforce and the economic population is one of the most important aspects in planning and managing the economy (Eichenauer and Klee 2013).

Two contradictory trends can be observed in national investment policies. On the one hand, there are liberalisation, promotion and facilitation measures. On the other hand, there is the regulation of foreign direct investment. It was pointed out that countries have external powers concerning foreign direct investment and that that uncertainty can negatively affect the extent of foreign direct investment. (Witkowska 2020)

Young and more qualified workers will migrate from underdeveloped regions to developed parts of the country. As a result, age structure and educational standards will deteriorate in these regions (Kilper and Klee 2018).

The practice of foreign direct investment is far ahead of theoretical approaches. Gudowski and Piasecki (2020) underlined that the theories dealing with foreign direct investment deal with the cooperation of Western economies. Then, the growing trend of the open economy and globalisation emerged. In less-developed countries, there is a significant demand for foreign direct investment.

The countries of Central and Eastern Europe have undergone a rapid metropolitan transformation in the last two decades, although the process is delayed and is still dynamic with general and some specific features. This change was mainly reflected in the physical and functional transformation of large cities, which became the primary beneficiaries of the new economic and political system. At the national level, the development of the urban hierarchy has led to the growing dominance of capitals. The observed parallel trends include the declining importance of medium-sized cities and differentiation of small settlements in respect of functionality and regionalism (Korcelli and Korcelli-Olejniczak 2015).

Outward foreign direct investments and inward foreign direct investments can be distinguished. Outward foreign direct investments can be considered a negative phenomenon since they export occupations and practices to other countries, whereas inward foreign direct investments are identified with a more positive aspect since they facilitate occupations and reduce the need for imports. Bathelt and Buchholz (2019) claimed that outward investments have a positive cumulate effect in the domestic regions since they have access to foreign markets and new knowledge.

Central Europe shows significant differences and temporal variability in the spatial delimitation of the region. In chronological order, natural German dominance (the concept of Central Europe) can be perceived as a transitional zone between Germany and Russia (or the Soviet Union) and can be considered an independent third region of Europe. Currently, the area designated as Central Europe usually contains Austria, the Czech Republic, Germany, Hungary, Poland, Slovakia, and sometimes Slovenia and Switzerland (Bláha et al. 2016).

Economic and demographic development are closely interrelated, and it is very difficult to determine the cause and consequence of this economic and demographic development. The European population is generally in the process of demographic ageing, with differences from country to country. However, by analysing demographic aspects, a connection between economic convergence and demographic differences can be recognised. The structure of the workforce and the economic population is one of the most important aspects in planning and managing the economy (Manić, Popović, and Mitrović 2016).

Regarding the failure of Mexico's economic policy, Parnreiter (2013) argued that the Mexican government's main goal with the North American Free Trade Agreement was to increase imports of working capital from the U.S. and Canada and to stimulate capital inflows to help to create jobs. He stressed that foreign capital goods also boosted private investments. However, Mexico has not been able to change its economic and foreign trade structure, and as a result, many Mexicans have left their homeland. He highlighted that Mexico's economy could not grow. Trade liberalisation caused growth in only a few manufacturing industries. Its foreign trade was also behind that of the United States, and Mexico was unable to take part in globalisation processes. This study is related to the topic because it investigates foreign trade.

After the change of regime, Hungary was characterised by a balance between the West and the East. Molnár and Lengyel (2016) highlighted that global production was facilitated by foreign direct investment.

Based on Solow's growth model, it can be asserted that in many sectors (agriculture, manufacturing, communications), the amount of capital per employee, or capital intensity, increased. Capital intensity increases while technological change, natural resources, the quantity and quality of work remain unchanged. The increase of capital intensity can cause a growth in the output per worker (Somogyi 2016).

Another variable to the Solow model can be added so that the evolution of physical and human capital are completely analogous. The explanatory power of the Solow model was substantially enhanced by the inclusion of human capital in the model (Mankiw, Romer, and Weil 1992).

Examining the fundamental causes of economic growth is an important topic. Empirical research has often shown the phenomenon of conditional convergence, i.e., if two countries can be described with similar parameters (e.g. savings rate), the initially poorer country will produce faster growth. However, this can have limited relevance from an economic policy perspective. What is important is the lack of absolute

convergence. Why is the savings rate (or other parameters) not the same in different countries? How can the observed income disparities be reduced by changing them (Acemoglu 2016)?

The investigation of economic growth has been one of the key research topics in economics. Czárl (2005) underlined that it is one of the oldest fields of study in economics, but when the concept emerged is controversial. He argued that countries treat economic growth as a primary economic and political goal, and he pinpointed that countries with rapid economic growth are moving forward in the ranking of nations and setting an example for emerging ones. He emphasised that if the economy grows, the country's domestic output will expand, and an increase in its per capita value will mean an improvement in the living standards of the population. He also pointed out that economic growth is, therefore, one of the most significant factors in the long-term economic success of nations.

Factors of economic growth: general economic indicators, demographic and labour market processes, foreign direct investment, foreign trade openness

The most important factors of economic growth are GDP per capita, the activity rate, the employment rate, the unemployment rate, foreign development investment (FDI) and foreign trade openness.

GDP shows the total value of goods produced by a country's population and companies. He pointed out that two types can be distinguished: nominal GDP and real GDP. Nominal GDP shows the monetary value of all goods produced by a country's population and companies, but this excludes the impact of inflation. In contrast, real GDP already takes inflation into account. GDP per capita is a ranking for different countries, referring to the standard of living in each country. A higher GDP per capita means a higher standard of living (The Centre for Analysis 2017).

Let me introduce the following example regarding the definition of purchasing power parity. How much would the forint be worth in dollars, pounds or yen in a world without borders, where markets are not distorted and are free to operate everywhere? In such a world, everything would cost the same everywhere, as would exchange rates. If the same car costs $15,000 in New York and £9000 in London, $1 is worth £0.6. But this is not how the economy works. Exchange rates usually differ from purchasing power parity. One currency is undervalued, and the other is overvalued. So if the $1 exchange rate is 0.5 pounds, then the dollar is undervalued, and the pound is overvalued. The Big Mac Index is a measure of currency comparison that differentiate the price of Big Mac sandwiches in dollars around the world. The Big Mac Index can then be compared to exchange rates, and then it becomes clear which currency is undervalued or overvalued (Marron 2010).

The GDP per capita, the employment rate, the share of foreign direct investment will decrease, and the unemployment rate will increase in 2020. Furthermore, young

and more qualified workers will migrate from underdeveloped regions to developed parts of the country. As a result, age structure and educational standards will deteriorate in these regions (Barna and Molnár 2019).

One of the biggest global social challenges of the 21st century is the continued growth of the world's population, which could reach or even exceed 9 billion by 2050 (Bertalan and Sarudi 2016).

Areas where foreign-controlled companies are established can stimulate the economy. However, there is a lack of innovative developments or a graduate workforce in these areas. Varga and Lengyel (2019) emphasised that it can be considered an advantage if they bring market relations or technology transfer.

A significant factor for growth performance is foreign trade openness, which is the ratio of exports and imports to GDP (Alotaibi and Mishra 2014).

Methodology

In terms of the data collection method, the research is considered secondary research, as already available data related to the topic was collected.

First, I demonstrate the growth performance of the region over the past 25 years and the characteristics of its various phases, and then I discuss the topic of fiscal policy and its connections to economic growth. The surveyed countries include the eleven Central and Eastern European countries of the European Union: Bulgaria, the Czech Republic, Estonia, Croatia, Poland, Latvia, Lithuania, Hungary, Romania, Slovakia and Slovenia. Although there are substantial differences between the growth paths of individual countries, similarities also emerge. Then I present the demographic and labour market processes of the convergence period, and finally, I will focus on FDI and economic openness.

Research findings

In this chapter, research findings will be discussed in the light of economic growth, general economic indicators, demographic and labour market processes, FDI and foreign trade openness.

Convergence with Western Europe

The similarities and differences of the convergence paths can be outlined. At the end of the 1990s, there was no coherent convergence trend, as even more countries in the region suffered from a decline during this period. Poland, Slovenia and the three Baltic states were already able to show clear real convergence with Western European countries between 1995 and 2000. From 2000 onwards, however, until 2007–2008, there was

a mostly rapid convergence in the whole region. After 2008, convergence was also typical. In the Baltic States, GDP per capita in purchasing power parity reduced between 2007 and 2008 compared to Western European countries. This period was followed by a rapid convergence, as a result of which all three countries have now reached and exceeded their relative position before the recession. A slowdown of convergence can be identified in Bulgaria, Hungary, Romania and the Czech Republic, while segregation can be demonstrated in Croatia and Slovenia (Table 1).

Table 1. GDP per capita as a percentage of the average of Western European EU countries on PPP in the last 25 years (%)

Country/Year	1995	2000	2008	2019
Bulgaria	29.00	19.58	29.80	35.12
Czech Republic	65.30	49.50	58.79	61.03
Estonia	30.10	28.81	48.40	55.67
Croatia	–	33.98	44.02	43.25
Poland	36.40	32.51	38.83	48.61
Latvia	28.40	24.75	41.29	46.25
Lithuania	29.50	25.86	44.02	54.60
Hungary	43.20	36.20	44.02	48.82
Romania	27.30	18.10	35.55	46.25
Slovakia	40.30	34.72	50.04	49.04
Slovenia	63.10	55.41	62.89	58.24

Source: Eurostat, *Purchasing power*... (n.d.).

Labour market processes

Tables 2–7 show the three most crucial labour market indicators between 1997 and 2019 in Central and Eastern Europe. I excluded 1995 and 1996 since the necessary data of the countries are not available in 1995, and in 1996, only the data of Hungary and Slovenia are available.

Tables 2 and 3 show that the employment rate had an increasing trend in all countries between 1997 and 2019.

Tables 4 and 5 demonstrate that the activity rate increased until 2008, with the exception of Lithuania. It showed a growing trend between 2008 and 2019 in Bulgaria, Estonia, Lithuania, Hungary and Slovakia, while in other countries, a decline was observable. Furthermore, between 1997 and 2019, the activity rate indicated an upward trend in all countries except Romania.

Tables 6 and 7 highlight that the unemployment rate decreased until 2008, with the exception of Romania and the Czech Republic. It marked a declining trend between 2008 and 2019 in all countries. Furthermore, between 1997 and 2019, the unemployment rate indicated a downward trend in all countries.

Table 2. Employment rate in Central and Eastern Europe between 1997 and 2019 (%)

Year / Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bulgaria	–	–	–	34.69	34.41	35.08	36.03	37.55	38.08	39.90	41.89	43.37
Czech Republic	46.93	46.34	45.24	44.95	45.25	45.85	45.57	45.36	46.02	46.46	47.04	47.30
Estonia	41.90	42.73	40.89	40.73	40.67	41.32	41.92	42.56	43.69	46.35	47.08	47.24
Croatia	–	–	–	–	–	34.21	34.47	35.32	35.06	35.38	39.27	40.02
Poland	38.22	38.86	37.95	36.98	36.36	35.33	35.03	35.15	36.25	37.60	39.34	40.82
Latvia	–	39.74	39.40	38.78	38.94	40.05	40.68	40.99	42.09	44.69	46.14	46.32
Lithuania	–	40.97	41.35	39.48	38.70	40.53	42.24	41.65	42.55	42.97	44.02	43.68
Hungary	34.59	35.29	36.75	37.03	37.70	37.87	38.50	38.28	38.45	38.76	38.51	38.03
Romania	–	–	–	–	–	41.40	40.62	40.96	40.58	41.70	42.34	43.25
Slovakia	–	40.71	39.31	38.48	39.22	39.15	40.15	39.79	40.97	42.58	43.56	44.83
Slovenia	43.73	44.29	43.48	43.88	44.69	45.11	43.94	46.28	46.23	46.65	47.40	48.23

Source: Eurostat, *Population by sex*... (n.d.).

Table 3. Employment rate in Central and Eastern Europe between 1997 and 2019 (%)

Year / Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bulgaria	42.25	40.31	39.84	39.62	39.77	40.52	41.43	41.45	43.43	43.69	44.86
Czech Republic	46.30	45.73	45.69	45.77	46.10	46.40	46.80	47.48	48.10	48.43	48.28
Estonia	42.94	41.12	43.73	44.60	45.19	45.56	46.68	46.53	47.55	47.77	47.86
Croatia	39.67	38.37	36.98	35.79	35.11	36.40	37.05	37.55	38.81	39.85	40.77
Poland	40.61	39.55	39.75	39.81	39.77	40.51	41.12	41.38	41.85	42.00	41.92
Latvia	40.93	39.52	40.83	41.89	43.05	43.05	43.89	44.01	44.40	45.34	45.48
Lithuania	40.78	39.53	40.48	41.65	42.75	43.92	44.77	45.94	46.16	47.25	47.42

Hungary	37.09	37.01	37.35	38.23	39.02	41.25	42.42	43.91	44.68	45.12	45.40
Romania	43.23	41.03	40.40	40.98	40.92	41.45	41.54	41.44	42.69	43.05	43.31
Slovakia	43.50	42.49	42.67	42.86	42.82	43.35	44.36	45.51	46.01	46.52	46.65
Slovenia	46.77	45.95	44.56	44.07	43.12	43.29	43.70	43.71	45.67	46.42	46.42

Source: Eurostat, *Population by sex*... (n.d.).

Table 4. Activity rate in Central and Eastern Europe between 1997 and 2019 (%)

Year / Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bulgaria	–	–	–	41.48	43.04	42.92	41.87	42.77	42.39	43.85	45.01	45.97
Czech Republic	49.04	49.24	49.47	49.30	49.20	49.33	49.31	49.45	50.01	50.06	49.71	49.50
Estonia	46.80	47.30	46.32	47.15	46.85	46.02	47.43	47.60	47.61	49.35	49.43	50.03
Croatia	–	–	–	–	–	40.46	40.24	41.13	40.30	39.98	43.69	43.84
Poland	43.06	43.27	43.40	44.33	44.73	44.29	43.61	43.59	44.22	43.74	43.58	43.98
Latvia	–	46.57	45.81	45.35	45.34	46.59	46.36	46.54	46.85	48.16	49.19	50.37
Lithuania	–	47.60	47.87	47.15	46.70	46.70	48.54	46.68	46.47	45.64	46.02	46.41
Hungary	38.00	38.72	39.50	39.65	39.98	40.13	40.88	40.66	41.44	41.92	41.61	41.28
Romania	–	–	–	–	–	45.38	43.87	44.58	43.88	45.13	45.41	46.05
Slovakia	–	46.35	46.79	47.55	48.67	48.18	48.47	48.89	48.94	49.17	49.03	49.56
Slovenia	46.93	47.92	47.02	47.22	47.45	48.02	47.04	49.31	49.52	49.68	49.87	50.48

Source: Eurostat, *Population by sex*... (n.d.).

Table 5. Activity rate in Central and Eastern Europe between 1997 and 2019 (%)

Year / Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bulgaria	45.37	44.96	44.94	45.22	45.73	45.80	45.64	44.89	46.32	46.12	46.86
Czech Republic	49.65	49.37	49.02	49.24	49.60	49.46	49.33	49.47	49.56	49.57	49.29
Estonia	49.84	49.61	50.04	49.69	49.58	49.28	49.82	50.01	50.56	50.52	50.17
Croatia	43.80	43.54	42.98	42.74	42.57	44.10	44.31	43.29	43.76	43.58	43.71
Poland	44.28	43.82	44.04	44.34	44.42	44.57	44.50	44.14	44.04	43.71	43.37
Latvia	49.89	49.28	48.90	49.48	48.98	48.43	48.81	48.85	48.74	49.06	48.65
Lithuania	47.41	48.24	48.00	48.23	48.56	49.29	49.37	49.97	49.79	50.44	50.71
Hungary	41.25	41.71	42.02	42.99	43.47	44.72	45.54	46.29	46.64	46.88	47.02
Romania	46.57	44.24	43.67	44.11	44.18	44.60	44.69	44.13	44.98	44.99	45.12
Slovakia	49.47	49.65	49.42	49.85	49.94	49.96	50.14	50.42	50.12	49.81	49.54
Slovenia	49.75	49.63	48.62	48.43	48.06	48.05	48.07	47.57	48.93	48.97	48.61

Source: Eurostat, *Population by sex…* (n.d.).

Table 6. Unemployment rate in Central and Eastern Europe between 1997 and 2019 (%)

Year / Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bulgaria	–	–	–	16.37	20.04	18.27	13.94	12.20	10.18	9.02	6.93	5.66
Czech Republic	4.29	5.90	8.53	8.84	8.04	7.06	7.58	8.27	7.98	7.20	5.37	4.44
Estonia	10.47	9.67	11.74	13.62	13.20	10.21	11.61	10.61	8.24	6.06	4.75	5.59
Croatia	–	–	–	–	–	15.44	14.34	14.13	13.01	11.52	10.11	8.73
Poland	11.24	10.17	12.56	16.60	18.71	20.23	19.68	19.36	18.01	14.03	9.72	7.20
Latvia	–	14.67	13.99	14.49	14.11	14.03	12.24	11.94	10.15	7.21	6.19	8.03
Lithuania	–	13.92	13.63	16.27	17.14	13.22	12.98	10.78	8.43	5.85	4.33	5.89

Hungary	8.96	8.86	6.97	6.59	5.69	5.63	5.82	5.86	7.21	7.53	7.45	7.86
Romania	6.03	6.20	6.92	7.71	7.27	8.76	7.39	8.11	7.53	7.61	6.75	6.08
Slovakia	–	12.19	15.97	19.07	19.41	18.74	17.16	18.63	16.28	13.41	11.17	9.54
Slovenia	6.82	7.59	7.53	7.07	5.81	6.06	6.60	6.14	6.66	6.10	4.96	4.46

Source: Eurostat, *Population by sex*... (n.d.).

Table 7. Unemployment rate in Central and Eastern Europe between 1997 and 2019 (%)

Year / Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bulgaria	6.88	10.34	11.35	12.38	13.04	11.52	9.23	7.67	6.23	5.27	4.28
Czech Republic	6.75	7.37	6.79	7.04	7.05	6.19	5.13	4.03	2.94	2.28	2.06
Estonia	13.85	17.13	12.61	10.25	8.86	7.53	6.30	6.97	5.94	5.43	4.57
Croatia	9.43	11.87	13.96	16.25	17.53	17.46	16.39	13.27	11.30	8.55	6.72
Poland	8.27	9.75	9.76	10.21	10.46	9.11	7.60	6.24	4.97	3.91	3.34
Latvia	17.97	19.81	16.51	15.34	12.11	11.10	10.08	9.90	8.91	7.60	6.50
Lithuania	14.00	18.06	15.67	13.64	11.98	10.90	9.32	8.06	7.30	6.33	6.48
Hungary	10.10	11.25	11.11	11.07	10.24	7.77	6.85	5.15	4.20	3.75	3.45
Romania	7.17	7.27	7.49	7.09	7.39	7.07	7.04	6.09	5.09	4.33	4.03
Slovakia	12.06	14.42	13.67	14.01	14.26	13.22	11.55	9.73	8.20	6.61	5.84
Slovenia	6.01	7.41	8.34	9.00	10.28	9.90	9.10	8.11	6.67	5.20	4.50

Source: Eurostat, *Population by sex*... (n.d.).

FDI and foreign trade openness

A developing, open economy cannot expand its capital stock solely from domestic resources. FDI also played a significant role in this process in the countries of the region; however, naturally, differences can also be observed (Figures 1 and 2).

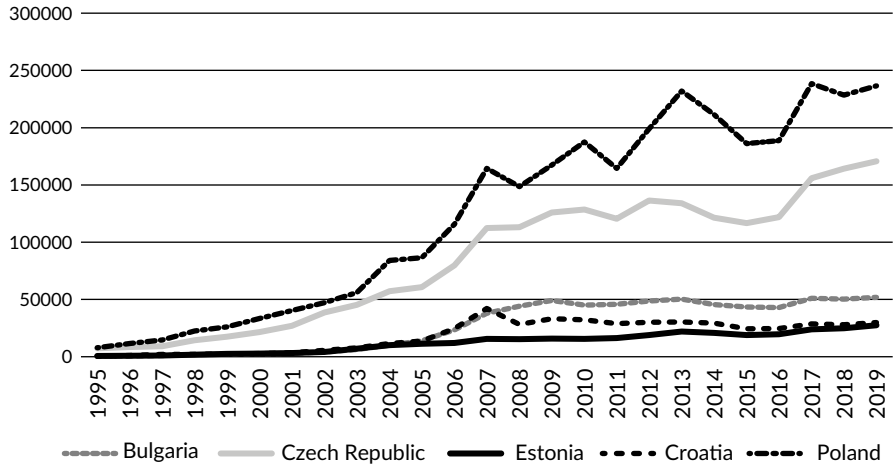

Figure 1. The incoming FDI stock in Central and Eastern Europe as a percentage of GDP in the last 25 years
Source: Eurostat, *Population by sex* ... (n.d.).

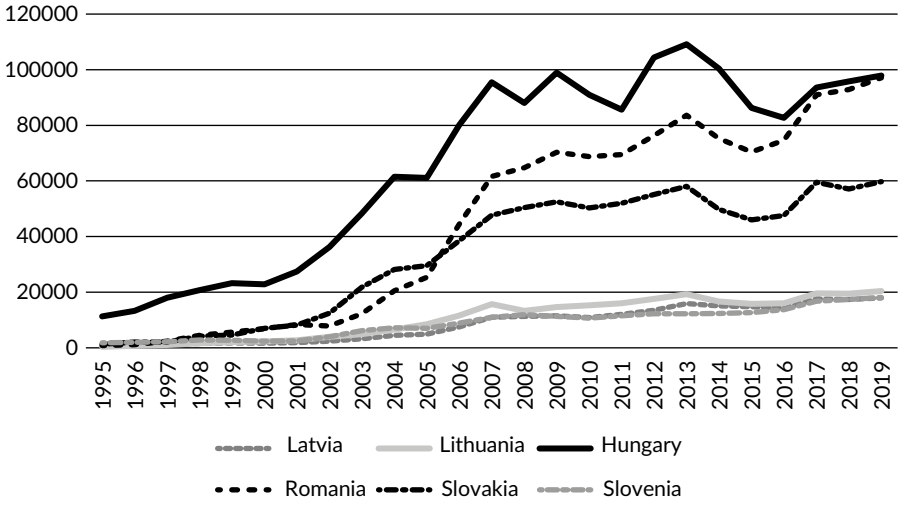

Figure 2. The incoming FDI stock in Central and Eastern Europe as a percentage of GDP in the last 25 years
Source: Eurostat, *Population by sex*... (n.d.).

Conclusion

The study addressed the issues of economic growth. Firstly, the most important growth theories were presented. Secondly, the performance of Central and Eastern European countries was investigated over the past 25 years in the light of the theoretical background.

The growth performance of eleven EU member states was examined in the last 25 years, and similarities and differences were also introduced. The most important statements are the following:

- In terms of economic growth, the last 25 years can be divided into three distinct phases in each country in the region: 1) transformational decline, 2) convergence period, 3) recession.
- The recession was followed by rapid growth everywhere, as a result of which all countries showed convergence with Western European countries. Overall, the whole region underwent a very significant upswing during this period. Of course, this also meant a significant degree of convergence with the more developed countries of Western Europe, as shown by the data in Table 1.
- The driver of rapid growth was capital accumulation.
- Rapid capital accumulation would not have been possible without a large inflow of FDI.

Growth prospects for the countries:

- The inflow of FDI has decelerated significantly since 2008 and will not be able to restart easily in the near future due to the global decline in investment and risk propensity.
- As a result of emigration, serious tensions have arisen in the labour market, and in addition to the existing long-term unemployment, there is also a growing labour shortage.

In my view, in order to achieve substantial economic growth in the coming years and decades and to be able to reduce the gap with Western Europe in accordance with the continuously formulated convergence goals, it is absolutely necessary to improve the quality of the institutional system. This can lead to the stability of economic policy.

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Csilla Polster

Rozwój i wzrost gospodarczy w Europie Środkowo-Wschodniej

Opracowanie przedstawia wyniki badania wzrostu gospodarczego w Europie Środkowo-Wschodniej w ciągu ostatnich 25 lat. Gospodarka może być uważana za istotny temat analiz w każdym kraju, ale jest szczególnie interesująca w przypadku krajów rozwijających się. Jednym z podstawowych dążeń Unii Europejskiej jest konwergencja państw członkowskich, czyli zmniejszanie dysproporcji rozwojowych, co można osiągnąć poprzez szybszy wzrost gospodarczy krajów słabiej rozwiniętych.
Teoria wzrostu jest jednym z głównych tematów w ekonomii. Jej ogromne znaczenie wynika z tego, że chęć rozwoju jest jedną z głównych sił napędowych ludzkości.
Celem badania jest wskazanie istotnych różnic między ścieżkami rozwoju jedenastu krajów członkowskich Unii Europejskiej z Europy Środkowo-Wschodniej oraz cech wspólnych.
Po uprzednim przedstawieniu teorii wzrostu, pokazano osiągnięcia w obszarze wzrostu badanych państw członkowskich z Europy Środkowo-Wschodniej.
W badaniu wzięto pod uwagę PKB per capita, liczbę ludności, migracje, wskaźnik aktywności zawodowej, wskaźnik zatrudnienia, stopę bezrobocia, bezpośrednie inwestycje zagraniczne oraz otwartość handlu zagranicznego.

Słowa kluczowe: wskaźniki ekonomiczne, procesy na rynku pracy, wzrost gospodarczy

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Diversification Perspectives of a Single Equity Market: Analysis on the Example of Selected CEE Countries

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Abstract

The study addresses the benefits of a unified stock market in terms of diversification risk for the eight CEE stock markets. For this purpose, each stock market was treated as a separate portfolio based on the companies listed during 2018–2019. Portfolio diversification techniques were used to identify risk linked with the eight Central Eastern European stock markets. The results show that the stock market with the lowest diversification risk was the Bulgarian Stock Exchange, followed by the Prague Stock Exchange, the Ljubljana Stock Exchange, and at the end stands the Zagreb Stock Exchange. The portfolio constructed from the Zagreb Stock Exchange carries the highest portfolio risk, but it also offers the highest weekly weighted average returns. Stock

markets that benefit in terms of portfolio risk from unification are the Bratislava Stock Exchange, the Budapest Stock Exchange, the Bucharest Stock Exchange, the Warsaw Stock Exchange, and the Zagreb Stock Exchange. The indexes where the portfolio risk increases at the time of unification are the Bulgarian Stock Exchange, the Ljubljana Stock Exchange, and the Prague Stock Exchange. From a managerial perspective, financial investors get a novel outlook on the diversification possibilities offered within a hypothetical unified CEE stock market.

Keywords: diversification opportunities, CEE stock market, unification benefits, risk-reward tradeoff

JEL: G11, G12

Introduction

Stock markets are an important indicator that generates signals in the current spark of the financial system and the economy in general. Efficient stock markets integrate overall information related to financial problems, political issues, natural disasters, and so on, into equity prices. The member states of the European Union (EU) hold different cultural backgrounds, languages, and political systems but act as a common economic unit. The single EU market, which represents the free movements of goods, services, people, and money, was followed by the common currency, the *euro*. Even though 19 member countries embraced the euro as the national currency, there are still differences over taxes, restructuring policies, and capital markets, among others. Euronext (2020) is an example where the stock markets of Paris, Amsterdam, London, Oslo, Milan, Dublin, and Lisbon operate under the rules of a joint institution.

The standard financial paradigms indicate that the unified equity market provides additional liquidity for listed firms, lower transaction costs, and offers higher visibility for international investors. Nielsson's (2009, pp. 229–267) study of Euronext shows that the biggest beneficiaries from the unified exchange were large, capitalized corporations, while for small and medium-size firms, the effect was insignificant. Another form of a common equity index is Nasdaq Baltic, which includes listed firms from Lithuania, Estonia, and Latvia (Nasdaq Baltic Equity Index 2020). Meanwhile, Bulgaria, Macedonia, and Croatia also set up a joint trading platform for equity stocks, named SEE link (2020). In principle, unifying equity markets enables low activity exchanges to increase their trading volume and reduce transaction costs. This is also in line with the European Commission directive "MiFID II," which seeks to increase transparency, unification, and better regulation of the European financial markets (European Commission 2014).

In August 2015, Jean-Claude Junker, president of the European Commission, launched initiatives on the conceptual economic benefits of a Capital Markets Union (CMU) (Juncker 2014). The idea was to create a single capital market for all European

Union countries by the end of 2019. The work by Quaglia, Howarth, and Liebe (2016, p. 185) found that a CMU would reduce fragmentation of financial markets in EU countries, create new financing channels for firms, and encourage cross borders capital movements. Establishing a CMU would enhance cross-border financial integration, which relies on information transparency and data reliability to reduce information asymmetry (Véron and Wolff 2016, pp. 130–153).

In Central and Eastern European (CEE) countries, banks play a crucial role in financing business needs and human consumption. Corporations in these countries prefer to finance their liquidity and investment projects through banking channels rather than the capital markets. People in Europe keep their savings mainly as bank deposits, while in the US, they are in the form of financial securities. Stock markets in CEE countries are characterized by a small number of listed firms and limited trade volume. Speculative stock prices are additional problems that prevent the efficient functioning of capital markets in CEE countries. The study by Miloş, Barna, and Boţoc (2020, p. 535) of seven CEE stock markets (including those in our study) indicated that stock prices do not follow a random walk, which violates the efficient market hypothesis (EMH). Other authors confirm the inefficiency of CEE stock markets by covering the problem on different time intervals and different countries (Nivet 1997, pp. 171–183; Ajayi, Mehdian, and Perry 2004, pp. 53–62; Worthington and Higgs 2004, pp. 59–78; Guidi, Gupta, and Maheshwari 2011, pp. 337–389).

The inefficiency of the equity markets generates stock prices that do not reflect the domestic and international economic reality. Since not all events are integrated into stock prices under an inefficient market, this creates information asymmetry and prevents potential trades. The possibility of creating a joint-stock market for CEE countries would increase liquidity, efficiency, and attention from international investors. Obstacles with unifying stock markets in these countries might be related to national accounting systems, monetary policies (for non-eurozone countries), different taxation, and unique political systems.

The purpose of this study was to identify the diversification benefits of a single equity market for the selected CEE countries, although the issue of creating a single equity market in CEE countries exceeds the remit of this study. The issue of a single market involves difficulties related to political will, taxation systems, monetary policies, and trading platforms, among others. Recognizing the importance of creating a single equity market in Europe, the theoretical contribution of this study appears in two dimensions. First, in the use of portfolio techniques in measuring diversification risk of a possible single equity market in CEE countries. Second, it verifies the well-established portfolio theory that increasing the number of stocks decreases the divarication risk of the portfolio.

The study contributes to the ongoing discussion of the European Commission on the unification of capital markets (bond and equity exchanges). The idea of a single capital market is a very complex topic that requires addressing the problem from different perspectives. CEE countries have experienced almost identical economic and

political transitions. Considering the common features of CEE countries, our work provides a financial perspective on the possibility of a unified equity market. The study investigates the risk-reward relationships of merging the seven stock markets of CEE countries. From the complexity of this process, the results analyze diversification risk attached to the separate stock markets of CEE countries. First, the study compares diversification risk and weekly weighted average returns for selected stock exchanges of CEE countries. Generating a unified stock market does not necessarily provide higher diversification benefits for all analyzed stock markets.

Literature review

Constructing an optimal portfolio is a task that requires continuous commitments as the market dynamics constantly change. The financial meltdown of 2008/2009 and the Greek debt crisis of 2010/2011 proved that the world financial system is highly integrated. Financial globalization, together with international trade, means that the benefits of international diversification exist on a limited scope (Driessen and Laeven 2007, pp. 1693–1712). Publicly listed companies are located in different countries where their sales tend to be well-diversified. A series of studies show the possibilities of reaching full diversification by investing only in local publicly listed companies (Errunza, Hogan, and Hung 1999, pp. 2075–2107; Aliu et al. 2019, pp. 273–287; Berrill, Kearney, and O'Hagan-Luff 2019, pp. 672–684).

The stock exchanges of Eastern European Countries have different levels of efficiency, and therefore, they are at different stages of diversification. Aliu et al. (2019, pp. 273–287), using portfolio diversification techniques, believed that the Budapest Stock Exchange (BUX) offers higher diversification benefits than the Warsaw Stock Exchange (WIG20) and the Bratislava Stock Exchange (SAX). Equity markets tend to be highly interconnected in times of crisis, while in normal periods, each stock exchange follows its course. A recent study by Tilfani, Ferreira, and El Boukfaoui (2020, pp. 643–674) showed that the stock markets of the Czech Republic, Hungary, Poland, Croatia, and Romania are highly interconnected in the short run. However, stock markets with limited trade volumes and efficiency, like those of Slovakia, Serbia, and Bosnia, tend not to show signs of integration. Meanwhile, Boţoc and Anton (2020) indicated that CEE stock markets hold short and long-run co-integration with the stock markets of Germany, the UK, and the USA.

The concept of a common European market and the introduction of a single currency (the euro) have diminished the fragmentation of financial markets in eurozone countries. The interdependence within the stock markets of Eastern European countries with Western ones reduces the diversification opportunities for international investors.

The number of financial assets within a portfolio affects the diversification risk by reducing or increasing the concentration level. Scholars and practitioners still have

not reached a consensus on the number of shares that would fully eliminate portfolio risk. An earlier study by Evans and Archer (1968, pp. 761–767) showed that a portfolio containing 8 to 16 shares achieves maximum diversification benefits. In measuring portfolio risk, scholars use various diversification techniques at different time intervals and geographical locations. Increasing the number of shares in the portfolio from 1 to 10 reduces the portfolio risk by 50%, while moving from 10 to 20 shares, the risk declines by only 5% (Elton and Gruber 1977, pp. 415–437). However, Statman (1987, pp. 353–363) found that portfolios constructed with 30 to 40 equity stocks manage to reduce portfolio risk significantly.

Aliu et al. (2020, pp. 41–51) recently investigated diversification benefits using weekly data from companies listed in the six largest European stock exchanges. The results show that diversification risk begins to be eliminated when the portfolio contains more than 47 stocks. Correlation among assets in the portfolio is an additional component of portfolio risk. A higher positive correlation among the financial assets increases the portfolio risk, and vice versa. Thus, portfolio managers tend to find financial assets that are not correlated to each other or stay in the negative correlation zone. Although within the financial system, it is difficult to find securities that hold a negative correlation. However, correlation identifies short-run dependency among securities while the co-integration method follows this phenomenon in the long run.

Knowledge of financial instruments directly affects portfolio optimization and the diversification level. Çera et al. (2020, pp. 1–18) found that financial literacy can be improved by carefully informing individuals about financial products and their importance, whereby their financial behavior can be rationalized. Abreu and Mendes (2010, pp. 515–528), using a 2007 survey from UniCredit customers, investigated financial literacy for investors regarding their portfolio choices. Based on the survey, the lack of proper diversification is related to financial literacy by the investors. Financial literacy is based on the knowledge and experience of individuals to effectively manage their finances.

Moreover, the level of education, cultural characteristics, demographic structure of the population, and technological advancement are factors that affect the level of financial literacy. Individuals tend to invest in only a few stocks and are not diversified, as they place their money in the firms they work with (Dorn and Huberman 2005, pp. 437–481). A lack of regional and global diversification of the individual's wealth is linked to the fact that they are more focused on the local companies (Moskowitz and Vissing-Jørgensen 2002, pp. 745–778). However, there is ample evidence that sustainable diversification benefits can be achieved by investing in local companies that operate internationally (Errunza, Hogan, and Hung 1999, pp. 2075–2107; Aliu et al. 2019, pp. 273–287; Berrill, Kearney, and O'Hagan-Luff 2019, pp. 672–684).

In the 1990s, most CEE countries went from a command economy to a system where prices are set by market forces. However, a free-market economy and well-organized financial markets are concepts not well known to these countries. According to the Central Bank of Slovakia (2019), financial literacy may be one of the reasons why peo-

ple are dissatisfied with the services of the financial system. Beckmann (2013, p. 9) showed that in Romania, savings and investments are positively related to the level of financial literacy. Adequate knowledge of the financial system and personal finances enables individuals to react rationally in certain situations. Klapper, Lusardi, and-Panos (2013, pp. 3904–3923) investigated issues related to financial literacy in Russia, where there has been an enormous increase in the debt of private individuals.

Despite the benefits offered by stock market unification, it is extremely complex, involving not only economic issues but also political will. Brexit has made this problem even more difficult, as London (The City) was the main financial center in the European Union. Portfolio diversification techniques were used to explore the possibility of creating a single equity market for CEE countries. Seven equity markets have been selected from CEE countries to measure their risk and identify the benefits of the unified exchange. Our study deals only with equity markets in the CEE countries, bypassing the bond market, which is even more complex when analyzed. First, the study divides the selected stock exchanges into separate portfolios based on the number of listed firms during 2018 and 2019. The additional aim of the study was to identify which countries benefit from a unified equity market in terms of diversification risk and which do not. Based on the identified problem, the following questions were asked:

RQ1: Which is the individual diversification risk of a selected CEE equity exchange?

RQ2: Which are the diversification benefits of a unified CEE equity exchange for individual countries?

Methodology

The methodology is organized into two sections, where section 3.1 analyzes data collection while section 3.2 focuses on the diversification model.

Data collection and processing

The study measures the risk and returns tradeoff of the individual CEE stock markets and identifies the diversification benefits of unified stock markets in terms of risk and rewards. Closed stock prices and trading volume were the two main inputs used in the diversification model. Table 1 shows the selected equity exchanges for our study, the number of firms, and the period when the data were analyzed. Stock prices and trading volume were collected weekly from 5.01.2018 to 3.01.2020 for individual firms listed.

Seven CEE stock markets were selected, i.e., the Bratislava Stock Exchange (SAX), Budapest Stock Exchange (BUX), Prague Stock Exchange (PSE), Warsaw Stock Exchange (WIG20), Bucharest Stock Exchange (BVB), Zagreb Stock Exchange (ZSE), Ljubljana Stock Exchange (LJSE), and Bulgarian Stock Exchange (BSE).

Table 1. Stock exchanges of CEE countries and the number of firms selected

	Equity Index	Country	No. of firms	Period
Portfolio A1	SAX	Slovakia	7	5.01.2018–3.01.2020
Portfolio A2	BUX	Hungary	14	5.01.2018–3.01.2020
Portfolio A3	PSE	Czech Republic	12	5.01.2018–3.01.2020
Portfolio A4	WIG20	Poland	20	5.01.2018–3.01.2020
Portfolio A5	BVB	Rumania	14	5.01.2018–3.01.2020
Portfolio A6	ZSE	Croatia	18	5.01.2018–3.01.2020
Portfolio A7	LJSE	Slovenia	10	5.01.2018–3.01.2020
Portfolio A8	BSE	Bulgaria	14	5.01.2018–3.01.2020
Portfolio C	(SAX + BUX + PSE + WIG20 + + BVB + ZSE + LJSE + BSE)	—	109	5.01.2018–3.01.2020

Source: authors' own elaboration.

In financial markets, we have continuous entry and exit of firms, which affects the structure of the exchange. For this reason, only firms were used that have closed prices and trade volume in the Thomson Reuters Eikon Database (2020), from 5.01.2018 to 3.01.2020. The closed stock prices and trade volume for all selected companies are harmonized on identical dates. Each stock market is considered a separate portfolio based on the number of firms listed during the period covered in our study. Portfolio A1 stands for the Slovak Stock Market (SAX), portfolio A2 for the Hungarian Stock Market (BUX), and so on, to portfolio A8 linked to the Bulgarian Stock Market (BSE). However, portfolio C represents the unification of the eight stock markets selected for our study (SAX + PSE + WIG20 + BVB + ZSE + LJSE + BSE). Countries like Poland, Romania, Hungary, Bulgaria, Croatia, and the Czech Republic have their national currencies, while Slovenia and Slovakia use the euro. To harmonize the data in portfolio C, stock prices and trade volume of all firms from the TRD were collected in the euro currency. The work does not consider the exchange rate risk, direct and indirect taxes, or transaction costs.

Diversification model

Since stock markets are classified as separate portfolios, their risk is measured using Markowitz's (1952) diversification techniques. Diversification risk is influenced by elements such as correlation among financial instruments, concentration, and volatility of returns. When the concentration level (measured by trade volume) in the portfolio increases, the diversification risk is higher and vice versa. An additional element of portfolio risk is correlation among assets, standing between –1 and +1 ($-1 \leq \varphi_{ij} \leq +1$). Portfolio managers reduce portfolio risk when items are not perfectly positively correlated. However, in reality, it is very difficult to combine assets that have perfect negative correlation –1. The formula below presents the correlation coefficient:

$$\varphi_{1,2} = \frac{\operatorname{cov}(1,2)}{\sigma_1 \sigma_2}, \tag{1}$$

where: cov stands for the covariance between two securities (1, 2), and σ_1 and σ_2 indicate the standard deviation of the first and second security in the portfolio. Portfolio uncertainties also depend on the standard deviation of each financial asset found in the portfolio. The standard deviation is measured by the weekly returns of each stock identified in the respective portfolios (portfolio A1, A2, …, A8, C). Markowitz's diversification formula is used to measure the diversification risk of the separate portfolios selected for our study. The general form of the diversification risk formula is as follows:

$$Pr_k^2 = \sum_{i}^{n_k} w_{i_k}^2 \sigma_{i_k}^2 + 2 \sum_{i}^{n_k} \sum_{j<\mathrm{i}}^{n_k} w_{i_k} w_{j_k} \sigma_{j_k}. \tag{2}$$

Explanations regarding the formula used: The method indicates that Pr_k^2 stands for the portfolio in the year k and is calculated based on the number of n_k listed firms. Items such as $i, j = 1, \ldots, n_k$ show the positions and order of the companies in the particular portfolios (stock markets); basically, index i and j stand for the listed firms. Item i is linked with a particular security (listed firm), while item j assures that correlations are generated on distinct assets in the portfolio. However, w captures the weights of the assets (stock market firms) in the portfolio while w^2 stands for the squared weights. σ^2 represents the variance of returns while σ indicates the standard deviation of returns of individual securities in the portfolio. $\varphi_{(i,j)}$ represents the correlation coefficient of all possible firms in the portfolios (stock markets).

The programs that are used to implement the diversification risk formula are Python 3.6.3 (version 0.21.0), Jupiter Notebook (version 5.2.0), and Numpy (version 1.13.3). The equation below is used to generate the results for the inputs used in our study:

$$\mathrm{U}_{\mathrm{ij}} = \begin{cases} \mathrm{b}_{\mathrm{ij}} & for\, i < j \\ 0 & for\, i \geq j \end{cases} \tag{3}$$

where: b_{ij} shows the orders (sequences) among listed firms in the portfolio, i, and j. The first step in the process is to organize the excel table with all possible combinations between financial securities (in our case, equity stocks). This process involves combinations with $1,2,3,4,5,6,\ldots\ldots\ldots\ldots n$ where n indicates all the equity stock within the experiment. The combinations could be between "Equity Stock A" and "Equity Stock B," while the other combination might be within "Equity Stock A," "Equity Stock B," and "Equity Stock C". Combinations of the financial securities in the organized table generate merging data, where the merging happens by grouping financial securities of each stock market in one place. The identical process of merging data

tracked all selected equity indexes (in our case, named portfolio A1, A2…….C). For the combination process and merging the data, the panda library was used. *(A special program is built for this whole process and is available on request.)*

The next step requires cleaning the data for all files that are generated from the combinations of the financial securities. Rows were removed for all equity stocks that did not have data for the period we have defined. To make the best use of the data, the interpolation method was used for the missing data. The final procedure contains the calculation of all combinations for each portfolio (A1, A2……, C). Each portfolio is driven through the calculated inputs such as *"Correlation," "Variance," "Standard Deviation,"* and *"Portfolio Risk"*.

Returns to investors are generated from price changes (capital gains or losses) and the level of dividends distributed. The study does not take into account the level of dividend distributed but measures only weekly weighted average returns. The reason why weighted average returns are selected and not a simple arithmetic return is because companies have different weights within their portfolios (stock markets). The formula below shows the weighted average returns:

$$war = \sum_{i=1}^{n} w_i R_i. \tag{4}$$

A higher concentration of securities within the portfolio increases the diversification risk and vice versa. The Herfindahl-Hirschman Index (HHI) is used to measure the concentration level via trade volume that each firm contains within its respective portfolios. Portfolios containing HHI less than 1500 points are considered sufficiently competitive, while portfolios with HHI between 1500 and 2500 points are considered moderately concentrated. However, HHI over 2500 points is treated as highly concentrated, where two or three companies hold most of the trading volume in the portfolio. The formula below shows how HHI is calculated:

$$\text{HHI} = f_1^2 + f_2^2 + f_3^2 + f_4^2 + \ldots\ldots\ldots\ldots f_n^2, \tag{5}$$

where: f_n represents the percentage share of firm n within the portfolios (stock market), which appears as an integer and not a percentage.

Results

The results are divided into two parts. Section 4.1 compares the diversification risk of individual stock markets (portfolios), while section 4.2 identifies the diversification benefits of a unified CEE stock market.

Diversification risk of the individual portfolios (stock markets)

The work analyzes the risk-return tradeoff of each portfolio based on the Markowitz diversification techniques. Stock markets selected from the CEE countries are considered separate portfolios based on the listed firms during 2018/2019. Table 2 shows the descriptive statistics for the eight selected stock markets analyzed in our study.

Table 3 shows the main inputs used to measure portfolio risk (Pr), such as weight concentration (HHI), average correlation (ρ_{ij}), average variance (σ^2), and average standard deviation of returns (σ). The HHI shows that five portfolios are highly concentrated, i.e., portfolio A1 (HHI = 6626.5), followed by portfolio A5 (HHI = 4971.3), portfolio A7 (HHI = 4314.1), portfolio A3 (HHI = 4138.8), and portfolio A6 (HHI = 3298.2). The BSE index, i.e., portfolio A8, has a moderate degree of concentration, where HHI is 1571. Portfolios C, A4, and A2 are sufficiently competitive, with HHI lower than 1500 points. Portfolio A1 (SAX) holds the highest level of concentration, while portfolio C (hypothetical CEE Index) holds the lowest.

Table 4 indicates the correlation matrix of the companies listed on the Prague Stock Exchange (PSE) – portfolio A3. On average, all portfolios contain a positive correlation (Avg. ρ_{ij}), increasing portfolio risk (Pr). The lowest average positive correlation is for portfolio A7 ($\varphi_{ij} = +0.03$), tracked by portfolio A1 ($\varphi_{ij} = +0.04$), portfolio C and A6 ($\varphi_{ij} = +0.05$), while portfolio A5 ($\varphi_{ij} = +0.39$) is at the end.

The Ljubljana Stock Exchange (LJSE), i.e., portfolio A7, holds the lowest positive average correlation, while the Bucharest Stock Exchange (BVB), i.e., portfolio A5, has the highest positive average correlation. Uncertainties created by price changes are an additional element that influences portfolio risk (Pr). The average standard deviation (Avg. σ) is measured by the weekly returns of each firm listed in the respective portfolios. The index with the highest degree of volatility is portfolio A7 ($\sigma = 5.5\%$), followed by portfolio A6 ($\sigma = 4.3\%$); portfolio A3 ($\sigma = 2.4\%$) has the lowest volatility level.

Table 2. Descriptive statistics of eight CEE stock markets (2018–2019)

	SAX	BUX	PSE	WIG20	BVB	ZSE	LJSE	BSE	Unified CEE Stock Market
Mean	0.6107	0.1527	–0.0761	–0.1083	0.1078	0.0600	0.1143	–0.1034	0.1591
Median	0.6301	–0.2905	–0.0890	–0.1753	0.1809	–0.2971	0.0543	–0.1047	–0.14464
Std. Dev.	4.3770	4.2802	2.4840	4.2366	3.4115	4.3868	5.6421	2.8734	0.0372
Skewness	0.7919	0.8056	0.0558	0.1358	–0.7823	0.9985	–0.2001	0.4289	0.3157
Kurtosis	6.2138	7.4420	6.5175	3.9996	9.9702	9.3405	11.8343	7.7933	7.3630
Jarque-Bera	20.030	215.5373	3.3085	16.1479	282.5676	512.7496	385.8383	206.747	226.081
Probability	0.2361	0.0607	0.0031	0.3236	0.0000	0.1010	0.0000	0.0703	0.1302
Observations	936	936	936	936	936	936	936	936	936

Source: authors' calculations based on the Thomson Reuters Eikon database [EViews output].

Table 3. The main components used for measuring portfolio risk (*Pr*)

	Indexes	HHI	*Pr*	Avg.σ	Avg.σ_{ij}	Avg.σ^2	*war*
Portfolio A1	SAX	6626.5	2.7%	3.4%	0.04	0.00354	–0.12
Portfolio A2	BUX	1290.9	2.3%	4.2%	0.11	0.00248	0.41
Portfolio A3	PSE	4138.8	1.7%	2.4%	0.14	0.00065	0.02
Portfolio A4	WIG20	1183.4	2.5%	4.2%	0.25	0.00185	–0.22
Portfolio A5	BVB	4971.3	2.9%	3.3%	0.39	0.00121	0.39
Portfolio A6	ZSE	3289.2	5.5%	4.3%	0.05	0.00246	0.64
Portfolio A7	LJSE	4314.1	1.9%	5.5%	0.03	0.00495	0.07
Portfolio A8	BSE	1571.2	1.4%	2.8%	0.06	0.00096	–0.05
Portfolio C	CEE index	951.1	2.1%	3.7%	0.05	0.00169	0.07

Source: authors' own elaborations based on the Thomson Reuters Eikon Database (2020).

Portfolio A6 ($Pr = 5.5\%$) has the highest level of diversification risk, followed by portfolio A5 ($Pr = 2.9\%$), portfolio A1 ($Pr = 2.7\%$), and finally portfolio A8 ($Pr = 1.4\%$). The lowest level of portfolio risk is generated by the Bulgarian Stock Exchange (BSE), i.e., portfolio A8. In contrast, the Zagreb Stock Exchange (ZSE) – portfolio A6 – holds the highest level of portfolio risk ($Pr = 5.5\%$), but it also offers the highest weekly weighted average return ($war = 0.64$).

Table 4. Descriptive statistics and matrix of correlations between companies listed on the PSE

	Variance	Standard deviation	VIF	Tolerance	1	2	3	4	5	6	7	8	9	10	11
1. CEZ as (*p-value*)	35.2793 ---	5.9396 ---	1.1673 ---	0.8566 ---	1 ---										
2. Erste Group (*p-value*)	15.7561 ---	3.9693 ---	1.5587 ---	0.6415 ---	0.09260 (0.3498)	1 ---									
3. Komercni Banka (*p-value*)	40.5521 ---	6.3681 ---	1.3719 ---	0.7289 ---	0.27718 (0.0044)	0.22527 (0.0215)	1 ---								
4. O2 (*p-value*)	24.9556 ---	4.9955 ---	1.0937 ---	0.9143 ---	0.05518 (0.5779)	0.10537 (0.2871)	−0.0342 (0.7296)	1 ---							
5. VIG (*p-value*)	22.4651 ---	4.7397 ---	1.4466 ---	0.6912 ---	0.06797 (0.4931)	0.51060 (0.0000)	0.18861 (0.0552)	0.08762 (0.3764)	1 ---						
6. Moneta (*p-value*)	23.8961 ---	4.8883 ---	1.3582 ---	0.7362 ---	0.17680 (0.0726)	0.29334 (0.0025)	0.41501 (0.0000)	0.11980 (0.2258)	0.24257 (0.0131)	1 ---					
7. Philip Morris CR (*p-value*)	27.8426 ---	5.2766 ---	1.1779 ---	0.8489 ---	0.05989 (0.5459)	0.03956 (0.6901)	0.24535 (0.0121)	0.14246 (0.1491)	0.05780 (0.5601)	0.20558 (0.0363)	1 ---				
8. CEM Enterprises (*p-value*)	8.5849 ---	2.93 ---	1.2766 ---	0.7833 ---	0.06180 (0.5331)	0.28540 (0.0033)	0.21576 (0.0278)	0.05981 (0.5465)	0.22189 (0.0236)	0.28113 (0.0038)	0.26993 (0.0056)	1 ---			
9. Stock Spirits (*p-value*)	12.5655 ---	3.5447 ---	1.0895 ---	0.9178 ---	0.18438 (0.0610)	0.00202 (0.9837)	0.09845 (0.3201)	0.07093 (0.4742)	0.15803 (0.1091)	0.13766 (0.1634)	0.07390 (0.4559)	0.06146 (0.5353)	1 ---		
10. PFNonwovens (*p-value*)	41.1666 ---	6.4161 ---	1.1412 ---	0.8762 ---	0.19756 (0.0444)	0.19424 (0.0482)	0.02212 (0.8236)	0.07157 (0.4703)	−0.0054 (0.9566)	0.08376 (0.3979)	0.01159 (0.9072)	0.16483 (0.0945)	−0.0324 (0.7441)	1 ---	
11. Kofola (*p-value*)	16.7065 ---	4.0873 ---	1.0381 ---	0.9632 ---	0.04609 (0.6422)	0.07644 (0.4405)	0.09732 (0.3257)	0.04542 (0.6471)	0.08479 (0.3921)	0.08045 (0.4168)	0.05374 (0.5879)	0.09493 (0.3378)	0.05648 (0.5692)	−0.0997 (0.3137)	1 ---

Source: authors' own calculations based on the Thomson Reuters Eikon Database [EViews output].

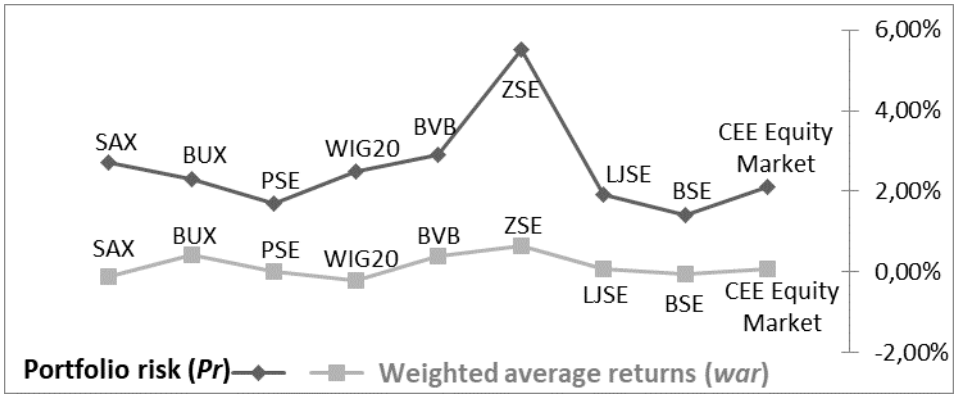

Chart 1. The relationship between weekly weighted average returns (*war*) and portfolio risk (*Pr*)
Source: authors' calculations based on the Thomson Reuters Eikon Database (2020).

Chart 1 shows the relationship between portfolio risk (*Pr*) and the weekly weighted average return (*war*) of the selected portfolios. The graph indicates that the relationship between risk and return in most portfolios is in line with portfolio theories (the risk level is offset by return benefits). Switching from BUX to PSE, the portfolio risk decreases, but the weekly weighted average returns. In contrast, if we move from PSE to WIG20, the portfolio risk increases and the returns fall; the same happens with SAX. The exception is ZSE, where the higher portfolio risk is not offset by the same increase in the weekly weighted average returns. The portfolios where the risk-return tradeoff is in line with portfolio theories are BUX, PSE, BVB, LJSE, BSE, and the hypothetical CEE Index. Meanwhile, portfolios that go against portfolio theories are ZSE and SAX.

Diversification benefits of a unified hypothetical CEE equity index

This section analyzes the benefits of a unified stock market in terms of portfolio risk, volatility, weekly weighted average returns, and concentration level. As can be seen from Chart 2, some countries benefit from stock market unification while others do not. Countries that benefit in terms of portfolio risk (*Pr*) from the stock market unification are portfolios A1 (SAX), A2 (BUX), A4 (WIG20), A5 (BVB), and A6 (ZSE). Portfolio C is 10% less risky than A2, 19% less risky than A4, 29% less risky than A1, 38% less risky than A4, and 162% less risky than A6. In contrast, portfolios that do not benefit from the stock market unification are A8 (BSE), A7 (LJSE), and A3 (PSE). However, portfolio C is 10% riskier than A7, 19% riskier than A3, and 33% riskier than A8.

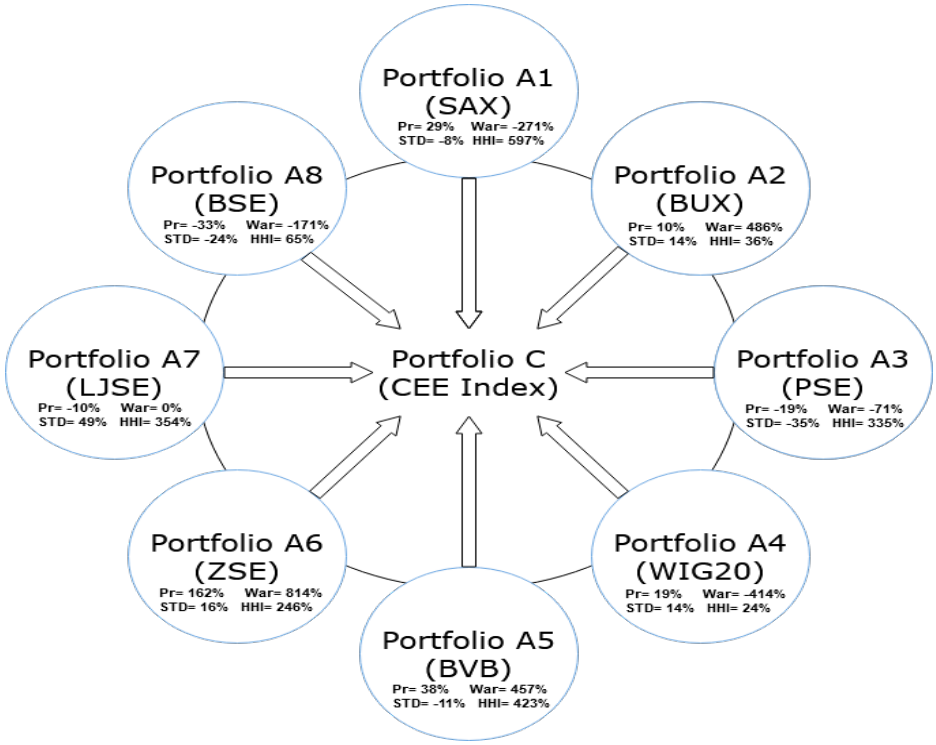

Chart 2. The benefits of a common equity index in terms of risk, returns, volatility, and concentration level
Source: authors' calculations based on the Thomson Reuters Eikon Database (2020).

Analyzing the weekly weighted average returns, three portfolios will realize higher weekly weighted average returns while the other three will have lower weekly weighted average returns from unification. Portfolios that might enjoy higher weekly weighted average returns from unification are A8 (BSE), A4 (WIG20), and A1 (SAX). In contrast, portfolios like A2, A5, and A6 do not benefit from unification since they already hold better returns than the hypothetical portfolio C. Portfolio A7 (LJSE) has identical weighted average weekly returns with portfolio C.

Portfolios that benefit from the unification of stock markets in terms of the standard deviation of returns (STD) are A1, with an 8% decrease in STD, A5, with an 11% decrease, A8 with 24%, and A3 with 35%. In contrast, portfolios that do not benefit from the unified stock market in terms of STD are portfolios A2, A4, A6, and A7. The level of concentration measured via the HHI Index declines for all selected stock markets when pooled into a single equity market.

Table 5. The weights of the largest companies in their national indexes and within the hypothetical CEE index

Company Names	Weights (portfolios)	Weights (CEE exchange)
Tatry Mountain Resorts as (SAX)	80.50%	1.32%
Opus Global Nyrt (BUX)	16.20%	1.51%
Moneta Money Bank as (PSE)	61.80%	2.70%
Tauron Polska Energia SA (WIG20)	22.80%	11.60%
OMV Petrom SA (BVB)	64.20%	22.20%
OT Optima Telekom dd (ZSE)	52.10%	0.15%
Krka dd Novo Mesto (LJSE)	59.40%	3.11%
Industrial Holding Bulgaria AD (BSE)	27.60%	0.11%

Source: authors' calculations based on the Thomson Reuters Eikon Database (2020).

Table 5 shows that some companies lose their weights from the stock market unification. Moneta Money Bank's market position drops from 61.8% to 2.7% within the CEE index. The market position (weights) of Polish company Tauron Polska Energia declines from 22.8% to 11.6% during the transition to the hypothetical CEE equity market. In this aspect, a common CEE equity market is not in favor of companies listed on the national stock markets, as they lose their visuality from the unification process.

Conclusion

Capital markets are an important pillar for generating a competitive environment within the financial system. The stock markets of CEE countries are characterized by a low level of efficiency, which indicates that not all events are integrated into stock prices. Unification might increase trade volume, harmonize transaction costs, and eventually increase the efficiency of CEE equity markets. This paper compares risk returns tradeoffs based on the diversification techniques related to the selected CEE stock markets. The study also analyzed which countries benefit and which do not in terms of diversification risk from the stock market unification. Selected equity markets are considered as separate portfolios based on the listed firms during 2018 and 2019. Based on the HHI, eight portfolios have a high concentration level where a limited number of firms influence the entire stock market performance. The unified hypothetical CEE equity market reduces the concentration of all selected exchanges but diminishes the importance of large companies.

The correlations between assets influence portfolio risk, where the BVB Index has the highest average positive correlation while the LJSE has the lowest. In terms of volatility, the LJSE Index shows the highest level of STD while the PSE Index has the lowest.

The first research question addressed the separate portfolio risk of the eight selected CEE equity markets. In response to the first research question, the index with the

highest portfolio risk is ZSE, followed by BVB, SAX, and finally BSE Index. However, while the ZSE Index has the highest portfolio risk, it also offers the highest weekly weighted average returns.

The second research question raised the issue of diversification benefits from a single equity market for the selected CEE countries. Portfolio C, i.e., the hypothetical CEE equity market, does not reduce the portfolio risk of the overall selected exchanges. Therefore, after stock market unification, the portfolio risk increases for some countries while it decreases for others. The equity exchanges that benefit from unification in terms of portfolio risk are SAX, BUX, WIG20, BVB, and ZSE. However, for equity exchanges where the portfolio risk increases from unification are BSE, LJSE, and PSE. The increase in the size of the stock market generated by the unification may reduce its volatility. For some indexes, such as BUX, WIG20, ZSE, and LJSE, volatility increases from the unified stock market. However, the unified CEE index eliminates the important position of many listed firms that hold on to their national stock markets.

The results contribute to the ongoing discussion on the EU's capacity to create a single equity market. However, the results are limited solely to the risk-return tradeoffs of a possible common equity market in the selected CEE countries.

The complexity of stock market unification in CEE countries is also related to different transaction costs and diverse financial reporting standards. Furthermore, some of the member countries have national currencies and unique taxation systems that are not covered in our study. The results include only data for 2018 and 2019; to have a better understanding of risk outcomes, it would be preferable to compare historical trends. Stock market unification cannot be viewed only in terms of economic benefit, but also the cultural context and political differences. Moreover, stock markets are symbols of the national economy, which can hardly be merged under a unified, organized exchange. The European Commission's idea to operate within a unified capital market is an ambitious project that requires a more integrated approach to the problem and not just a financial one.

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Perspektywy dywersyfikacji jednolitego rynku akcji: analiza na przykładzie wybranych krajów Europy Środkowo-Wschodniej

Opracowanie przedstawia analizę korzyści płynących z istnienia jednolitego rynku akcji dla ośmiu rynków akcji z Europy Środkowo-Wschodniej w kontekście ryzyka dywersyfikacji. Dla celów analizy każda giełda została potraktowana jako osobny portfel obejmujący spółki notowane w latach 2018–2019. Do identyfikacji ryzyka ośmiu rynków akcji z Europy Środkowo-Wschodniej wykorzystano techniki dywersyfikacji portfela. Wyniki analizy wskazują, że rynkiem akcji o najniższym ryzyku dywersyfikacji była Giełda Bułgarska, następnie Giełda Papierów Wartościowych w Pradze, Giełda Papierów Wartościowych w Lublanie i Giełda Papierów Wartościowych w Zagrzebiu. Portfel zbudowany z akcji Giełdy Papierów Wartościowych w Zagrzebiu niósł ze sobą najwyższe ryzyko portfela, ale jednocześnie oferował również najwyższe tygodniowe średnie ważone zwroty. Rynki akcji, na których doszło do zmniejszenia ryzyka portfelowego w wyniku ujednolicenia, to Giełda Papierów Wartościowych w Bratysławie, Giełda Papierów Wartościowych w Budapeszcie, Giełda Papierów Wartościowych w Bukareszcie, Giełda Papierów Wartościowych w Warszawie i Giełda Papierów Wartościowych w Zagrzebiu. Indeksy, dla których wzrastało ryzyko portfela w momencie ujednolicenia, dotyczą Bułgarskiej Giełdy Papierów Wartościowych, Giełdy Papierów Wartościowych w Lublanie i Giełdy Papierów Wartościowych w Pradze. Z perspektywy zarządzania, inwestujący w instrumenty finansowe zyskują nowe spojrzenie na możliwości dywersyfikacji oferowane w ramach hipotetycznego jednolitego rynku akcji w Europie Środkowo-Wschodniej.

Słowa kluczowe: możliwości dywersyfikacji, rynek giełdowy Europy Środkowo-Wschodniej, korzyści z ujednolicenia, bilans korzyści i ryzyka

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The Economic Performance of Central Europe Metropolises. A Comparative Approach

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Abstract

Since the fall of communism, the big cities of Central Europe have been included in the international metropolitan network, and their economic performance has improved significantly. Based on that, it can be asserted that the whole region is undergoing a process of metropolisation, which may be manifested by a focus of development in the limited areas of metropolises. Therefore this paper aims to present the results of a closer examination of this process in Central Europe. It is based on a comparative analysis of the metropolises in relation to their countries in terms of economic performance. A taxonomic approach based on Hellwig's development pattern is adopted. The available Eurostat data (NUTS 3 level) on a range of socio-economic characteristics is used. The study results show that the economic performance of Central European metropolises is relatively closer to Western Europe's cities than the countries' non-metropolitan parts. Highlighting development issues in Central Europe from the spatial-metropolitan point of view is the paper's added value.

Keywords: metropolises, Central Europe, metropolisation, taxonomy

JEL: F60, O18, R19

Introduction

Traditionally, the EU economy is seen as a community of nation-states that intensify their cooperation but are still different regarding economic performance. Some more spatially oriented authors argue that this view is abstract in the absence of trade barriers and the free movement of capital, services, and labour. A better way of looking at the European economy would be to understand it as spatially connected production systems or an archipelago of metropolitan centres (Krätke 2007, p. 26).

As the integration of the New Member States from Central Europe (CE) into the single market advances, a convergence process between them and the "old EU" is often emphasised. From a spatial point of view, a question that arises naturally is whether this relatively fast growth in the east is focused in big cities or if it appears more equally in space. As the first option could be called metropolisation, this study will first describe the basic features of metropolises and metropolitan growth sources. Then, metropolisation will be explained, and contemporary literature on the metropolises of CE will be reviewed. In the empirical part, the performance of metropolises and non-metropolitan regions of different EU parts will be considered. It will make it possible to address the research question: Is the economic performance of CE metropolises relatively closer to the cities of Western Europe (WE) than the performance of the non-metropolitan parts of their countries? The results of both the theoretical and analytical parts will be used in the final reflection of CE's development. The paper's added value is that it brings spatial and metropolitan arguments to the discussion on the development issues in Central Europe.

Metropolises and metropolisation – basic definitions and features

Common sense suggests that a metropolis is an area of a big city plus its suburbs[1]. However, the literature shows that metropolitan status depends more on functional characteristics than physical or demographic size. Some of those metropolitan features will be briefly described below.

What primarily distinguishes metropolises from any other big agglomeration is that the former performs high-order economic, political, administrative, social and cultural functions (Parysek and Mierzejewska 2006, p. 302). This ability is based not only on the size of the metropolis but also on its structure. A metropolis is a complex of economically diversified districts that enable a high degree of the social division of labour (Angotti 1995, p. 627). This transfers into a unique offer both in the field of consumer goods and activities, as well as the conditions for business activity.

1 For convenience, metropolises in this study will also be referred to as cities.

Another feature of metropolises is that they tend to be connected by flows of information (Förster and Mainka 2015, p. 1895), money, people, goods and services relatively stronger than other areas. Unrestricted flows of those factors allow for interdependence and specialisation of metropolitan areas that are often referred to as a "global network of cities" or "global cities" (Roberts 2005, p. 111). This network of inter-connected cities is often seen as essential in the current phase of globalisation (Taylor 2004, p. 55).

Even though the degree of connections between cities depends strongly on contemporary technology, the importance of big cities and their links is nothing new. Historically, a significant part of socio-economic processes took place in cities, and capital was also accumulated there (Garza 1999, p. 149). As some authors phrase it, cities were the spaces where "creative destruction" took root (Boudreau et al. 2007, p. 31). Political, sociological and economic changes did not come to the cities from the outside, but they were conceived and implemented inside. Next, those changes were passed to other cities and, later on, to other areas. New technologies and production systems were introduced early in the cities because the most intensive networking also took place there. Cities always seem to provide a socio-spatial milieu that is flexible in coordinating wages, industrial relations, consumption modes and political power (Cho 1997, p. 195).

As activity tends to cluster in cities, this leads to disparities between them and non-metropolitan and, especially, rural areas. Even though some living costs may also be higher in cities, the urban wage premium may also exist. One study estimated it to be 21% (Łaszkiewicz 2016, p. 865). This premium may encourage employees to move to metropolitan areas, enriching the labour markets. On the other hand, employers may focus their most demanding, and therefore, highly paid, jobs in those areas. This way, "cumulative causation" fuels cities' growth (Krugman 1997, p. 17).

This clustering of populations and activities in and around large cities is referred to as metropolisation (Fuguitt, Heaton, and Lichter 1988, p. 115). In contemporary discourse, this process is often connected with globalisation, and the links between those processes are often emphasised. Some authors see metropolisation as "an urban counterpart of globalisation" (L'Hostis 2009, p. 434). To take advantage of globalisation, i.e., to become a metropolis, a city needs to create and develop new activities and attract, adapt, and continuously change due to its internal economic diversity and accumulated capital (Gaussier, Lacour, and Puissant 2003, p. 253).

On the one hand, metropolisation means spatial fragmentation and discontinuity, and it creates "porosity", but on the other hand, it can also increase the resilience of economies (Pessoa, Altes, and Tassan-Kok 2015, p. 1). It was argued, even historically, that critical assets, activities and processes tended to concentrate in metropolises. As the most diversified and fast-advancing parts of economies, metropolises can reinforce those economies. They seem to be inevitable, especially for modern services and advanced industries. Based on these arguments, Short (2012, p. 6) called big metropolitan areas "new building blocks" of economies.

Some studies that can today be seen as classical in the field indicate firms' internationalisation as the driving force of metropolisation. Foreign companies tend to lo-

cate in large cities, and this trend is strongest in the case of headquarters and financial branches (Rozenblat and Pumain 1993, p. 1706). Those companies bring capital, but also technology and organisation, and, crucially, their presence makes a city a part of the global corporate network.

However, metropolisation is not limited to inter-city connections. It also works on the intra-metropolitan level and alters the spatial pattern of cities. One study suggests that the functional division of labour is reinforced inside cities because of the business service sector's growth. This, in turn, leads to so-called "pericentral" spatial development, where the business specialisation of particular districts is relatively high (Halbert 2007, p. 89).

A metropolis does not need to be monocentric. Metropolisation can be seen as the functional, cultural and institutional integration of nearby cities to benefit from agglomeration advantages. The initial cities can, in a sense, "borrow the size from each other", and this can be a stimulus that allows them to be more competitive in a globalised world. The metropolis that grows this way will probably be based on more than one initial city, so it will be polycentric (Meijers, Hoogerbrugge, and Hollander 2014, p. 53).

An issue that should be clarified here is that metropolisation is more than just a part of the urbanisation process. Even though on the grounds of theory it should be clear that the distinction between the two processes is more than just their scale, there is also other evidence to prove it. The authors of one study on metropolises focus on the city size in terms of population, showing two interesting features derived from empirical data. The first is that in relatively smaller countries, the importance of metropolises is higher than in larger ones. They understand this importance as the size of the main city in comparison to the whole urban population. This means that in relatively small countries, a big enough metropolis is necessary to perform all the metropolitan functions, including hosting international companies. The second regularity is that during long periods and in different countries, the size of metropolises tends to grow faster than the overall size of the urban population. Thus, even though urbanisation is an inevitable counterpart of development, metropolitan growth is connected even more strongly with advances of economies (Pumain and Moriconi-Ebrard 1997, p. 313). It may be because the goods and services of the highest order tend to be completely concentrated in the most important cities, making "ordinary cities" just the receivers. In this tone, metropolisation can be described as "a higher stage of urbanisation", in which the importance is crucial (Viturka et al. 2017, p. 505).

One of the consequences of metropolisation is the pressure to increase the political importance of metropolises. As some argue, cities may gain more political power in unitary states, whereas in more federal ones, their power will be limited by regional governments' powers, such as lands, cantons or regions (Kübler, Schenkel, and Leresche 2003, p. 276).

Metropolisation in Central Europe

After this brief characterisation of metropolises and metropolisation, it is possible to take a closer look at this process in CE. It could be interesting because this region was included in the world network of economies in the 1990s, while in the West, this stage of globalisation started after World War II . Thus, it can be safely stated that both globalisation and metropolisation in CE might still be different when compared to WE.

The fact that metropolisation is a part of CE's spacio-economic reality has been shown from different angles. Smętkowski used data for the first decade of the 21st century and showed that metropolisation is indeed being pursued in the CE region. He suggests that it is mainly based on metropolises' ability to attract investments in advanced services and innovative manufacturing. However, it is especially interesting that this process applies not only to the capital cities, which are usually the biggest in terms of population, but there is also diffusion of this development model in space, at least to some degree (Smętkowski 2013, p. 10).

On the other hand, Pumain and Rozenblat, who focused on the spatial character of metropolisation, show that this diffusion is indeed limited and metropolisation in CE differs from WE. They explored the relationship between city size and its metropolisation status, and they showed that it is much more robust in CE than in Western Europe. As a rule, the biggest cities in particular countries tend to demonstrate a metropolitan status (understood in the study in a functional way), and those metropolises do not cluster together spatially. In WE, in turn, cities follow a more centre-periphery pattern, which means that the most important cities tend to cluster in the centre of this region. It may genuinely validate the statement that metropolisation in CE is still at a different stage than in WE. Pumain and Rozenblat also argue that their results show two more things. First, they show a paradox because, before opening themselves up to globalisation, the structure of cities in CE was less hierarchical than today, almost thirty years later. Second, in their opinion, this highly hierarchised "archipelago-like" character of metropolisation may not only indicate a delay in comparison with the West, but it can also be a permanent feature of the different structures of CE economies (Pumain and Rozenblat 2019, p. 1659).

Šauer analysed CE metropolises in the light of the tourist market, as it can be a metropolitan status symbol. In particular, the study was based on tourist network connections, and it reveals that thirty years since the beginning of free international integration, the division between WE and CE still exists. The most important tourist cities in CE are, according to the methodology that was used, Prague and Budapest. Of the Polish cities, only Warsaw and Kraków can be seen as becoming parts of the world tourist city network (Šauer and Bobková 2018, p. 136). It can be stated that metropolisation understood this way is progress in CE, although still far from maturity.

Another study of inter-city connections was based on a more general approach that recalls the role of advanced services and innovative industry in metropolitan growth.

In this case, the advanced producer services and R&D sector cooperation network was examined. The results revealed the existence of strong ties between mostly big CE capital cities. It is another sign of metropolisation in the region seen from the point of view of strong links between metropolises (Kramar and Kadi 2013, p. 196).

Another study of metropolisation patterns was conducted for the Czech Republic. The authors generally see the Czech Republic as following the metropolisation pattern of WE. In particular, they draw a picture of metropolisation taking place mainly in the Prague and Brno regions and argue that this trend of metropolitan development is going to prevail in the future (Maier and Franke 2015, p. 118). Those conclusions seem to be in accordance with other studies.

An interesting observation was also made in another study. Smętowski examined the influence of the 2008 financial crisis on metropolisation in CE. The results show that the crisis did not change the overall trend, at least in the capital cities. A large share of business services turned out to be the driving force of the metropolitan growth, which did not stop during the crisis (Smętkowski 2015, p. 50). The long-term factors behind metropolisation seem to be stronger than the effects of business cycles. It can be even argued that the West's financial constraints may work as an incentive towards cost-cutting investments in CE.

Further advances in metropolisation can also be found in studies that provide predictions of the future development of spatial processes. One of them was prepared for metropolitan development in Poland. As a probable scenario, it points to continuing, but decelerating metropolisation. In its authors' opinion, this scenario should be considered the reference in the investigations and policy-related studies (Korcelli-Olejniczak and Korcelli 2015, p. 119). In our opinion, whether and to what degree this deceleration will be seen remains one of the most interesting in the field of metropolitan studies in Poland.

Besides the research considering general patterns of metropolisation in the whole CE or particular countries, there is another approach to this process, based on case studies of particular metropolitan regions. A brief review of those studies will help complete the picture of the current state of metropolisation in CE.

One study by Egedy et al. is based on a case study of Budapest. Although metropolisation could be noticed to some extent in communist times, its contemporary magnitude only came after the fall of this system. This process was instantly driven by market forces that were released in the 1990s. They emphasise that any policy attempts in this field had only a follow-up character. There was no conscious strategy towards using the city's potential to increase its competitiveness based on metropolisation (Egedy, Kovács, and Csaba Kondor 2017, p. 27).

The Upper Silesian conurbation in Poland can be shown as an almost opposite example, at least formally. A supra-local administrative structure consisting of cities and surrounding areas was created and called the "Upper Silesian Metropolis". In practice, the initial phase of metropolisation can be fully observed only in Katowice. Some signs of institutional infrastructure can be found in other cities belonging to this as-

sociation, although it is too early to say that the whole area is a functional metropolis (Szajnowska-Wysocka and Zuzańska-Żyśko 2013, p. 122). It can be pointed out that the local governments' active fostering of metropolisation may prove successful as an idea of restructuring the post-industrial area of Upper Silesia.

Spatial signs of metropolisation can also be seen in Warsaw, and they are mainly driven by market forces. The results of a study by Kwaśny et al. can be summed up in a statement that this city follows a "pericentral" development pattern. This kind of pattern was mentioned before as being characteristic of the big metropolitan area of Paris. It is also possible to connect it with the theory of clusters, as well as urban externalities (Kwaśny, Mroczek, and Ulbrych 2019, p. 111), which allows us to say that it is one of the symptoms of ongoing metropolisation. On the one hand, the location pattern resembles western metropolises; on the other hand, it shows some local features. Professional services prefer the central district, but other, mostly creative services tend to form clusters outside the centre. Kwaśny et al. direct attention to the fact that in post-socialist cities, car dependency is relatively high. Nevertheless, as it was argued, the "pericentral" pattern is more the norm than the exception in the case of metropolises (Smętkowski, Celińska-Janowicz, and Wojnar 2021, p. 10).

According to another study, Krakow and its surroundings are undergoing the same kind of spatial changes. The recent development of the area can be referred to as "pericentral", and it is important to emphasise that this process goes beyond suburbanising the same fraction of inhabitants. Suburbanisation also includes businesses, both production and some kinds of services. A second sign of gaining metropolitan status is that the functional relationships between Krakow and other urban centres are growing in meaning. It refers not only to local connections but to the growing network links with other important cities in Poland (Kurek, Wójtowicz, and Gałka 2017, p. 47).

Both case studies and works based on a more general approach confirm that CE is an area in which metropolisation is taking place. This process bears common features of metropolisation in other parts of the world, yet it is also unique due to the region's recent economic history. However, the picture of metropolisation in the region is not complete, and empirical questions are waiting for an answer. One possible direction for research is the links between metropolises and other parts of the country.

The trivial statement that there is always a division between metropolitan and non-metropolitan (or just rural) areas is not enough. Metropolises can also spread the development to those latter areas, and this diffusion is what is often expected. In other words, the question is not if CE metropolises are ahead of their countries, which is evident in the light of the very definition of metropolisation. The more appropriate problems to study are the relative positions of CE metropolises in relation to their western counterparts and the signs of the development spreading from the CE metropolises to the rest of the country. Those problems can be addressed by the question: Is the economic performance of CE metropolises relatively closer to the cities of WE than the performance of the non-metropolitan parts of their countries. This question will be dealt with below.

Methodological context

The study's primary geographical area comprises the following Central European countries: Croatia, Slovenia, Slovakia, Estonia, Latvia, Lithuania, the Czech Republic, Bulgaria, Romania, Hungary and Poland, which are all New Members States of the EU. As a reference, the countries of the EU–15, referred two as Western Europe, are used. Those countries are divided into two groups, based on differences in economic performance related to their geographical locations. The first one is referred to as Northern Europe, and comprises France, Finland, Denmark, Sweden, Germany, Austria, Belgium, the United Kingdom, the Netherlands and Ireland. The countries belonging to the second group are as follows: Italy, Spain, Greece, Portugal and Malta, and this group are called Southern Europe.

As was demonstrated, the understanding of metropolises is primarily based on their socio-economic functions and structure. This is why most authors that deal with urban topics prefer to use functional rather than administrative approaches to delimitate city boundaries. In this study, large metropolitan areas – not only city cores – will be considered. They will be called "cities" or "objects" (of the study) for convenience.

Preparing the list of objects to study is often the first step of any study. In the case of metropolises, however, this is not an obvious procedure. The authors of different studies use various criteria in this case. For example, the Urban Audit report provided by Eurostat includes 52 "principal metropolises". As its authors mention, they chose to study actual metropolises, in other words, the most important and developed cities (RWI 2010, p. 10). However, this choice is not appropriate for this study, as it excludes cities that are not "metropolitan enough".

Therefore, the decision was made to rely on a simple demographic criterion and study all the cities that met it. Eurostat provides a list of 268 metropolitan NUTS3 level areas in Europe defined as cities and their commuting zones that comprise at least 250 thousand inhabitants (Eurostat 2013). However, this number of objects seems to be far too big for this kind of study, and it is hard to consider the smallest areas as being comparable to the biggest ones. So, the list was narrowed to metropolitan areas inhabited by at least one million people, plus four smaller capital cities from CE, which together made 87 objects to study.

After choosing the objects, a statistical comparison of them could be planned. Hellwig's development pattern, which is a synthetic measure, was used as the primary method. It is a taxonomic approach that makes it possible to rank the objects under consideration according to several different features, which do not need to be of the same kind or unit. Based on the literature review, six indicators were initially chosen for which the data could be found in the Eurostat database. Those indicators can also be called features of the objects under consideration, or diagnostic variables. They are presented in Table 1.

Table 1. The initial diagnostic variables

Symbol	Description	Unit
X1	Gross Domestic Product in Purchasing Power Parity	Euro
X2	Employment in: financial and insurance activities; real estate activities; professional, scientific and technical activities; administrative and support service activities	% of total employment
X3	Gross Value Added in: financial and insurance activities; real estate activities; professional, scientific and technical activities; administrative and support service activities	% of total GVA at basic prices
X4	Number of patents	Per 10,000 inhabitants
X5	Unemployment rate	%
X6	Employment rate	%

Source: own preparation.

The GDP and labour market variables (X1, X5 and X6) were chosen to indicate the general economic performance. The other variables (X2, X3 and X4) can be called structural, as they represent the objects' structural state. This way, a broader comparison, addressing not only growth but also development, could be performed.

The Eurostat database was the source used in this study, as it allows the user to download data directly for the metropolitan areas mentioned above. In several cases (for the number of patents and unemployment), it was necessary to add values from the general regional database. As the latter were also provided at the NUTS3 level, this did not disturb the integrity of the total data. The intention was to use the most up to date data; however, the availability of this data differed, depending on its character. It ranged from 2012, in the case of the number of patents, to 2015–2017 for GDP and the chosen sections of economic activity, to 2019 for the labour market data. As can be seen, data availability was far from ideal. However, the data for all objects were collected from one source, which ensured comparability, and the overall score is up to date. The data were available for all of the objects for most of the variables; only for X2 and X6 were data missing for several objects.

Having collected the data, the procedure was first to eliminate the unnecessary variables and normalise them to make them comparable. It was then necessary to calculate the synthetic measure for each city and compare the groups of cities. The same was then done for the non-metropolitan regions of the member states, making it possible to draw some conclusions on the cities' condition compared to their countries' condition.

The basic idea in constructing a synthetic measure is to use several variables, all of which should have a high informational value. To control for it, first, the variability coefficient for each variable was calculated. There is no set limit below which a variable should be eliminated. In this case, all of the coefficients turned out to be above 10%. So none of the variables was disqualified at this step (Murawska 2010, p. 213). However, it is worth noting that the coefficient for X6 was the lowest, equalling 13%.

Another useful fact is that if two variables are strongly correlated, it means that they provide almost the same information. One such variable can be then eliminated. The correlation coefficients for the variables are shown in Table 2.

Table 2. Coefficients of correlation for the initial diagnostic variables

Variables	X1	X2	X3	X4	X5	X6
X1	1	0.54	0.58	0.58	0.48	0.41
X2	0.54	1	0.71	0.35	0.20	0.41
X3	0.58	0.71	1	0.21	0.10	0.14
X4	0.58	0.35	0.21	1	0.27	0.38
X5	0.48	0.20	0.10	0.27	1	0.88
X6	0.41	0.41	0.14	0.38	0.88	1

Source: own preparation based on the Eurostat regional database (Eurostat n.d.).

As there is no exact number above which the correlation should be considered too high, here it was decided to use 0.7 as the border value. The correlation of X2 with X3 and also X5 with X6 is above this rate. As mentioned before, in rare cases, there is no data for X2 and X6, and the coefficient of variation for X6 is also relatively low. Therefore, those two variables could be eliminated without losses in the informative value of the final measure. Thus, the final group of variables comprises X1, X3, X4 and X5.

For all the variables except X5, higher levels are desirable. For the unemployment rate, lower levels are positive. To make this variable useful, it was developed such that higher levels would also be positive. It was done by deducting the rate of each object from the highest level noted. This way, the greatest difference was the biggest number, which was also the lowest level of unemployment.

The next step was to normalise the data in order to make the influence of all features equal. This was done by using the equation:

$$z_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}}, i = 1,2\ldots n, j = 1,2\ldots 4, \tag{1}$$

where:
z_{ij} – the value of j-feature for i-object, after normalisation,
x_{ij} – the value of j-feature for i-object, before normalisation.

The normalised values range from 0 to 1, where 0 is the worst score and 1 is the best.

In the following stage, a synthetic measure of development for each object was calculated. This measure can be verbally described as the sum of the distances of the object under consideration to the best object for each variable, formally (Krakowiak-Bal 2005, pp. 73–74):

$$d_i = 1 - \frac{c_{i0}}{c_0},\ i = 1,2\ldots n, \tag{2}$$

where:

$$c_{i0} = \left[\sum_{j=1}^{n}\left(z_{ij} - z_{oj}\right)^2\right]^{\frac{1}{2}}, \tag{3}$$

$$c_0 = \overline{c_0} + 2SD, \quad \overline{c_0} = \frac{1}{n}\sum_{j=1}^{n} c_{i0} \tag{4}$$

and:
d_i – Hellwig's development pattern synthetic measure,
c_{i0} – Euclidean distance of each z_{ij} from z_{0j} (benchmark of development),
SD – standard deviation.

The final results for each object lie basically between 0 and 1, where 1 is the highest possible score, i.e. the development benchmark. Only extremely low results can be lower than 0. In other words, the closer the score of a particular city is to 1, the better this city was ranked.

Then, to compare the results, the cities were divided into three groups, according to their countries. The first group was formed by 48 cities from Western Europe. The second was made up of cities from the south of Southern Europe (22 cities), and the third by cities from CE (17 cities). This approach was convenient to illustrate the situation of the CE cities. To draw conclusions, the arithmetic mean of Hellwig's synthetic measure of development for each group was calculated, making it possible to compare them.

After that, the whole procedure was performed for the non-metropolitan areas of the EU member states grouped the same way. The data came from the same Eurostat database, which allowed the use of the values for non-metropolitan areas, except for the number of patents, which was only available for the entire economies and used as proxies for non-metropolitan areas. Finally, it was possible to compare the results of the metropolises with the results of the non-metropolitan areas.

Results

The total scores of the metropolitan areas under consideration are presented in Table 3. The closer their score is to 1, the closer the particular city is to the ideal type. The cities are divided into three geographical areas and ordered according to the declining score.

Table 3. Final scores of the metropolitan areas (benchmark = 1.0)

Western and Northern Europe									
München	0.96	København	0.76	Lyon	0.68	Bremen	0.53	Newcastle u. T.	0.39
Stockholm	0.89	Köln	0.75	Toulouse	0.63	Strasbourg	0.51	Glasgow	0.39
Düsseldorf	0.88	Grenoble	0.72	Wien	0.62	Leeds	0.49	Liverpool	0.38
Stuttgart	0.86	Antwerpen	0.72	Malmö	0.62	Nantes	0.48	West Midlands u.a.	0.37
Nürnberg	0.85	Utrecht	0.71	Berlin	0.61	Dresden	0.46	Cardiff	0.37
Frankfurt a.M.	0.85	London	0.71	Rennes	0.60	Manchester	0.45	Rouen	0.35
Helsinki	0.82	Mannheim-Ludwig.	0.71	Göteborg	0.58	Bordeaux	0.44	Stoke-on-Trent	0.34
Paris	0.80	Amsterdam	0.70	Rotterdam	0.57	Marseille	0.44	Lille–Dunkerque–Valenciennes	0.33
Bruxelles	0.79	Hannover	0.70	Nice	0.55	Leicester	0.40	**Mean**	**0.61**
Hamburg	0.77	Bristol	0.68	Ruhrgebiet	0.55	Montpellier	0.39		
Southern Europe									
Milano	0.70	Lisboa	0.43	Bari	0.23	Murcia–Cartagena	0.10	Thessaloniki	–0.04
Torino	0.54	Barcelona	0.43	A Coruña	0.22	Catania	0.10	Napoli	–0.07
Brescia	0.51	Bilbao	0.39	Valencia	0.21	Málaga – Mar.	0.10	Mean	0.26
Roma	0.51	Athina	0.28	Oviedo – Gijón	0.17	Palermo	0.04	Distance to W. and N. Europe	0.35
Madrid	0.49	Porto	0.25	Alicante – Elche	0.15	Sevilla	–0.04		
Central Europe									
Bratislava	0.61	Budapest	0.48	Vilnius	0.37	Brno	0.26	Ostrava	0.06
Warszawa	0.58	Tallinn	0.46	Zagreb	0.35	Łódź	0.25	Mean	0.37
Bucuresti	0.56	Sofia	0.40	Kraków	0.32	Gdansk	0.21	Distance to W. and N. Europe	0.24
Praha	0.52	Riga	0.39	Poznań	0.31	Katowice	0.15		

Source: own preparation based on the Eurostat regional database (Eurostat n.d.).

The arithmetic mean of scores for the western and northern cities is vastly above the means for the southern, central and eastern cities. What is worth noting is that the latter is remarkably higher than the former. The distance of the mean score for the CE cities to the western and northern cities equals 0.24. The same distance for the southern cities amounts to 0.35. It should be pointed out that under the scheme used in this study, the CE cities are better developed than the southern cities.

In Table 4, the same procedure results for the non-metropolitan areas of the countries are presented. Comparing them with the previous results allows us to make a relative assessment of the state of the cities and the rest of their countries.

Table 4. Final scores of the non-metropolitan areas (benchmark = 1,0)

Western and Northern Europe		Southern Europe		Central Europe	
France	0.81	Italy	0.78	Croatia	0.40
Finland	0.76	Spain	0.67	Slovenia	0.40
Denmark	0.73	Greece	0.48	Slovakia	0.34
Sweden	0.68	Portugal	0.41	Estonia	0.27
Germany	0.68	Malta	0.33	Latvia	0.25
Austria	0.66			Lithuania	0.22
Belgium	0.65			Czech Republic	0.17
United Kingdom	0.63			Bulgaria	0.16
Netherlands	0.62			Romania	0.14
Ireland	0.60			Hungary	0.11
				Poland	0.09
Mean	0.68	-	0.54	-	0.23
Distance to Western and Northern Europe	–	-	0.14	-	0.45

Source: own preparation based on the Eurostat regional database (Eurostat n.d.).

Again, the mean score for the western and northern countries is higher than for the others. However, the mean for southern countries is significantly higher than for the CE countries. The distance of the CE mean score to the most developed countries' mean score is 0.22 further than for the metropolitan areas.

Conclusion

The comparison of synthetic indicators for the CE metropolitan and non-metropolitan areas in this study shows that the cities are relatively more developed than their countries. Both types of areas are less advanced than their counterparts in the west and north of Europe. However, the cities from CE are more developed than those from the south of the continent. On the other hand, the CE non-metropolitan areas remain less developed than those in the west, the north and the south. It enables us to give a positive answer to the research question of this study. Then, it can be stated that the

economic performance of CE metropolises is relatively closer to the cities of WE than the performance of the non-metropolitan parts of their countries.

The results also show that the CE metropolises are the places where globalisation transformed the structures of the regional economies in the most profound way. What is again worth emphasising is not that the structures of the metropolitan economies in CE can be referred to as more advanced than the remaining parts of their countries. This metro to non-metro relation appears everywhere. This study's critical conclusion is that the cities are much more advanced in reaching the western level, while their countries remain relatively behind.

It allows us to say that the spread of development from the CE metropolises to their countries is limited. In other words, the metropolisation process is genuinely taking place. The economically growing cities may even become the "growth poles" for their surroundings, but this effect has not yet spread to the rest of their countries. Those results, taken together with the work of Pumain and Rozenblat (2019, p. 1659) quoted before, reinforce the conclusion that metropolisation in CE is still at a different stage than in WE. In CE, it seems to be the main factor that shapes the spatial picture of economies, while in the West, a more core-periphery pattern is present.

As CE's general distances to their western counterparts – both cities and countries – remain great, shortening those distances should be seen as a priority objective. Discussing policy issues in this field is not easy, however. On the one hand, the metro to non-metro divergence may seem problematic. On the other hand, any economic policy to reduce it should be considered exceptionally cautiously. As shown in the introduction, under the highly competitive conditions of contemporary globalisation, strong metropolises are necessary for any national economy to remain competitive. Moreover, even in the West, spatial differences remain, even though they are more due to core-periphery differences.

A natural limitation of the study is that it shows a picture at a certain point in time. This picture will undoubtedly change after more years of globalisation and European integration, and knowing it will be interesting. The most promising research direction seems to be observing the diffusion of development from the metropolises, especially in the broader range.

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Osiągnięcia gospodarcze metropolii Europy Środkowej. Podejście porównawcze

Od upadku komunizmu, duże miasta Europy Środkowej stały się częścią światowej sieci metropolii, a ich rola gospodarcza znacznie wzrosła. Może to oznaczać, że region ten doświadcza procesu metropolizacji polegającego na skupianiu aktywności na ograniczonych obszarach dużych miast i ich bliskiego otoczenia. Z tego względu celem artykułu jest zbadanie procesu metropolizacji w EŚW. Badanie to jest oparte na analizie porównawczej metropolii i obszarów niemetropolitalnych pod względem poziomu rozwoju gospodarczego. W badaniu wykorzystano taksonomiczną miarę rozwoju Hellwiga. Użyto w nim danych Eurostatu (na poziomie NUTS 3) w zakresie szeregu wskaźników społeczno-ekonomicznych. Wyniki wskazują, że metropolie z regionu są bliższe pod względem gospodarczym metropoliom Europy Zachodniej, niż obszary niemetropolitalne z regionu w stosunku do ich zachodnich odpowiedników. Wartością dodaną artykułu jest spojrzenie na kwestię rozwoju regionu Europy Środkowej przez pryzmat przestrzenny i metropolitalny.

Słowa kluczowe: metropolie, Europa Środkowa, metropolizacja, taksonomia

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European Deposit Insurance Scheme(s) – Consequences for the EU's Financial Stability

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Abstract

The aim of this paper is to evaluate the potential consequences that the shortcomings in harmonising the national deposit guarantee schemes may have on the financial stability of the European Union. The relevance of this subject is underlined both by the European Commission's intention to revive the European Deposit Insurance Scheme project in 2021 and the recent signals from Germany that they are willing to support the initiative. The paper presents a review of the discussions on establishing a European Deposit Insurance Scheme, the reasons for the project's failure and the consensus solution that took the form of the Deposit Guarantee Scheme Directive (DGSD). The limited scope of deposit guarantee scheme harmonisation under this directive is discussed in the context of the related EBA opinions pointing to different areas of potential improvements. Differences in national implementation are also reviewed in terms of their potential impact on financial stability. Apart from a careful literature review, statistical analysis of the available financial information characterizing the largest national deposit schemes of the euro is performed to quantify their progress towards the target level of the available financial means. The results prove that most national schemes are still far from reaching the 0.8% target level of readily available funds and that potentially desirable amendments to the DGSD may drag them even further away from reaching that target by 2024. The author concludes that from the perspective of financial stability, the EU should focus on establishing a single scheme at an international level that would complete the project of establishing a banking union. The results contribute to the ongoing discussion on the need to further integrate the national deposit guarantee schemes inside the EU.

Keywords: EDIS, guarantee scheme, banking union, financial stability

JEL: F115, G18, G21

Introduction

Nearly ten years have passed since the establishment of the banking union. Its creation was intended to break the vicious circle between the solvency of credit institutions and taxpayer funding. In 2020, two pillars of the banking union – the Single Supervisory Mechanism (SSM) and the Single Resolution Mechanism (SRM) – were both in place. The third pillar of the banking union – the European Deposit Insurance Scheme (EDIS) – is still missing, and the harmonisation of the deposit guarantee schemes under the related directive has many flaws.

Centralised supervision under the SSM was established first, and its performance is viewed as positive, in contrast to the SRM, which is frequently described as "[…] in office, but not in power" (Garicano 2020, p. 2). The SSM's reliance on national authorities in the first years of operation can be seen as a weakness, yet it would be hard to expect the newly appointed central supervisor to have all the relevant knowledge and expertise from the outset. In the case of the SRM, the problem is that a decision on a bank's resolution has political weight, and there is still a strong preference for bailouts. The literature on the subject also underlines that different national insolvency measures tend to interfere with the latter resolution, and the entire process loses efficiency as a consequence. Failure to establish EDIS is also frequently perceived as a serious mistake that weighs on the success of the entire banking union project (Zielińska 2019, p. 178). All these drawbacks have been recognised by the European Commission, which has included a revision of the directives establishing the SSM and EDIS in their 2021 work programme.

The aim of this article is to verify the impact that the shortcomings in harmonising the national deposit guarantee schemes have on the financial stability of the European Union and whether the revision of the Deposit Guarantee Schemes Directive can effectively address any of the identified weaknesses in the future. The analysis was based on a careful literature review on the subject of financial stability and deposit guarantee schemes, as well as statistical analysis of the quantitative data characterizing existing national deposit schemes. The results contribute to the ongoing discussion on the establishment of a deposit guarantee scheme at the EU level.

Commission proposals to create a European Deposit Insurance Scheme

The term "financial stability" is often understood as the banking sector's resilience, as liquidity and business continuity within that sector can prevent panic during a financial crisis (Szczepańska 2008, p. 2008). Financial stability is often analysed in the context of optimum currency areas, where close financial integration is an important precondition of their proper functioning (Zielińska-Lont 2020, pp. 44–46). There is ample evidence of the importance of deposit guarantee schemes for financial sta-

bility. According to Large (2003, p. 2), it is trust in the banking system that conditions its stability. The existence of guaranteed deposit pay-outs increases trust in the banking system and plays an important role in facilitating bank resolution (Baudino et al. 2019, pp. 1–3). The latter is all the more important when factoring in the consequences of a negative feedback loop between the risk borne by the banking sector and the home country risk (Stawasz-Grabowska 2020, p. 42).

The first attempt to create a common deposit scheme was in 2012, when the then President of the European Council presented a proposal to create a banking union. The first action in this field was Directive 2014/49/EU on deposit guarantee schemes (DGSD), which forced Member States to create a guarantee scheme that would ensure a minimum level of deposit insurance. In this context, it is worth mentioning a study ordered by the Commission on national discretion under the DGSD (Centre for European Policy Studies 2019). The report provides a useful analysis of the degree to which the Member States can adjust the shape of their national guarantee schemes to their specific needs. A total of 22 national options and discretions (NODs) were identified and analysed in terms of the impact they have on the level of protection offered to depositors. With such a level of discretion granted to the Member States in the context of national guarantee schemes, the level of harmonisation under the DGSD was bound to be unsatisfactory from the perspective of the ambitious banking union project. Some of the most striking discrepancies between the national guarantee schemes will be analysed in terms of their impact on financial stability in chapters 3 and 4.

In 2015, the European Commission (EC) presented the proposal to establish the EDIS in a three-stage process: re-insurance, co-insurance and full insurance (see Zielińska-Lont 2020, pp. 137–141). The European Commission aimed to create a common guarantee scheme for all of the EU and to achieve this goal in stages in order to recognise the concerns of the Member States over the mutualisation of their national schemes. During the re-insurance phase, the EDIS would essentially serve as backup to the national schemes governed by the Single Resolution Board and support the loss-financing process for up to 20% of the costs incurred. In the co-insurance phase, the EDIS was to become the primary source of pay-outs, covering up to 20% of the loss incurred in the first year of operation and up to 80% of that loss in the fourth year. After that period, the full insurance phase would become a fact, and the EDIS would fully replace the national schemes and would no longer require separate contributions from the credit institutions.

Nonetheless, this proposal still encountered strong dissent from one Member State – Germany. According to Donnelly (2018, pp. 214–216), Germany raised two arguments – first of all, they were afraid that their national deposit insurance fund would be used to help other banking systems even if some of their institutions should have been resolved or closed before a common scheme was established. Secondly, they underlined the risk of a contagion effect under a common scheme. The proposal was also criticised by the European Banking Federation (2015, p. 1), which criticised the proposed pace of the reform and the non-satisfactory level of harmonisa-

tion of national schemes under the DGSD. Howarth and Quaglia (2018, pp. 205–206) argued that, in fact, it was the discrepancies between the national banking sectors and tailor-made deposit guarantee schemes that caused the reluctance to establish the EDIS. It can be argued that a common scheme disregarding the national specificities of the national banking sectors would result in an uneven distribution of the burden of the mutualised fund.

Without the consent of the Member States, the proposal was postponed for two years, and in 2017, the EC announced a second plan to create the European Deposit Insurance Scheme. In the proposal from 2017, the EC suggested that creating the deposit guarantee scheme needed more time in order to build trust in such a mechanism. Therefore, the proposal was to establish the EDIS as a loan facility that would initially support the performance of the national schemes. The second step (co-insurance), where the EDIS funds would be used first before the resources of national schemes, would only go live after a positive economic test of the EU banking sector. After the go-live, the EDIS would still initially cover no more than 30% of the loss incurred. Interestingly, the proposal did not specify how fast this loss absorption capacity would grow or when it should reach 100%. Unfortunately, despite the multiple additional precautionary measures, the EC proposal failed once again (Howarth and Quaglia 2018, pp. 190–209).

Another opportunity to return to the project of setting up the missing pillar of the banking union stems from the DGSD itself. Article 19 (6) of the DGSD obliges the Commission to report on the directive's implementation progress. To support the Commission's work in this area, the European Banking Authority (EBA) prepared three opinions that look at different areas addressed by the directive's provisions. Before these opinions are described, it should be noted that a reassuring signal was sent by the German Minister of Finance in November 2019, stating that his country should support the establishment of a common deposit guarantee scheme in order to complete the banking union and deepen the financial integration (Silk 2019).

DGSD implementation and potential impact on financial stability

The DGSD has left a lot of freedom to the Member States when it comes to the details of how national guarantee schemes function, although the directive remains an alternative solution to the far more ambitious plan of having a single deposit guarantee scheme for all of the EU (Cerrone 2018, pp. 236–237). Weak harmonisation in terms of resilient depositor protection remains a significant flaw of the increasingly interlinked financial market of the EU.

The EBA released its first opinion in August 2019, and it related to deposit eligibility, coverage level and deposit scheme cooperation (European Banking Authority 2019b). In this area, the EBA prepared a number of proposals that would lead to im-

proved harmonisation (Kozdras 2020, pp. 21–29). One area that could be addressed under the directive was providing a clear definition of how the contributions from a given credit institution are transferred between the schemes when the institution moves all or part of its activities elsewhere. Here, the EBA indicated that the way the transferred amount is calculated needs to change and requested that the European Commission confer the responsibility for defining such a methodology onto them. The Authority also signalled that the deposit guarantee schemes should cooperate closely with anti-money laundering offices to make sure that no guarantee transfers are made against deposits that may come from illegal sources. In terms of EU-third countries relations, the Authority indicated that the Directive should make it clear that no EU deposit guarantee scheme would cover any deposits held in third-country branches of EU institutions. The opinion also indicated that the DGSD should clarify that any third-country financial institution that becomes licensed by an EU Member State is automatically obliged to join the deposit guarantee scheme, unless it can prove it participates in an equivalent scheme that will protect the interests of EU depositors. In order to optimise the operational costs, it was suggested that a certain minimum threshold on deposit guarantee be established, below which no automatic repayment action would be triggered (although the funds would still be returned upon request of the owner). Amendments in the spirit of this opinion would improve the resilience of the deposit schemes and would help to reject any claims from third countries after the failure of an international financial institution.

The second opinion followed in October 2019 and related to deposit guarantee pay-outs (European Banking Authority 2019a). The DGSD defines several parameters common for all national schemes, and these include the guarantee level of 100,000 EUR and the target level of the available financial means. Certain exemptions exist to the guarantee level whereby Member States may choose to provide additional guarantees on temporary high balances resulting from:

- private real estate transactions,
- deposits that serve social purposes (e.g. marriage, retirement),
- deposits based on payment of, e.g. insurance benefits.

The Centre for European Policy Studies (CEPS) report for the Commission signalled that most Member States had chosen to implement such additional guarantees in their national schemes (Centre for European Policy Studies 2019, p. 39). One very interesting issue in this context is that the level of additional coverage varies greatly (between 30,000 EUR and an unlimited guarantee) and that, apart from Spain, this additional coverage is not factored into calculating the fund's own financial means that need to be collected ex-ante by the deposit guarantee scheme. The existence of this flexibility did not alarm the EBA since such additional protection can be facilitated through opening a dedicated account, yet the Authority suggested that the revised DGSD should harmonise the duration of the additional guarantee at six months across the EU (European Banking Authority 2019a, p. 108). In practice, some national schemes (e.g. the Dutch DGS) ensure the additional coverage only after the guarantee is activated and

the depositor notifies the authority of the temporary high balance (DNB 2019, p. 20). The consequence of such a setup is that no ex-ante contribution to the deposit guarantee scheme can be calculated, and the financial resources available to the national fund are automatically underestimated.

Another area of discrepancies between the national deposit guarantee schemes is the seemingly obvious deduction of any due liabilities the depositor might have towards the failing institution before the guarantee is paid. According to research by CEPS, such deduction is only envisaged in 17 Member States. Although the set-off of liabilities does seem logical and would reduce the burden placed on the deposit guarantee schemes, the EBA's evaluation of the impact the set-offs have on the actual level of contributions to the scheme and eventual pay-outs proves that it is marginal. It does seem logical given that, in practice, any liabilities towards the failing institution are deducted automatically from the deposits of the clients on the due date, and if that does not take place, then typically, it would imply that the due amount was larger than the deposit. Therefore, the author concludes that with no substantial impact on the risk profile of the guarantee schemes, this aspect will not be considered further in the analysis.

The final opinion was released in January 2020, and it related to the funding of deposit guarantee schemes and the way the funds are used (European Banking Authority 2020b). The available financial means of a national deposit guarantee fund are defined as a percentage of the deposits covered by the guarantee, and that needs to be held by the responsible institution in the form of cash, deposits, payment commitments and low-risk assets that can be liquidated in a short period of time (as per the DGSD). That percentage is set as a target for the national schemes and typically, with few exceptions, amounts to 0.8% of the covered deposits by 3 July 2024. Article 10 subpoint 3 of the DGSD allows national deposit guarantee schemes to collect up to 30% of the available financial means in the form of payment commitments, provided that they are properly collateralised. According to the CEPS report, this option is very popular and has been implemented in 24 Member States.

While the threshold is defined in the Directive, it can be applied either at the level of the entire scheme or at the level of individual institutions. Differences to the admissible types of collaterals also apply. Altogether, the eligibility to provide commitments instead of actual contribution can provide significant relief to the liquidity of credit institutions in some Member States and impact the level playing field between banks across the EU. The volatile value of the collateral backing the commitment can also impact the credibility of the scheme and hence financial stability altogether. The EBA also highlighted that harmonising the national schemes under EDIS would most likely be impossible if the option of payment commitment was to be retained. However, it is worth mentioning that Orszaghova and Miskova (2015, pp. 21–24) proved that the option to provide payment commitments provided some relief to the credit institutions already burdened with a number of contributions stemming from the strict prudential requirements.

Apart from deleting the payment commitments, the EBA requested that the Directive state that low-risk assets financed by borrowed funds, as well as the borrowed funds themselves, cannot count as available financial means (as per art. 10 of the Directive). The Authority also suggested that the Directive should be clear about the order in which the funds of the guarantee scheme should be used – the proposal was to offer the guarantors some flexibility in using additional funding before the available statutory funding is used. In general, the level of harmonisation in terms of funds collected by the national deposit guarantee institutions is clearly a weakness of the scheme that could be addressed under EDIS.

One peculiar optionality under the directive with a potentially direct impact on financial stability is the possibility to use the available financial means for purposes other than guaranteed repayments. Article 11 of the DGDS allows national schemes to use these funds to prevent a credit institution from going into insolvency. The CEPS report mentions nine Member States that have transposed the alternative use of funds option into the national law, including France, Germany, Italy and Spain. Although subject to a number of conditions, the directive remains vague in terms of the necessary cost assessments, and it effectively gives Member States a lot of freedom to use the available funds for bank bailouts. The same view can be found in the EBA opinion, where the Authority pointed out that the act does not specify what kind of costs should be calculated when determining whether the "alternative" action can impact the statutory capacity of the guarantee scheme or not. Whereas the motivation to include such flexibility is understandable provided that the cost of the bailout is lower than the cost of guarantee pay-out, the author believes that the EU acquis needs to be more prescriptive when defining the kind of costs that need to be taken into consideration before a deposit guarantee scheme saves a bank from insolvency. On the positive side, it is worth mentioning here that thus far in practice, this option is primarily applied to institutional protection schemes (IPSs) as defined under the Capital Requirements Directive (Koleśnik 2013, p. 284), which are treated as deposit guarantee schemes (Centre for European Policy Studies 2019, pp. 125–132). Since IPSs are established precisely to provide mutual support between the participating companies, it is also necessary that the revised DGSD or the future EU guarantee schemes allow these institutions to fulfil their statutory operations.

At the time of preparing this article, the Commission has not issued any position building upon the recommendations of the EBA but has placed the EDIS on its work programme for 2021.

The resilience of national deposit guarantee schemes

In this chapter, the data on the functioning of national schemes in selected Member States will be analysed in more detail. The choice of the national deposit schemes for this study follows an analysis aiming to select the schemes that are of particular im-

portance from the perspective of financial stability. The primary criterion in this context was the size of the domestic banking sector and the presence of credit institutions that were deemed systemically important to the entire banking sector of the EU. The second parameter that was of importance was to select Member States whose deposit guarantee schemes collected the available funds ex-post upon implementation of the DGSD. This was to select schemes whose establishment imposed the greatest additional burden on credit institutions, as well as schemes that were facing the greatest challenge to reach the target level of the available financial means. The analysis led to seven national deposit guarantee schemes being chosen, i.e. in Belgium, Denmark, France, Germany, Italy, the Netherlands and Spain. The banking sectors in these Member States have considerable size and, apart from Belgium, are home to at least two credit institutions of systemic importance. In addition, prior to 2015, the funds of the deposit guarantee scheme in the Netherlands were collected ex-post. The research timeframe was predefined by the directive's entry into force, i.e. 2015, and limited to the latest available data from 2019.

The current state of the selected national deposit guarantee schemes has been presented in Figure 1 below. The figure depicts the total value of the deposit guarantee and the related level of available financial means accumulated by the national bodies responsible for guaranteeing the deposits. It is worth underlining right at the beginning that with the exception of Belgium and Denmark, which have already accumulated excess funds, the readily available funds held by the analysed deposit guarantee schemes continued to grow over the entire research period.

It is interesting to see that the value of protected deposits in Italy is similar in size to the amount protected in the Netherlands. This is partly because a share of the eligible deposits in Italy collected by cooperative banks is held in a dedicated fund that remains outside the scope of this analysis. This distinction makes the most significant difference in Germany, where cooperative banks hold a meaningful share of the deposits. The other scheme that stands out in the group is the Danish DGS, which holds a significantly larger amount of available funds than would stem from the obligatory percentage. However, the annual report of the responsible institution explains that the surplus beyond the obligatory level is not that significant since the target calculation does not factor in the coverage for special types of deposits, such as pension funds (Finansiel Stabilitet 2020). The third point that deserves to be mentioned is the swift build-up of the fund in the Netherlands as the one scheme that has been transformed from an ex-post collection setup into an ex-ante one. It appears that over the five-year period, the Dutch scheme collected more funds than the Italian one, despite the difference in size of the two banking sectors. It is also worth noting that out of the research sample, the Dutch and German schemes do not envisage any deduction of liabilities towards the failing institution from the guarantee, and thus, the required size of the fund may be overestimated to some extent when compared to the other Member States.

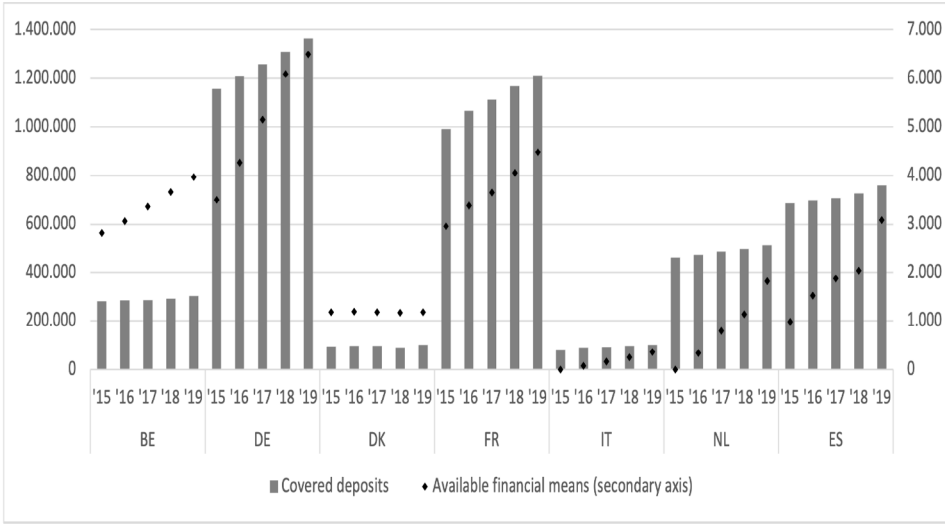

Figure 1. Size of the selected guarantee schemes and their available financial means level
Source: own elaboration based on European Banking Authority (2020a).

The calculated share of the deposits covered by the available financial means of the analysed deposit guarantee funds is presented in Figure 2. The defined target level defined by the DGSD is 0.8% for most Member States and 0.5% for France. The exceptionally low target for France was approved after considering the structure of the French banking system, where a significant share of the sector's assets is held by a small number of institutions that are more likely to go into resolution than insolvency (Carmassi et al. 2018, p. 14). Nonetheless, it may be expected that such a distinction might prove to be contentious under a mutualised deposit guarantee fund.

The data depicted in Figure 2 demonstrate that few national schemes have managed to reach their target so far. The pace of collecting additional available funds is not high, with the exception of the Netherlands and Spain, which both managed to reach approx. 50% of their target in 2019. The French fund underlined that the gap between readily available funds and their target level for 2024 is already covered by a revolving credit line (The Fonds de Garantie des Dépôts et de Résolution 2020). Similar financial flexibility is available to the other funds as well, although these funds cannot be calculated against the target. Therefore, it remains doubtful whether the required available funds level will be reached by 2024 in those countries. This may prove to be all the more challenging if the DGSD is revised in a way that excludes payment commitments (currently eligible in all the analysed Member States) from the calculation or requires that additional contributions be collected on account of the additional guarantees offered by the national deposit schemes.

The author believes that both amendments are desirable from the perspective of financial stability, and this would imply that the distance from the target level of available funds would become far greater than calculated at the end of 2019. The challenge

with estimating the impact of factoring in the additional coverage on the total guaranteed amount stems from the temporary nature of the coverage and the fact that the high balance may be signalled to the fund only after the failure of the institution. If this issue is to be addressed ex-ante, it would imply that the standardised additional guarantee level and its duration in the revised DGSD would also need to be supplemented with a predefined additional contribution to the national funds on account of that coverage. The alternative would be that if any temporary high balances were to be covered by an additional guarantee, they would have to be allocated to a dedicated account, as implied in the EBA opinion (European Banking Authority 2019a, pp. 108–115). The impact of excluding payment commitments from calculating the available funds is more straightforward – as an attractive alternative for banks, it might be expected that the missing fund would be close to the upper limit (i.e. 30%) for that form of contribution (Cranston et al. 2018, p. 92).

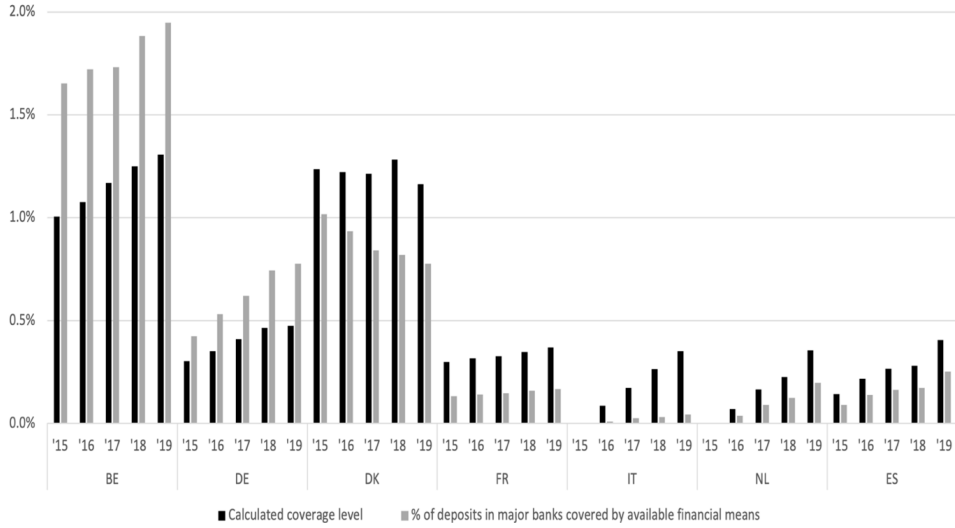

Figure 2. Current progress towards the target level of available financial means and a comparison to the size of customer deposits in the country's systemically important credit institutions. Source: own elaboration based on European Banking Authority (2020a).

In view of the difficulties that the national deposit schemes have in collecting the 0.8% of the guaranteed deposits in readily available resources, it seems all the more important to establish a single scheme at the EU level with sufficient resources to promptly react and coordinate additional support when necessary.

Another way of showing why an institution at the EU level would be better placed to guarantee the deposits is by comparing the readily available capacity of the national schemes and the total value of customer deposits held by their domestic institutions classified as systemically important (see Figure 2). While naturally not all of the deposits held by these international banking groups are covered by the guarantee in ques-

tion, it is also easy to see that it is hard to expect any national economy to survive the failure of one of their largest credit institutions without external support. The size and activity scope of the systemically important banks requires international coordination both in terms of their supervision and resolution (Kyriakou 2017, p. 2).

Conclusion

The failure to establish a European Deposit Insurance Scheme has left the banking union project unfinished. The consensus solution was to harmonise the national deposit insurance schemes under the Deposit Guarantee Schemes Directive, but the experience with its transposition into national legislation has shown that only a very limited level of harmonisation has been achieved over the past five years. The literature review of the subject shows that it was exactly the national specificities of the banking sectors and tailor-made design of the related deposit guarantee schemes that prevented greater harmonisation or transition towards a mutualised scheme for guaranteeing deposits. The national character of the financial sectors of the Member States has remained largely unchanged in view of the DGSD, and it is therefore questionable whether a review of its provisions can sufficiently enhance harmonisation.

Regardless of the Member State's current willingness to harmonise the design of the deposit schemes for its credit institutions, ample evidence in the literature can be found that close integration of the financial markets is an important prerequisite for a currency area's optimality and therefore should be pursued by the European Commission. The EBA's recommendations expressed in the three opinions published since August 2019 point to a number of important improvements that can be made to the design of the DGSD. They can positively impact the EU's financial stability in the long term and reinforce depositor trust in the banking sector, yet they will also result in greater financial burdens that will need to be borne by the financial institutions.

An analysis of the current state of the selected national deposit schemes signals that they are far from their target level of readily available funds and that national transposition of the DGSD provisions varies in several areas, impacting the level-playing field between the competing credit institutions. Ultimately, the national specificity of the banking sectors requires that a number of derogations and options be retained in the directive, automatically limiting the achievable level of harmonisation. The study results signal that non-harmonised national deposit guarantee schemes act to the detriment of financial stability. The national specificities of the financial sectors of different Member States require that the DGSD accommodate several derogations that, by default, weaken its potential to enhance the level of financial market integration. The qualitative and quantitative study results jointly confirm that a solution less ambitious than a common EU deposit guarantee scheme offers limited scope for harmonisation and cannot fully reinforce financial stability. Therefore, the European Union should aim at establishing the EDIS, fully completing the banking union.

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Klaudia Zielińska-Lont

Europejski(e) System(y) Gwarantowania Depozytów – konsekwencje dla stabilności finansowej Unii Europejskiej

Celem artykułu jest ocena potencjalnego wpływu braku harmonizacji krajowych systemów gwarantowania depozytów na stabilność finansową Unii Europejskiej. Zaprezentowany został przebieg dyskusji na temat ustanowienia Jednolitego Mechanizmu Gwarantowania Depozytów, przyczyny porażki tego projektu oraz rozwiązania zastępczego jakim była harmonizacja krajowych depozytów w ramach Dyrektywy w sprawie systemów gwarantowania depozytów.
Ograniczony stopień harmonizacji osiągalny w ramach Dyrektywy w sprawie systemów gwarantowania depozytów jest dyskutowany w kontekście opinii przedstawionych przez Europejski Urząd Nadzoru Bankowego, które wskazują na potencjalne obszary wymagające usprawnień. Różnice w krajowej transpozycji dyrektywy zostały przeanalizowane pod kątem potencjalnych konsekwencji dla stabilności finansowej zwłaszcza sektora bankowego. Poza szczegółowym przeglądem literatury traktującej o stabilności finansowej i systemach gwarantowania depozytów, prześledzone zostały również dane finansowe charakteryzujące największe krajowe systemy gwarantowania depozytów w strefie euro, zwłaszcza w kontekście osiągania docelowego poziomu dostępnych środków finansowych.
Wyniki analizy wskazują, iż większość krajowych systemów jest wciąż daleko od celu zgromadzenia 0,8% gwarantowanych środków w postaci dostępnych środków finansowych. Wskazują również, że niektóre z potencjalnie pożądanych z perspektywy stabilności finansowej zmian w zapisach dyrektywy mogą jeszcze bardziej oddalić krajowe systemy od osiągnięcia tego celu w 2024 roku. Autorka wskazuje, że z perspektywy stabilności finansowej Unia Europejska powinna skupić się na ustanowieniu Jednolitego Systemu Gwarantowania Depozytów, który stanowiłby uzupełnienie projektu ustanawiania unii bankowej. Wyniki dostarczają cennych informacji dla toczącej się obecnie dyskusji na temat konieczności dalszej integracji krajowych systemów gwarantowania depozytów w Unii Europejskiej.

Słowa kluczowe: Europejski System Gwarantowania Depozytów, system gwarantowania depozytów, unia bankowa, stabilność finansowa

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Value Added from the Perspective of Econophysics

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Abstract

The production, or value added, approach to GDP involves calculating an industry or sector's output and subtracting its intermediate consumption (the goods and services used to produce the output) to derive its value added. The value added at the macro level depends on business efficiency. It reflects an increase in value that a business creates by undertaking the production process. We assumed that the market creates thousands of vibrating energies, coming from other enterprises, with different frequencies. The purpose of this article is to verify whether the econophysics approach could be successfully used to assess a business from the perspective of the interaction between economic forces. Thus, we propose that the term 'value added' be understood as a certain amount of accumulated energy of enterprises that comes from the interaction of basic economic forces and economic vibrating forces of accounting. Using regression models, we show the influence of basic forces, like debt and the stock market, and vibrating ones (i.e., accounts payable, accounts receivable, inventory) on the economic value added by testing US, European, and emerging markets. We confirmed the relevance and appropriateness of the econophysics approach to estimating the economic value added.

Keywords: accounting, business, economic forces, economic value added, econophysics

JEL: D02, D21, D25, D46, F21, F37, M21, M41

Introduction

The macroeconomic perspective of the value-added measure of GDP combines the value of output produced by each of the productive sectors in the economy. Therefore, value added is the increase in the value of goods or services as a result of the production process (the difference between the value of production and the value of intermediate goods). From a microeconomic perspective, the general definition of added value is proposed in the Dictionary of Business – "an amount added to the value of a product or service, equal to the difference between its cost and the amount received when it is sold. Wages, taxes, etc., are deducted from the added value to give the profit" (Collin 2004, p. 7). In other words, it is equivalent to the increase in value that a business creates by undertaking the production process. So, evaluating value added at the macro level should be implemented by considering a business's efficiency and accounting data.

Riahi-Belkaoui (1992, pp. 49–50) states that "value added refers to the increase in wealth generated by the productive use of the firm's resources before its allocation among shareholders, bondholders, workers, and the government. […] the value added refers to the total return earned by the team of workers, capital providers, and the government." De Chernatony, Harris, and Dall'Olmo Riley (2000, p. 39) define value added as a "multidimensional construct, playing diverse roles, and interpreted in different ways by different people." Brandenburger and Stuart Jr. (1996, p. 5) propose a definition of the "value created by firms together with their suppliers and buyers." They identified four value added strategies based on the game theory models.

Meanwhile, the main aim of our research is to verify whether the econophysics approach could be successfully used to assess a business from the perspective of the interaction between economic forces.

Using Google Books Ngram Viewer (n.d.), we can assess the interest in studying value added. For comparison, we analyze such related terms as 'added value,' 'cash flow,' and 'earnings quality.' An extremely strong interest is observed in 'cash flow' analysis; interest in 'value added' has grown in recent decades, while 'earnings quality' is rarely studied.

Some scholars even emphasize that the term 'added value' is losing its meaning. Moreover, in the system of Ukrainian national statistics, 'value added' is only formally an important measure of a country's development compared to other states (see: Hurnyak, Datsko, Yaremchuk 2015, pp. 37–47). Along with this, there are some attempts to implement this indicator in the system of financial and management accounting,

although the concept of value added in a range of states like Ukraine at the sectoral, regional, and state levels is not clearly defined. Here, it is considered mainly as a basis of taxation and a result of economic activity. This approach is typical for the Central and Eastern Europe market as a whole. This interpretation is related to fiscal obligations, although they have led to other sources than human labor of value creation being neglected. Such a position can be validated by mercantilism, according to which the production of goods (and, consequently, value added) is focused on the creation and accumulation of wealth.

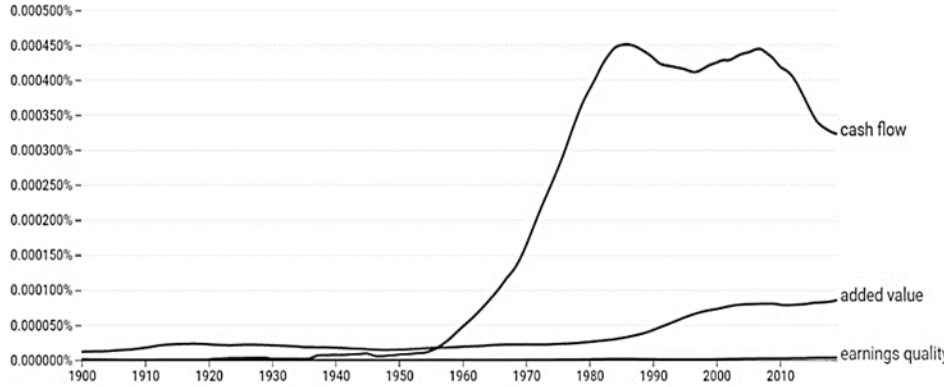

Figure 1. Search frequencies (%) for the term 'added value,' 'cash flow,' and 'earnings quality' in sources printed between 1990 and 2018
Source: adapted from Google Books Ngram Viewer (n.d.).

Theoretical review

In the 1930s and 1940s, the concept of value added was actively discussed in Germany among scientists in the field of accounting. Meanwhile, the greatest success was achieved by French experts, who implement the calculation of value added in the General Accounting Plan (Fr. *Plan comptable général*). The modern approach assumes that accounting should provide information for enterprises as well as for national economic statistics. Therefore, attention should be paid to preparing a value added statement that contains information about the value added created by a business during the reporting period and how this value was distributed among participants (i.e., employees, government, owners, lenders) and reinvested in the business. The proposal of Suojanen (1954, pp. 391–398) to compile a value added statement as an appendix to the financial statements was implemented only after twenty years.

In the mid-1970s, such statements began to be published by companies in Great Britain, France, Germany, the Netherlands, Italy, Denmark, Switzerland, and South Africa, among others. They were prepared mainly by large companies, in particular:

26% of German, 19% of French, 30% of British, and 34% of South African companies (Haller and Stolowy 1998, pp. 23–51; van Staden 1998, pp. 44–59). Nevertheless, since the 1980s, interest in value added reporting has decreased.

What is noteworthy is that we can observe the widespread use of this measure in the system of management accounting and also for fiscal purposes. Banerjee (2014, p. 23) states: "corporations in the US have started disclosing EVA (i.e., Economic Value Added) information from the beginning of 90s as a measure of corporate performance. It is believed that market value of a firm (hence shareholder wealth) would increase with the increase in EVA." Chen adds, "Economic value added (EVA) is a measure of a company's financial performance based on the residual wealth calculated by deducting its cost of capital from its operating profit, adjusted for taxes on a cash basis. EVA can also be referred to as economic profit, as it attempts to capture the true economic profit of a company" (Chen 2020). Assessing a company's economic potential by using EVA allows for analysis of various economic indicators such as financial stability, investment attractiveness, competitiveness, solvency, and profitability, among others (Struk 2018, p. 267).

The approaches to calculating and presenting the value added in reporting differ. Some companies report gross value added by including depreciation, while others present a net value added (i.e., by excluding depreciation). Apart from this, calculating value added is made by various methods: [gross trading profit + gross margin + other operating costs purchased from third parties] or [operating profit + depreciation, amortization, and impairment losses on fixed assets + personal costs + tax other than corporate income tax] (Quiry et al. 2014).

Considering Parker's approach (1992, pp. 294–297) to value-added reporting, we can specify its advantages and disadvantages.

Advantages: the employees, government, lenders, and owners are considered to be stakeholders; the employees' attitudes towards the company can be improved thanks to the dissemination of value-added information; the report contributes to higher employee motivation; a number of useful coefficients can be calculated based on value-added information (e.g., the ratio of value added to employee wages); it makes it possible to assess the size and effectiveness of the company significantly better.

Disadvantages: a conflict of interest between participants may exist that contradicts their treatment as a team; users of reporting can be confused by a simultaneous increase in value added and a decrease in profit; a desirable maximization of value added can lead to an increase in production that results in higher risk to sell at a price below production costs; unlike in the case of the income statement, such a report is not integrated with the balance sheet (statement of financial position according to IFRS); the lack of a general method to calculate value added makes it difficult to compare the reports of different companies.

The further development of the concept of value added is related to the doctrine of sustainable development, which contains, inter alia, requirements for environmental protection, social justice, and the absence of racial and national discrimination.

Managing sustainable development is impossible without a system of indicators that reflect the competitiveness of a business and its impact on the environment and society. For a long time, the most common practice for reporting sustainable development has been the Global Reporting Initiative. It offers three-dimensional reporting and reflects the activity by assessing environmental, social, and economic aspects. Thus, there are proposals to expand the financial statement by external costs and benefits related to the environmental, social, and economic aspects, which are not included in the traditional financial reporting (The Sigma Project 2003), and to introduce an extended value-added reporting on the following aspects (Mook 2007).

The main obstacle to implementing the proposed reporting is that the vast majority of environmental and social development characteristics cannot be reflected in monetary terms. Therefore, the concept of integrated reporting is dominant in modern times, according to which the company is interpreted as a mechanism for creating added value in the short, medium- and long-term periods of input resources (capital) in a certain way (business model) (Value Reporting Foundation 2013).

Many scientists have emphasized the importance of developing the financial markets due to the relationship between financial development and economic growth (see: Prats and Sandoval 2016). Scientists show the evidence of Granger causality between the stock market development and economic growth through an empirical analysis in Eastern Europe (Bulgaria, Slovakia, Hungary, Poland, the Czech Republic, and Romania) from 1995 to 2012. Furthermore, a number of participants who took part in the ECB workshop (Thimann 2002) for members of accession countries' central banks and the national central banks of the euro area agreed with the plausibility of a positive correlation between financial sector development and growth. They also remarked that the development of capital markets would possibly follow the strengthening of the banking sector, similar to the experience of several current EU Member States. "On the question of a choice or trade-off between a 'European' banking-based financial system and an 'Anglo-Saxon' market-based system, participants considered that this distinction should not be overemphasized as a relevant choice for accession countries. Priority at this stage was rather to establish a sound, stable and efficient banking sector" (Thimann 2002, p. 9). Meanwhile, we try to show and prove the importance of this institutional aspect without disclosing the details of such transformations.

Studying the diversification benefits to global investors, Baele, Bekaert, and Schäfer (2015, p. 30) found that "Central and Eastern European (CEE) markets have experienced similar trends as emerging markets more generally, with strongly increasing correlations with global benchmarks over time." They provided a comprehensive analysis of CEE equity markets from the mid-1990s until 2015 with global benchmarks over time. This also confirmed impossibility of narrowing our study just to the markets of Central and Eastern Europe, which are mainly included in emerging markets.

Ulfi Nur (2020) presented financial performance through the Economic Value Added (EVA) method in Mining Sector Public Companies listed on the IDX in 2014–2018 by using Invested Capital, Return on Invested Capital, and Weighted Average Cost

of Capital. Meanwhile, Al-Afeef (2017, p. 141) showed that "there is no statistically significant effect of the economic value added (EVA) on changes in Stock Market Value of corporate shares that are under study during the period (2006–2015)". But the researcher addressed only a random sample of 46 companies.

De Wet and Hall (2004, pp. 39–59) emphasized: "[…] to maximize value for shareholders companies should strive towards maximizing MVA[1] (and not necessarily their total market value). The best way to do so is 'to maximize the EVA.' […] The leverage available to companies that incur fixed costs and use borrowed capital with a fixed interest charge has been known and quantified by financial managers for some time."

Maeenuddin, Akhtar, and Wajid Raza (2020) assessed firm performance with economic value added momentum rather than accounting-based profits. Researchers evaluated the cash conversion cycle based on three accounting ratios – creditor's turnover, debtor's turnover, and inventory turnover – based on non-financial firms listed on the Pakistan Stock Exchange for the period 2007–2016. The findings revealed that "firms with relatively lower (higher) days inventory turnover and days debtor turnover (days creditors turnover) results in lower cash conversion cycle and leads to higher EVA momentum. Results based on fixed effect model showed that components of WCM plays significant role in explaining the variation in EVA momentum and can be used to predict changes in EVA momentum" (sic) (Maeenuddin, Akhtar, and Wajid Raza 2020, p. 13845).

Vanacker et al. (2011, pp. 681–705) empirically investigated the relation between bootstrap strategies used at startup and subsequent venture growth using a longitudinal database that comprised data from questionnaires and financial accounts of 214 new ventures. The findings provide evidence of a consistently positive impact of financial bootstrapping on growth in value added across time. "More specifically, new ventures that use more owner funds, employ more interim personnel, encourage customers to pay more quickly, and apply for more subsidy programs exhibit higher growth over time." (Vanacker et al. 2011, p. 68).

As we can observe from the above discussion, modern studies are in line with our research. As supporters of theories of value added and this category as the basis of business efficiency, we consider the stock market not as a result but as a tool or economic force. The same applies to the banking market or, more generally, the debt market.

1 MVA = Market Value of Shares – Book Value of Shareholders' Equity.

The econophysics approach

Nowadays, a considerable number of scholars have applied physics concepts and methods to understand economic phenomena. Notably, the distribution of returns in financial markets is studied the most intensively in that way (Mirowski 1989; Bouchaud and Cont 2002, pp. 543–550; Farmer and Joshi 2002, pp. 149–171; Sornette 2003). The approach is also used for studying the distribution of income and wealth (Levy and Solomon 1997, pp. 90–94; Drăgulescu and Yakovenko 2001, pp. 213–221; Chatterjee, Yarlagadda, and Chakrabarti 2005), the distribution of economic shocks and growth rate variations (Bak et al. 1993, pp. 3–30; Canning et al. 1998, pp. 335–341) and the distribution of firm sizes and growth rates (Stanley et al. 1996, pp. 804–806; Takayasu and Okuyama 1998, pp. 67–79). We would like to draw attention to the Theory of Monads proposed by Mykola Rudenko and Newtonian Microeconomics published by Mattie Estola, which states that physical tools may help investigate economic problems. According to Estola's approach (2017, p. 7), "the economic forces acting upon economic quantities are defined, and these forces explain the observed changes in economic quantities. This is a new framework of modeling in economics, and it is analogous to Newtonian mechanics in physics." He proposed replacing velocities of production values with annual value added of industries in the economy (Estola 2017, pp. 7, 88). Referring to the above concept, we would like to present different 'forces' that influence businesses by considering the macro-, meso- and micro levels (Figure 2).

Therefore, we propose that the term 'value added' be understood as a certain amount of accumulated energy of enterprises from the interaction of basic economic forces (i.e., a debt, stock market, a shadow economy, budget, etc.) and economic vibrating forces of accounting.

Figure 3 reflects our first simplified model for testing this approach. We suppose that the main forces in business are 'Debt' and 'Equity' like Gravity, Electro-Magnetism, Weak and Strong Nuclear in Physics. 'Equity' – 'Book Value of Equity' – refers to a firm or company's common equity – the amount available that can be distributed among the shareholders, and it is equal to the amount of assets owned by shareholders outright after all the liabilities have been paid off. Considering only the main forces, we cannot explain fully how the universe works, and respectively, we cannot explain all interactions in the economy only based on these 'forces.' The market creates thousands of vibrating energies that come from suppliers, buyers, competitors, and partners, with different frequencies (depending on the types of behavior). These vibrating forces influence any firm and are reflected in accounting, like accounts receivable (AR), inventory (I), accounts payable (AP), etc. Thus, increasing accounts receivable or inventory will shorten the distance between the company's debt and equity. Increasing accounts payable will expand the distance because it means that the enterprise has temporarily more funds for its activity and needs such resources from the outside less. If a company lacks resources for development, it can fall into the pit of surviving stability. The accumulation of equity and debt contributes to expanding and developing in terms of value added.

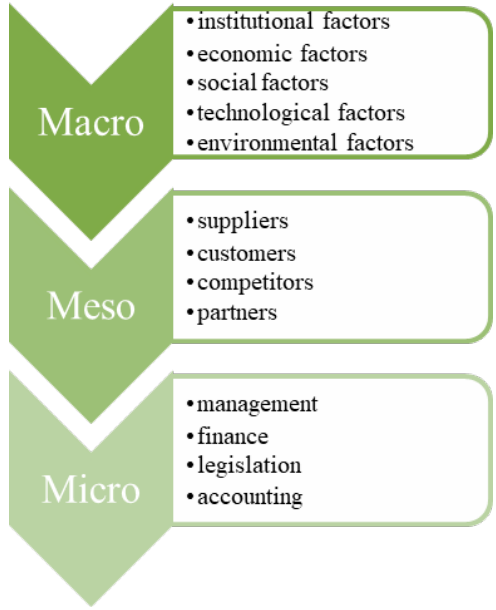

Figure 2. Macro-level, meso-level, and micro-level forces influencing business
Source: authors' elaboration.

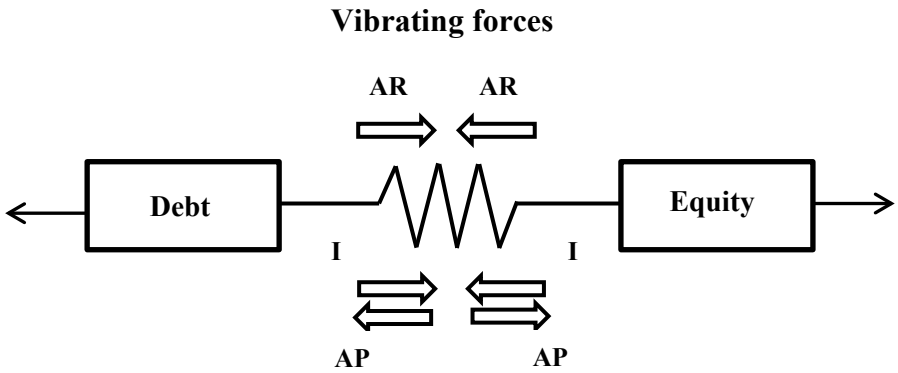

Figure 3. General simplified model of an enterprise's dynamic financial system
Source: authors' elaboration.

Figure 4 presents a weak dynamic financial system of an enterprise in times of crisis, where a complex of vibrating forces has influenced the market the most. The purpose can be found in negative fluctuations on the banking and stock markets. Thus, in the first model (Figure 3), the economic forces act in one line along with the masses, which is defined as the level of inertia.[2] Meanwhile, in model 2 (Figure 4), the market participants do not generate such significant masses due to their instability.

2 Newton's first law is called the law of inertia. The property of a body to remain at rest or to remain in motion with constant velocity is called inertia. The inertia of an object is measured by its mass.

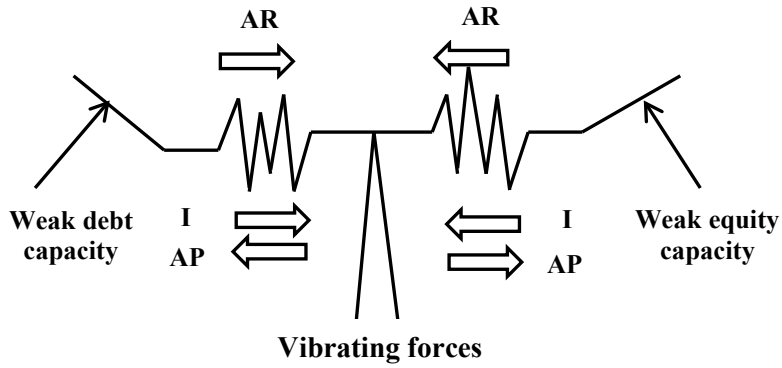

Figure 4. Simplified model of an enterprise's weak dynamic financial system in times of crisis
Source: authors' elaboration.

Figure 5 presents an enterprise's dynamic financial system by taking into account forces that come from the vibrating activity on the stock and banking markets (e.g., zombie banking, financial bubbles, etc.). In a more general case, we have to expand the main forces with sources of capital that come from the shadow market and state (community) budget. Each of these forces will be influenced by weaker vibrating forces of a special nature.

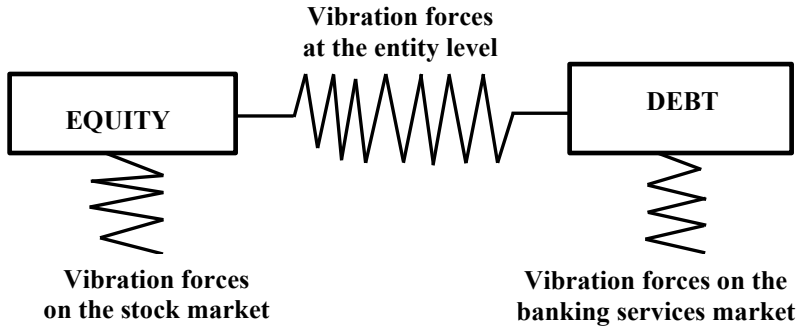

Figure 5. An extended market model of an enterprise's dynamic financial system
Source: authors' elaboration.

Methodology

The general formula for calculating EVA is:

$$[\,EVA = NOPAT - (\text{Invested Capital} * WACC)\,], \tag{1}$$

where: *NOPAT* – net operating profit after taxes,

$$\text{Invested capital} = Debt + \text{capital leases} + \text{ sharholders' equity}, \quad (2)$$

and *WACC* – weighted average cost of capital.

To test model 1 (Figure 3), we checked the impact of basic and vibrating forces on economic value added in the form of an equation (analogous to Newton's second law):

$$m_{EV}\overrightarrow{EV} = \int_0^T (-m_{AP}\overrightarrow{AP} + m_{AR}\overrightarrow{AR} + m_I\vec{I} + m_{Debt}\overrightarrow{Debt} + m_{Equity}\overrightarrow{Equity})\,dt, \quad (3)$$

where: T – reporting period, EV – economic value, $m_{EV}\overrightarrow{EV}$ – momentum (vector quantity that indicates the direction of movement), m_{EV} – inertia of economic value, m_{AP} – inertia of accounts payable, m_{AR} – inertia of accounts receivable, m_I – inertia of inventory, m_{Debt} – inertia of debt, and m_{Equity} – inertia of equity (book value of equity, *BVE*). Meanwhile, accounts payable, accounts receivable, and inventory become vibrating forces that allow enterprises to operate their resources regardless of the basic forces. Notably, debt includes both short- and long-term debt (but not accounts payable and non-interest-bearing liabilities), while the book value of debt is used as a proxy for the market value of debt (according to Damodaran's approach). The circulation of funds in the accounts of the balance sheet during the reporting period is perceived as a process of integral calculation in mathematics and a method of transforming the energy coming from the financial markets into value added as a corresponding subintegral function. Once again, let us note that enterprise value (*EV*) is a measure of a company's total value and includes in its calculation the market capitalization of a company but also its short- and long-term debt.

It is obvious to assume that the inertia of economic value and the level of gross sales (*GS*) have opposite directions (we also could avoid in this way potential scale effect), i.e., the bigger the sales, the smaller the level of inertia. Then, we rewrite the equation in a simpler linear form, assuming that the change of velocity of the economic value is economic value added.

$$EVA = -\frac{k_1}{GS}AP + \frac{k_2}{GS}AR + \frac{k_3}{GS}I + k_4 * BVC + k_5, \quad (4)$$

where *BVC* – book value of capital (the book value of debt plus the book value of common equity, as reported on the balance sheet). We assumed that $m_{EV} = 1$ or, in other words, rewriting the basic equation dividing all ingredients by m_{EV}.

Empirical findings and discussion

Table 1 presents the results of testing the US, European, and emerging markets.[3] Using the regression models, we showed the influence of the book value of capital, accounts payable, accounts receivable, and inventory on the economic value added in the US and emerging markets. Meanwhile, for the European markets, we applied the book value of equity due to the diversified influence of banking and stock markets on business in terms of the Anglo-Saxon and Continental models.

Table 1. The influence of main (book value of capital) and vibrating forces (i.e., accounts payable, accounts receivable, inventory) on the economic value added in the US, European, and emerging markets

US market				
Independent Variable	AR/GS	AP/GS	I/GS	BVC
Beta	–0.183	–0.018	–0.171	0.676
Sign.	0.064	0.836	0.088	0.000
VIF	1.278	1.017	1.329	1.267
Note: Adjusted R-square = 0.333; F-statistic = 12.252 (Sign. = 0.000). For constant: *t*-statistic = 3.156; Sign. = 0.002.				
Emerging markets				
Indicator/Variable	AR/GS	AP/GS	I/GS	BVC
Beta	0.08	–0.192	0.017	–0.827
Sign.	0.053	0.000	0.491	0.000
VIF	1.314	1.924	1.003	1.580
Note: Adjusted R-square = 0.883; F-statistic = 175.895 (Sign. = 0.000). For constant: *t*-statistic = 2.089; Sign. = 0.04				
European market				
Indicator/Variable	AR/GS	AP/GS	I/GS	BVE
Beta	0.138	–0.494	–0.046	0.233
Sign.	0.205	0.000	0.560	0.047
VIF	1.196	1.506	1.059	1.380
Note: Adjusted R-square = 0.123; F-statistic = 4.162 (Sign. = 0.004). For constant: *t*-statistic = 0.999; Sign. = 0.321				

Source: own elaboration based on a selected sample in 2018 (a total of 93 industries along with all necessary separate indicators and ratios for three different groups of markets) (Damodaran online n.d.).

Based on the regression models, we confirmed the relevance of the proposed approach to estimating the economic value added as a certain amount of accumulated energy coming from the interaction of basic and vibrating economic forces. The findings bring into question whether a value added is the result of (a) accounting 'manipulation,' in other words, the result of vibrating forces, (b) basic economic forces based on real investment in the stock, or (c) borrowing on the banking services market. Our findings of the univariate analysis seem to be successful by taking into account the ex-

3 According to MSCI (2020).

planatory power of the regression model (the Adjusted R-square value), the statistical significance of the model (F-statistic), and the ratio of the departure of the estimated value of a parameter from its hypothesized value to its standard error (*t*-statistic).

We found that in the US market, the basic economic forces are decisive and effective in terms of value added [$Beta_{BVC} = 0.676$], in other words, by accumulating the firm's additional energy. As we can observe, the negative influence of vibrating forces, caused by using accounting 'manipulations,' is present, but it is not predominant [$Beta_{AR/GS} = (-0.183)$; $Beta_{AP/GS} = (-0.018)$; $Beta_{I/GS} = (-0.171)$]. It is obvious that if the ratio between these indicators and sales is not maintained, such tools can be defined as manipulative, or such a situation is caused by a market crisis that is not covered by this model (Table 1).

In the case of emerging markets, we observe the influence of vibrating forces on the value added. Notably, the explanatory power of the regression model is 88.3%, which means that the dependent variable (i.e., economic value added) largely depends on the proposed independent variables. We can assume that ineffective and undeveloped stock and bank capital markets do not contribute positively to the formation of additional energy of the business (they are even contrary to it), and they are significantly harmful to its functioning [$Beta_{BVC} = -0.827$]. Thus, vibrating economic forces with an obvious accounting nature come to the fore [$Beta_{AR/GS} = 0.08$; $Beta_{AP/GS} = -0.192$; $Beta_{I/GS} = 0.017$] (Table 1, Figure 3). This can be explained by the banking sector concentrating on transactions with yielding government bonds, the phenomenon of zombie banking, or lending on non-market terms. We believe that emerging markets can be reflected by the model presented in Figure 4.

In European markets, the situation is ambiguous. On the one hand, as with American markets, the influence of basic economic forces is significant and positive [$Beta_{BVC} = 0.233$]. It indicates that these markets are close to being sufficiently developed. On the other hand, this influence was significantly weaker than those of the vibrating forces. Thus, the available vibration forces outweighed the basic ones [$Beta_{AR/GS} = 0.138$; $Beta_{AP/GS} = (-0.494)$; $Beta_{I/GS} = (-0.046)$]. This can be explained by another predominant type of corporate model compared to the United States.

Summing up, we can state that according to the data from 2018, the tightly regulated stock and banking markets in the US function much better in terms of generating additional business energy (value added) than European ones (Table 1). Taken separately in this case, the debt is not statistically significant. This model differs from the German banking pure one (traditionally popular in the past), with an emphasis on local interests and rapprochement with shareholders that requires other approaches and market interactions than those available in Europe earlier. Such analysis could also be made by taking into account the data from other years. At the same time, accounting indicators could be taken with a certain lag, for example, a year or a few years, and we can see how it will affect the value added in the particular year. We intend to use such an approach in future research. Meanwhile, this study was an attempt to present the possibility of reflecting the value added as a result of the interaction of economic forces, as well as the ability of such an approach to feed certain features of the business implementation mechanism.

Conclusions

Nowadays, a majority of scientists agree that accounting should provide information for enterprises as well as for national economic statistics. Therefore, firms' preparation of a value-added statement that contains information about the value added created by the business during the reporting period, and how this value was distributed among participants and reinvested in the business, could be greatly significant when evaluating value added at the macro level. Meanwhile, there is a wide range of definitions due to the different approaches used to calculate and analyze value added. However, we consider using earnings quality as a tool for analysis to be ineffective because of the inconsistency between individual elements of the accounting system and the manipulation of reporting. This means that individual accounts should be the most appropriate for analysis rather than an aggregated summary data of financial statements. On the other hand, using value added just from the perspective of taxation, like in Ukraine, becomes another serious problem of inadequacy to the real state of business.

Within the frame of our empirical analysis and graphical simulations, we showed that the econophysics approach could be successfully used for assessing a business from the perspective of the interaction between economic forces by using financial indicators and transforming these financial levers into economic forces. Consequently, we have a reason to understand the added value as the energy created by a business based on the interactions of basic and vibrating forces. In fact, this study is the first attempt to present value added in such a way, which undoubtedly constitutes its contribution to economic theory.

The models proposed for testing the markets of the USA, Europe, and emerging markets confirmed the viability of the approach and make it possible to analyze the current state of value added (i.e., additional business energy). We revealed that the basic economic forces have a positive influence on value added in the US and European markets, indicating the sufficient development of these markets. But in European markets, this influence was significantly weaker than that of the vibrating forces. Meanwhile, we observed a high level of the explanatory power of the regression model in emerging markets and the strong influence of vibrating forces on business.

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Wartość dodana z perspektywy ekonofizyki

PKB liczony metodą produkcyjną jest to suma wartości dodanej ze wszystkich gałęzi produkcji narodowej po odjęciu wartości dóbr pośrednich. Wartość dodana na poziomie makro zależy od efektywności biznesu – odzwierciedla bowiem wzrost wartości dóbr wytworzonych przez przedsiębiorstwa. Zgodnie z założeniami, rynek generuje tysiące wibrujących energii o różnych częstotliwościach, pochodzących od innych przedsiębiorstw. Celem niniejszego opracowania jest zatem zbadanie możliwości wykorzystania ekonofizyki jako podejścia do oceny biznesu z punktu widzenia interakcji pomiędzy siłami ekonomicznymi. W związku z tym, zaproponowaliśmy rozumieć pod pojęciem „wartość dodana" pewną ilość energii skumulowanej przedsiębiorstw pochodzącej z interakcji podstawowych sił ekonomicznych i sił wibrujących (informacji przedstawionych w sprawozdaniu finansowym). W drodze modelowania regresyjnego ujawniliśmy wpływ podstawowych sił (tj. dług i rynek finansowy) oraz wibrujących (tj. zobowiązania, należności, zapasy) na ekonomiczną wartość dodaną, poddając analizie rynek Stanów Zjednoczonych, Europy oraz rynki wschodzące. Otrzymane wyniki potwierdzają trafność i stosowność wykorzystania ekonofizyki jako podejścia do szacowania ekonomicznej wartości dodanej.

Słowa kluczowe: rachunkowość, biznes, siły ekonomiczne, ekonomiczna wartość dodana, ekonofizyka

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