Institute of Economics • University of Łódź

Comparative Economic Research

Central and Eastern Europe

Volume 25 No. 3/2022

WYDAWNICTWO UNIWERSYTETU ŁÓDZKIEGO
Łódź 2022

WYDZIAŁ EKONOMICZNO-SOCJOLOGICZNY
Uniwersytet Łódzki

COPE
Member since 2018
JM13708

INITIATING EDITOR
Sylwia Mosińska

TECHNICAL EDITOR
Aleksandra Przybył

COVER DESIGN
Katarzyna Turkowska
Agencja Komunikacji Marketingowej efectoro.pl

Printed directly from camera-ready materials provided to the Lodz University Press

Journal affiliated with the Faculty of Economics and Sociology of the University of Lodz

Published by Lodz University Press
First Edition. W.10792.22.0.C
Printing sheets 22.75

ISSN 1508-2008
e-ISSN 2082-6737

Lodz University Press
90-237 Łódź, 34A Matejki St.
www.wydawnictwo.uni.lodz.pl
e-mail: ksiegarnia@uni.lodz.pl
tel. 42 635 55 77

BOARD OF MANAGING EDITORS

Contents

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.19

Forecasting of the Employment Rate in the EU ICT Field

Tetiana Zatonatska https://orcid.org/0000-0001-9197-0560
Doctor of Sc. (Economics), Professor, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
e-mail: tzatonat@ukr.net

Yuriy Klapkiv https://orcid.org/0000-0002-9771-5357
Doctor of Sc. (Economics), Associate Professor, University of Lodz, Lodz, Poland, e-mail: jurij.klapkiv@uni.lodz.pl

Oleksandr Dluhopolskyi https://orcid.org/0000-0002-2040-8762
Doctor of Sc. (Economics), Professor, West Ukrainian National University, Ternopil, Ukraine
Higher School of Economics and Innovation (WSEI), Lublin, Poland, e-mail: dlugopolsky77@gmail.com

Olha Fedirko https://orcid.org/0000-0003-1955-9034
Data Scientist, Empower Company, Kyiv, Ukraine, e-mail: olya7fedirko@gmail.com

Abstract

The ingrained tendency to implement information and communication technologies (ICT) in EU enterprises over the last decade has caused dramatic changes in the labor market. Since the demand for ICT personnel is growing, there is still a need to create a comprehensive strategy to effectively manage ICT specialists when restructuring enterprises. The aim of the research is to identify transferring processes between low- and high-skilled ICT personnel and predict the employment rate in the ICT field until 2025. A Markov chain was used as the method of analysis. Using statistical data about the employment rate of ICT personnel by education attainment level, we have built a Markov chain model that describes the processes of ICT personnel with different levels of education. Data from 2005 to 2019 was used to build forecasting because of the absence of the latest information. We demonstrate that with the help of digitalization, the employment rate of ICT staff in 2025 will increase by 64% compared to 2018. The research verifies that ICT personnel will be in great demand until 2023 and, importantly, low- and middle-skilled personnel will be in demand, as well as high-skilled personnel. The employment rate in the ICT field will be at its highest level in 2022 as the favorable economic conditions for ICT

Received: 10.08.2021. Verified: 6.03.2022. Accepted: 18.05.2022

adoption will help it. The growing demand for low- and medium-skilled ICT staff are met both by staff relocation processes and by the increasing digitalization of business units and public sector institutions. The added value of the analysis is the prediction that the largest growth in ICT personnel employment will occur by 2023, but employment growth will slow down after that. The main obstacle to employment growth through digitalization is the global economic crisis because of different reasons.

Keywords: ICT adoption, digitalization, employment management, labor demand, Markov chain

JEL: J23, F17, F66, O32, O52

Introduction

The increasing trend of e-commerce and the implementation of information and communication technologies (ICT) systems led to significant changes in the labor market. The most visible effect can be seen in the employment rates of personnel who differ by education attainment level. Widely available self-study resources and the high pace of digitalization forced employees to transfer between qualification levels. All middle and low-skilled ICT personnel can be promoted to the high-skilled group. However, according to statistical data, the demand for high-skilled personnel is not big as for middle- and low-skilled personnel.

Given the current scientific debate on the nature of the impact of digitization on the labor market, research-based Markov chain modeling was conducted. The purpose of this article is to verify the transferring processes between ICT employees with different educational attainment levels. The most recent statistics (2005–2019) were used for the analysis to build forecasting. The scientific novelty of this research is the comprehensive analysis of the transition of ICT personnel with different educational attainment levels using Markov chain modeling. The results of the study can be used to build integrated strategies to engage staff with different qualifications in the technological restructuring of EU enterprises.

Literature review

The intensive development of e-business and e-commerce, and the increasing tendency to implement ICT motivate researchers to analyze the impact of digitalization factors on the employment rate of the population by qualification level. For our research, we reviewed relevant scientific papers that described the economic effect of implementing ICT and e-commerce on the labor market using econometric and data science methods. There is no doubt that there is a significant positive correlation between worldwide ICT adoption and economic growth (Amiri, Dodson, and Woodside 2015; Jorgenson and Vu

2016; Latif et al. 2017), but structural changes in labor demand should be prevented by an effective employment strategy.

Herman (2020) showed changes that personnel faced due to digitalization. It was reported that 21% of personnel in the EU have had their working tasks changed, and 39% needed to learn how to work with new technologies. The same results were obtained by Goaied and Sassi (2019) using data science. They showed that from a long-time perspective, ICT adoption caused global structural unemployment in developing and developed countries.

Falk and Biagi (2016) gave a detailed analysis of the impact of ICT on the highly skilled labor employment rate in seven European countries. They identified the significant impact of ERP and e-commerce on the employment rate of highly qualified staff using a panel-based model. They claimed that with a 10% increase in European enterprises that use ERP systems, the share of highly qualified labor employment increases by 0.4%. Thus, between 2001 and 2010, the proportion of highly qualified staff employed in seven European countries increased by 30%, demonstrating the positive effect of e-commerce and ICT on the employment rate of highly skilled staff. Similarly, Peters et al. (2017) showed the positive impact of ICT implementation on the employment rate in high-tech industries.

Balsmeier and Woerter (2019) focused on the impact of ICT and e-commerce on job creation. They examined in detail the tendency to eliminate low-tech jobs when implementing innovative solutions in 28 European countries. Their research was based on an econometric model of the impact of investments when implementing e-commerce systems and the digitization of workflows on the employment rate of staff with different levels of qualification. The econometric model based on panel data included parameters such as investments in digital technology, e-commerce and R&D, employment rates of high-, middle- and low-skilled staff, and the implementation of high-tech solutions in enterprises. They statistically confirmed that investing in e-commerce positively correlates with the employment rate of highly skilled workers and negatively correlates with the employment rate of low-skilled workers. Thus, e-commerce, as a whole, has a net positive impact on employment.

Pantea, Sabadash, and Biagi (2017) also confirmed that the implementation of ICT in European enterprises has no negative impact on employment. The results of their study are significant and reliable for seven European countries. It is important to analyze ICT effects at the country level, as well as at the sectoral level. Abramova and Grishchenko (2020) demonstrated that when adopting ICT, labor productivity rose, but there is a possibility of industrial unemployment due to unsustainable processes in some sectors.

The empirical study by Dachs et al. (2016) described the effect of "cannibalization" when, in the context of the innovative development of European enterprises, the growth

of highly skilled labor is accompanied by a proportional decline in low-skilled personnel employment. They argued for the net positive effect of enterprise innovation on employment growth in most industries. A similar result was presented by Arenas Díaz, Barge-Gil, and Heijs (2020), who investigated the impact of developing innovative enterprises on the change in the employment of high- and low-skilled personnel in Spain. They confirmed that about 13.3% of the gap in employment rate between the two different groups of personnel can be explained by the effect of implementing innovations. They confirmed the net positive effect of e-commerce on the employment rate.

Similar results were obtained by researchers studying the impact of e-commerce and ICT in selected countries. An econometric study by Bockerman, Laaksonen, and Vainiomaki (2016) demonstrated the emergence of the polarization of labor demand in Finland due to the rapid pace of innovation in enterprises. Fukao et al. (2020) provided quantitative arguments for the positive link between investment in ICT, the employment rate, and wages of highly qualified personnel in Japan and Korea. The risks of the negative impact of ICT on the employment of low- and medium-skilled personnel have also been investigated (e.g., Arntz, Gregory, and Zierahn 2016; Frey and Osborn 2017). Using modeling of the computerization development of business, the demand for the workforce of different skill levels in the near future was analyzed (Falk and Hagsten 2018).

In contrast to previous research, Spiezia, Polder, and Presidente (2016) identified the neutral impact of information and communication technology implementation on labor demand using regression models based on annual data of OECD countries. He argued that the rapid development of ICT eliminates jobs in proportion to the creation of new jobs. Thus, there is a shift in the workforce, from a highly-skilled group of staff, who have insufficient potential to perform new tasks in the innovation field to a group of low-skilled personnel, and vice versa – the transfer from low-skilled workers, who quickly adapt to new challenges, to high-quality staff.

A series of studies indicate the high negative correlation between ICT implementation and routine jobs and prove the trend towards the popularization of outsourcing. In their study on 28 OECD countries, Marcolin, Miroudot, and Squicciarini (2016) confirmed that ICT has a positive impact on the employment rate in innovative job places as well as in routine jobs. Importantly, high-routine jobs are displaced by digitalization. Corresponding results were obtained by Brambilla and Tortarolo (2018) on data from an Argentinian manufacturing company. The main aim of their study was to indicate whether ICT adoption displaces low-skilled labor or not. The results show that the employment rate of personnel with all skill levels increased, but there was a substitution of unskilled workers by personnel with higher education attainment levels. So, there is a high correlation between tasks routines, ICT adoption, and employment rate (Cirillo et al. 2020). Additionally, Falk and Biagi (2015) demonstrated a trend for increased high-skilled ICT

workers due to digitalization in Europe, although modern technologies did not displace low-skilled workers.

Dosi and Mohnen (2019) wrote about the polarization of jobs as a result of digitalization. Their study excluded a possible negative correlation between ICT and employment rates as due to technological restructuration, personnel acquires new skills. Furthermore, digitalization leads to globalization as the main source of knowledge for labor.

Unique research was conducted by Flynn, Dance, and Schaefer (2017), who studied the readiness of EU countries in the manufacturing sector to adopt ICT. The UK was found to be most prepared for ICT implementation as digital penetration in government, business, and education sectors was at the highest level (before Brexit). The UK, although no longer part of the EU, is second to Germany in the number of ICT specialists. Studies have demonstrated that it is vital to support ICT adoption by investments in the R&D and education sectors. The importance of ICT education for the Nigerian agricultural sector and economic growth was explained by Agwu (2015), while Anicic, Divjak, and Arbanas (2017) explained the problem of ICT education. Studies also provide cluster analysis and confirm the need to improve education programs for future ICT workers worldwide as it does not suit real-world issues.

Thus, given that the vast majority of studies prove the positive or neutral impact of ICT and e-commerce on the employment rate in different countries, there is a need for a detailed analysis of the probabilities of staff leakage, which is directly dependent on the nature of the development of ICT in European Union (EU) enterprises (Dluhopolskyi et al. 2019; Koziuk et al. 2020; Dluhopolskyi et al. 2021; Oleksiv et al. 2021; Panchenko et al. 2021). The main aim of the study is to identify the nature of the flow of ICT employees between high and low education attainment level groups and also to forecast employment rates in the ICT field for future periods. The object of the study is the employment rate in the ICT field in EU countries. Statistical data, unified standards, and European directives allowed us to combine the national ICT markets in EU countries, as it is a single European digital space.

Methodological approach

To quantitatively analyze the dynamics of ICT personnel employment rate by education attainment level, a Markov chain model was chosen (Tolver 2016). The Markov process is a "stochastic model describing a sequence of possible events in which the probability of each event depends only on the state attained in the previous event" (Gagniuc 2017, p. 62). Using this methodology makes it possible to analyze the flow of staff between

two groups of ICT skills, as well as predict the dynamics of the employment rate of ICT personnel by education attainment level.

In general, using Markov chain methodology can create a model that will help generate transferring processes between different groups of labor divided by education attainment level.

The Markov chain is a stochastic model that explains the sequence of possible events, and the probability of the occurrence of each subsequent event depends only on the previous event. In general, the Markov chain model looks as follows:

$$p_{ij} = P\left\{x_t = j \middle| x_{t-1} = i\right\}, \tag{1}$$

where $i, j = \overline{1,2}$.

The transition probability matrix will then look like this:

$$p_{ij} = \begin{pmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{pmatrix} \tag{2}$$

Each row of matrix (2) is a probability distribution, i.e., the coefficients of each line are equal to one:

$$\begin{cases} p_{ij} \geq 0 \\ \sum\limits_{i \in \mathbb{E}} p^{ij}_{t-1,t} = 1 \end{cases}, \tag{3}$$

where $i, j = \overline{1,2}$ і $t = \overline{1,14}$.

It is necessary to verify the stationarity of the simulated process. The process is stationary if $p_{ij}(t)$ is not time-dependent. The stationary testing hypotheses look as follows:

$$\begin{cases} H_0 : p_{ij}(t) = p_{ij}, t = \overline{1,14} \\ H_0 : p_{ij}(t) = p_{ij}, t = \overline{1,14} \end{cases} \tag{4}$$

In this case, the homogeneity test χ^2 can be used to test the above hypotheses:

$$\chi^2_i = \sum_{ij} \frac{n_i(t-1)\left(\widehat{p_{ij}(t)} - \widehat{p_{ij}}\right)^2}{\widehat{p_{ij}}}, \tag{5}$$

where n – number of possible conversions, $i, j = \overline{1,2}$ і $t = \overline{1,14}$.

For the Markov chain modeling, a software environment R was used with the Markov-chain function package required for modeling Markov processes (Spedicato 2020). Based on the estimated transition probabilities matrices, it will be possible to create forecasts of the transfer probabilities of personnel by education attainment level in the future and estimate each qualification group's employment rate.

The methodology of the study consisted of three main parts:

1. Data verification.
2. Modeling the transition graph.
3. Model verification.

With the help of the first part, it can be decided whether our data is appropriate for Markov chain modeling. To verify the data, the Markov property function from the Markov-chain function package should be used. If the p-value of the verification output is bigger than 0.05, the data row satisfies all necessary conditions for Markov chain modeling.

A transition graph can be created by using the same package in R. Using a general equation, this function automatically generates a graph based on previous data tendencies. The results of the modeling should be verified using qualitative and quantitative methods. Firstly, the χ^2 homogeneity test should be used and the next step is a logical discussion of modeling results. In general, the model should be statically verified based on previous data. The logical test can be provided on prediction results and historical databases.

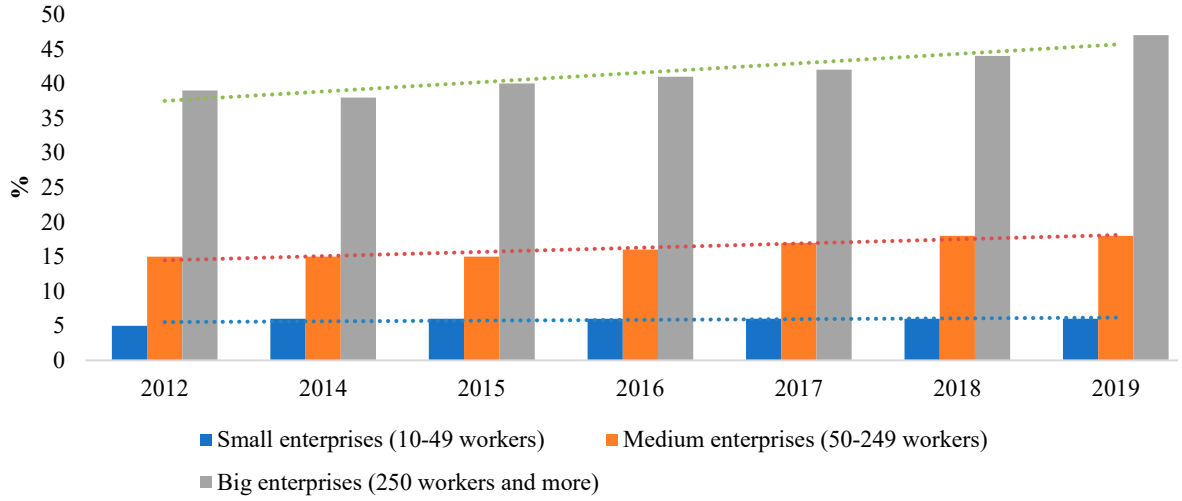
Thus, to conduct the research, annual data during the period 2005–2018 on the employment of high- and low-skilled workforce in ICT will be used, and the possibilities of transferring between the two groups of personnel qualifications will be evaluated.

The relationship between the rapid development of ICT and e-commerce and the employment rate is a widely debated theme within the EU and globally. Studies vary in their results. Some argue the net positive effect of investment in innovation on the employment rate, while others highlight the significant negative effect, which means that innovations increasingly destroy jobs.

Our previous works (Zatonatska and Dluhopolskyi 2019; Zatonatska et al. 2019; 2021; Zatonatska and Fedirko 2019) demonstrated the positive e-commerce effect on the employment rate of the EU population using regression modeling. Specifically, the aim was to verify the existence of transferring processes between different groups of employees by education attainment level who are causally related to ICT. It is assumed that due to digitization and widely available self-study resources, there was a tendency to gradually transfer ICT employees from medium and low-skilled technical staff

into the category of highly skilled labor from 2005 to 2019. There is also a hypothesis that over the next five years, the rate of transfer will increase, and the probability of becoming high-tech staff will gradually increase.

Given that the implementation of innovative solutions in e-commerce and ICT is rapidly expanding, it is advisable to assume a growing trend of demand for qualified technical staff. Graph 1 shows the dynamics of the proportion of EU enterprises by size employing or seeking to hire workers with ICT knowledge. It shows a clear upward trend in the share of large and medium-sized enterprises employing ICT staff. Between 2012 and 2019, the share of large enterprises employing ICT staff increased by 8%, and the share of medium-sized enterprises increased by 3%. Therefore, considering the above-average wage levels of workers with e-commerce and ICT qualifications and the cost of innovations required, the tendency to increase the proportion of small businesses employing ICT staff is not evident. So, the demand for skilled ICT personnel is generated by large and medium-sized enterprises to a greater extent.



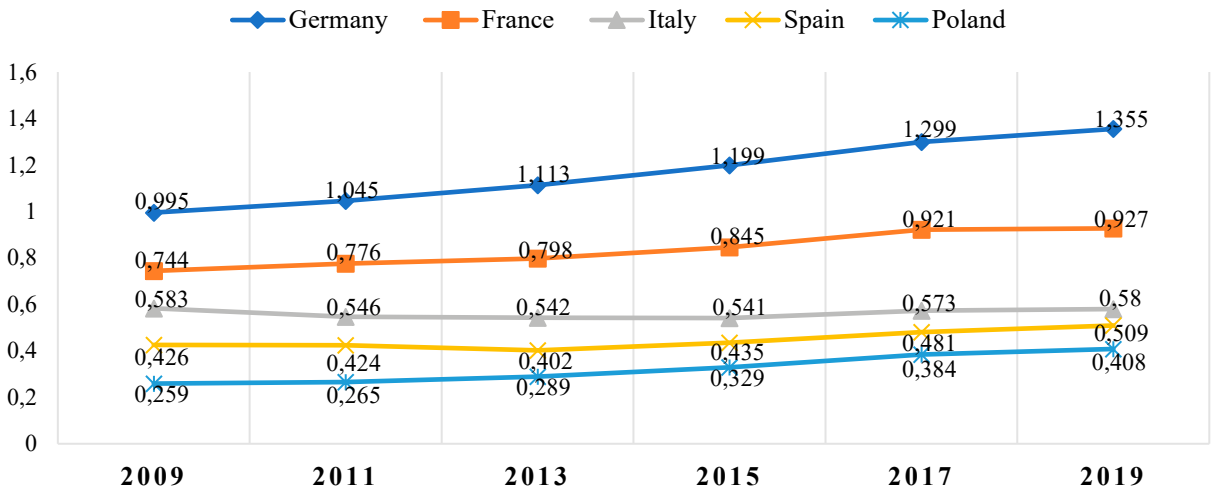
Graph 1. Share of EU enterprises that hire ICT specialists

Source: compiled by authors based on Eurostat (n.d.).

Among the new EU Member States, the largest number of people employed in ICT was recorded in 2019 in Poland (more than 408,000, of whom 3/4 are employed in the services sector). According to this indicator, Poland is among the Top 5 countries with the largest number of ICT specialists (Graph 2). Other new EU members with a high number of ICT employed include Romania (more than 203,000), the Czech Republic (more than 147,000), and Hungary (more than 138,000).

The ICT industry now constitutes about 8% of Polish GDP, and the number of employees increases by 5–6% annually. The revenues of the Polish IT sector in 2018 amounted to EUR 16 billion. The structure of the IT market in Poland: 55% – IT equipment sales, 16% – software, 29% – services (Rutkowski 2019). The top five recipients of Polish IT/

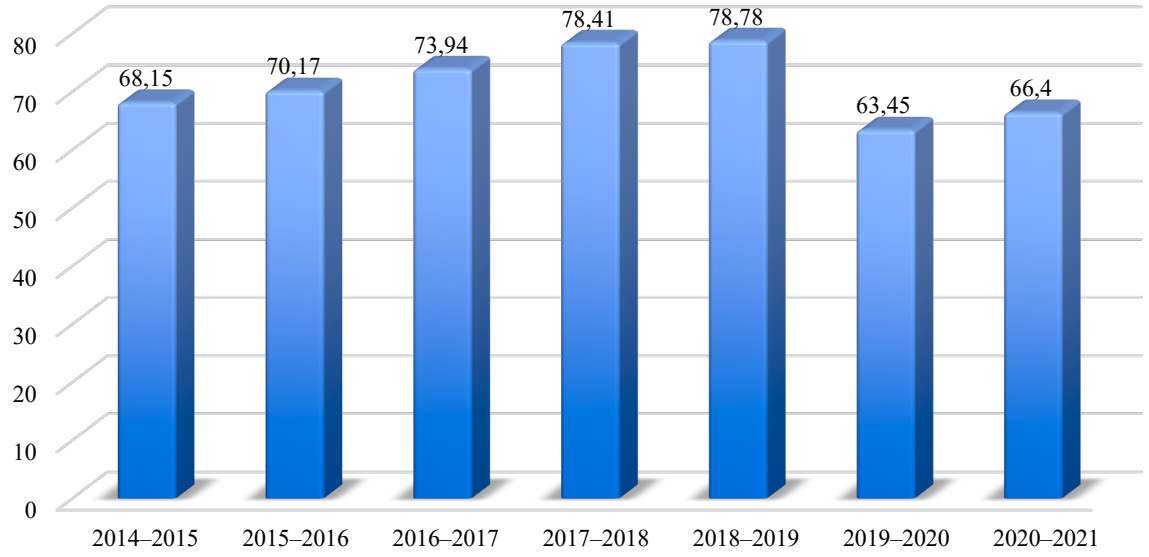
ICT services are the UK (€967 million), the USA (€889 million), Switzerland (€732 million), Germany (€715 million), and Sweden (€321 million). The two main business models of IT companies operating on the Polish market are sales of infrastructure under public contracts and the production of custom software together with staff outsourcing. In 2017, expenditures on cloud technologies in Poland amounted to nearly €200 million, and the International Data Corporation (IDC) forecasts that by the end of 2022, the cloud technology market will reach €450 million (Rutkowski 2019).



Graph 2. Top 5 EU countries by number of people employed in ICT, millions

Source: compiled by authors based on Nation Master (2022).

Given the number of ICT students in Poland (Graph 3), the country is well prepared for the growth of the share of this sector in the country's GDP in the future.

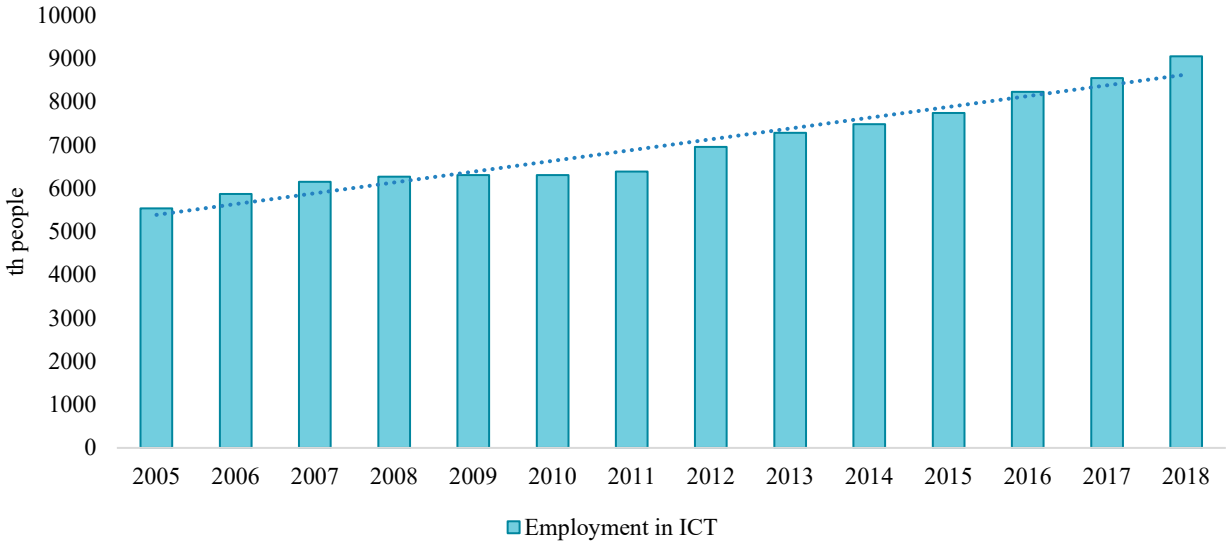


Graph 3. Number of students who studied ICT in Poland, in thousands

Source: compiled by authors based on Statista (2022).

Let us also consider the dynamics of the ICT staff employment rate in the EU countries (Graph 4). Graph 4 shows an upward trend in the level of employment of ICT specialists. Thus, between 2005 and 2018, the employment rate of staff with ICT education increased by 64%. Moreover, the rapid increase in employment and the demand for ICT staff started precisely in 2012, which is due to the increasing tendency to implement innovative solutions. Therefore, in 2012, the employment of ICT staff in European countries increased by 30%.

Given that the main purpose of our study is to analyze and forecast the employment of highly educated staff in ICT, it is necessary to investigate the employment rate of ICT staff by educational attainment level (Graph 5).



Graph 4. Employment of ICT personnel in the EU

Source: compiled by authors based on Eurostat (n.d.).

For our research, two groups of ICT staff were chosen by educational level – highly educated (workers with higher education in the relevant field, certified staff) and low educated (category of workers with lower or secondary education attainment level). There was a tendency to increase the employment rate of highly qualified personnel form 2005 to 2018. Moreover, the growth rate of highly qualified personnel employment exceeded the growth rate of low-skilled ICT personnel employment by 50%. So, it is assumed that in the future, there will be a demand for ICT specialists at the expense of a highly educated workforce. Thus, there will be an increasing tendency to promote higher education in this area, specialized courses, and as a result, transferring between lower and higher educated groups of employees.

All in all, given the analyzed statistical data on the employment rate of ICT personnel by educational attainment level, it is imperative to verify the hypothesis of the ex-

isting transfer of ICT staff with different educational attainment levels and to predict the future dynamics of the employment of high- and low-skilled personnel in ICT.

Graph 5. ICT personnel employment rate in the EU by education attainment level

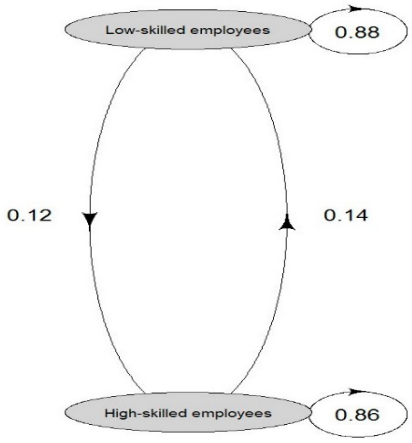
Source: compiled by authors based on Eurostat (n.d.).

Conducting research and results

First, the selected data series should be checked for Markov chain applicability. Using the verify Markov Property function, it can be verified that the selected sequences of values (employment of high-skilled/middle- and low-skilled ICT staff) match the Markov chains requirements. Since the p-value is more than 0.05 in this case, the null hypothesis is accepted, which means that the data series satisfy the necessary conditions for modeling using Markov chains.

To estimate the trend of ICT personnel overflow during the period 2005–2018, a transition graph was constructed. The transition graph for the flow of ICT staff between two qualification groups during the period is presented in Graph 6. There is a significant probability of remaining in the previous qualification group during the period. Thus, for high-skilled technical staff, the probability of staying at the previous qualification level is 86%, and there is a 14% probability of transitioning to the low-skilled group due to the lack of ICT qualification.

The results of the assessment above are fully in line with the previous studies that verified the ingrained tendency to transition between qualification groups of ICT specialists. Moreover, the probabilities determine the upward trend in the employment rate of highly qualified personnel, which is proof of the hypothesis that the demand for highly qualified personnel is growing.



Graph 6. The transition graph of ICT employment by education attainment level

Source: compiled by authors based on model results.

The comparison of transition probability matrices that are relevant for 2010 and 2019 are shown in Table 1. Until 2019, tendencies to transfer between qualification groups changed.

Table 1. Transition matrices for the two qualification groups of ICT employees, 2010–2019

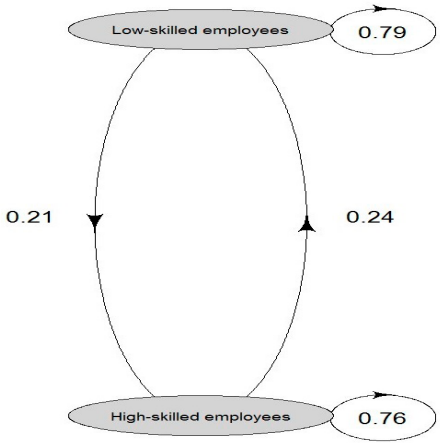
2010		
	High-skilled employees	Low-skilled employees
High-skilled employees	0.88	0.12
Low-skilled employees	0.08	0.92

2019		
	High-skilled employees	Low-skilled employees
High-skilled employees	0.84	0.16
Low-skilled employees	0.13	0.87

Source: compiled by authors based on model results.

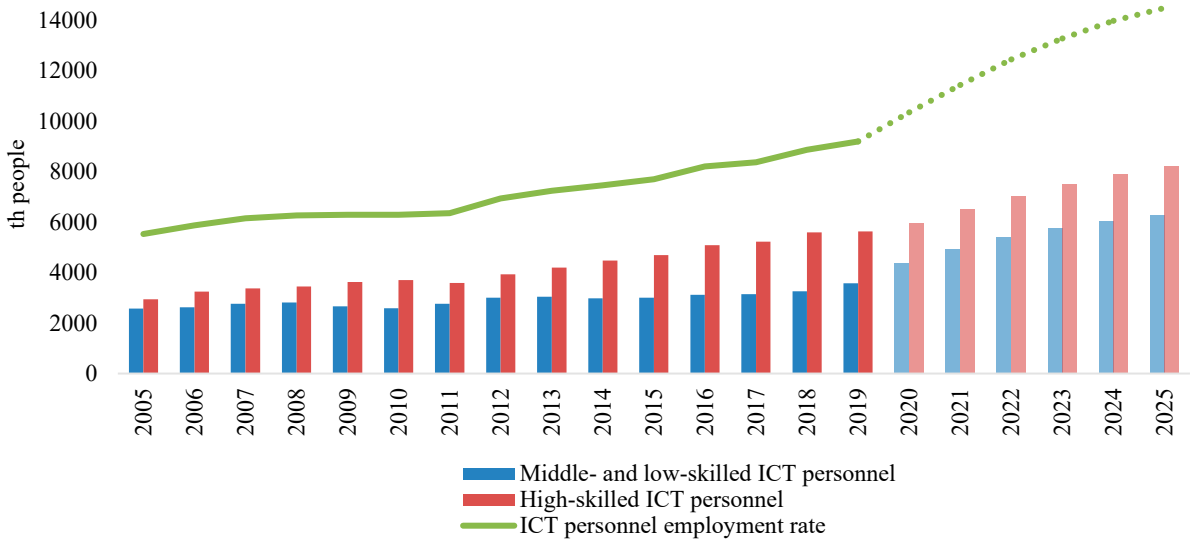
Graph 7 presents the transition probability that is relevant for 2020. It is important to note that 2018 is the starting point for the construction of this graph. The forecast of employment of high- and low-skilled personnel in ICT was calculated based on the probabilities of transitions between states. Thus, in 2020, the employment rate of high-skilled ICT personnel in EU countries was 5.97 million people, which is 7% higher than in 2018, and employment of low-skilled personnel was 4.37 million people (+34% to 2018). This tendency can be explained by the popularization of the direction and, consequently, the increasing level of self-study opportunities in this field. The overall employment rate will increase by 17% compared to 2018.

By modeling the transition probabilities of ICT staff step by step, we obtained a forecast of ICT staff employment by 2025. The simulation results are shown in Graph 8.



Graph 7. The transition graph of ICT employment by education attainment level

Source: compiled by authors based on model results.



Graph 8. Prediction of ICT personnel employment in the EU for 2020–2025

Source: compiled by authors based on model results.

According to the Markov-based modeling, the employment of ICT staff will increase by 64% by 2025 compared to 2018. It is also important to note that the employment of medium- and low-skilled staff will grow faster than the employment of high-skilled ICT professionals, to a greater extent provided by the transfer of staff from lower qualifications. Moreover, employment growth will be at its highest rate in 2022 due to favorable economic conditions in Europe for innovation implementation and the urgent need for economic growth.

With the help of Markov chain modeling, the presence of transitioning between qualification groups and the prediction for ICT employment rate in EU countries were confirmed.

Discussion

Digitalization can create job opportunities as well as destroy them. In this research, the positive correlation between ICT implementation and the labor market was statistically proven. It is important to note that ICT and e-commerce popularization destroys dozens of labor opportunities, but the key fact is that it creates more than destroys.

It is discussed worldwide that due to global digitalization, low-skilled staff has become useless in developed enterprises as high-skilled labor displaced them. Using an econometric model, our study confirmed that the employment of low-skilled staff is going to grow as ICT and e-commerce implementation facilitates it. Specifically, ICT implementation helps reduce labor demand. However, staff who develop new technologies (high-skilled staff) and those that serve existing technologies and processes (middle- and low-skilled staff) will also be in high demand.

Enterprises can optimize labor demand by giving them the type of work that suits them. Our research refers to the fact that digitalization destroys those types of workplaces that are old and unproductive and creates new ones that are progressive. By progressive job opportunities, we mean workplaces that hire all types of staff, high- and low-skilled, but require a new vision and the ability to adapt to modern processes.

The main obstacle for the employment rate growth through digitalization is global economic crises. In the case of economic crises, enterprises will face new challenges that require technological restructuration. However, the consequences cannot be predicted using data science methods. Qualitative analysis may lead to the conclusion that low-skilled staff may be replaced by higher-educated labor. However, it is undeniable that until the start of a global economic crisis, low-skilled personnel will be transformed into medium-skilled staff, and digitalization will neither create nor destroy workplaces.

According to statistical data on European enterprises that try to hire ICT specialists (Graphs 1–3) and the ingrained growing trend of employment rates of ICT staff, the demand for ICT specialists will be met by 2025. Additionally, widely available studying resources will contribute to the supply of qualified ICT staff. So, up to 2023, the pace of employing ICT personnel will rapidly rise due to the enabling conditions (available education and demand for ICT staff). However, from 2025, ICT employment will be stable.

Conclusion

To study the impact of e-commerce and ICT on the employment of highly qualified and low-skilled personnel, the EU ICT employment market was taken, which operates based on unified standards, uniform norms, and rules, and has an appropriate statistical

base. The results of the study can be used to build a comprehensive strategy for the development of a single European digital space.

The growing demand for IT services globally makes technology both a catalyst for growth and a reliable protection against competitors. For example, many experts believe that Polish programmers are among the Top 3 in the world. Poles are valued for the high quality of their work, their quick adaptation to change, and high productivity.

The added value of the research is that, based on the Markov chain simulation, transitioning was found for ICT staff with different educational attainment levels, and the employment rate forecast up to 2025 was created. It was established that in the next five years, the pace of personnel transitioning from being low- to high-skilled will increase. The highest employment growth of ICT staff will occur by 2023, after which, employment growth will slow. Overall, by 2025, the employment rate of ICT staff will increase by 64% compared to 2018, and given the availability of easily available training resources, growth will be largely driven by the increasing employment of middle- and low-skilled ICT staff.

The growing demand for a labor force of medium and low qualifications will be primarily attributed to personnel polarization and causally related to the development of ICT and the adoption of innovations in enterprises, both at the government and enterprise levels. The main obstacle to employment growth through digitalization is the global economic crisis based on different factors. In case of an economic crisis, enterprises will urgently need to restructure the technological aspects of their operations and significantly retain personnel with different educational attainment levels.

References

Abramova, N., Grishchenko, N. (2020), *ICTs, Labour Productivity and Employment: Sustainability in Industries in Russia*, "Procedia Manufacturing", 43, pp. 299–305, https://doi.org/10.1016/j.promfg.2020.02.161

Agwu, E. (2015), *Application of ICT to agriculture as a panacea to unemployment in Nigeria*, "International Journal of Advanced Multidisciplinary Research and Review", 3 (4), pp. 26–48.

Amiri, S., Dodson, Ch., Woodside, J. (2015), *The impact of information and communication technology (ICT) on Brazil, Russia, India and China's (BRIC) employment and economic growth*, Twenty-first Americas Conference on Information Systems, https://aisel.aisnet.org/amcis2015/GlobDev/GeneralPresentations/3/ (accessed: 11.01.2022).

Anicic, K., Divjak, B., Arbanas, K. (2017), *Preparing ICT Graduates for Real-World Challenges: Results of a Meta-Analysis*, "IEEE Transition on Education", 60 (3), pp. 191–197, https://doi.org/10.1109/TE.2016.2633959

Arenas Díaz, G., Barge-Gil, A., Heijs, J. (2020), *The effect of innovation on skilled and unskilled workers during bad Times*, "Structural Change and Economic Dynamics", 52, pp. 141–158, https://doi.org/10.1016/j.strueco.2019.09.012

Arntz, M., Gregory, T., Zierahn, U. (2016), *The risk of automation for jobs in OECD countries: A comparative analysis*, "OECD Social, Employment and Migration Working Papers", No. 189.

Balsmeier, B., Woerter, M. (2019), *Is this time different? How digitalization influences job creation and destruction*, "Research Policy", 48 (8), 103765, https://doi.org/10.1016/j.respol.2019.03.010

Bockerman, P., Laaksonen, S., Vainiomaki, J. (2016), *Are Jobs More Polarized in ICT Firms?*, "IZA Discussion Paper", No. 9851, https://doi.org/10.2139/ssrn.2757961

Brambilla, I., Tortarolo, D. (2018), *Investment in ICT, Productivity, and Labor Demand: The Case of Argentina*, "Policy Research Working Paper", No. 8325, https://doi.org/10.1596/1813-9450-8325

Cirillo, V., Evangelista, R., Guarascio, D., Sostero, M. (2020), *Digitalization, routines and employment: An exploration on Italian Task-based data*, "Research Policy", 5 (7), 104079, https://doi.org/10.1016/j.respol.2020.104079

Dachs, B., Hud, M., Koehler, C., Peters, B. (2016), *Innovation, creative destruction and structural change: firm-level evidence from European countries*, "Industry and Innovation", 24 (4), pp. 346–381, https://doi.org/10.1080/13662716.2016.1261695

Dluhopolskyi, O., Zatonatska, T., Lvova, I., Klapkiv, Y. (2019), *Regulations for Returning Labour Migrants to Ukraine: International Background and National Limitations*, "Comparative Economic Research. Central and Eastern Europe", 22 (3), pp. 45–64, https://doi.org/10.2478/cer-2019-0022

Dluhopolskyi, O., Simakhova, A., Zatonatska, T., Oleksiv, I., Kozlovskyi, S. (2021), *Potential of Virtual Reality in the Current Digital Society: Economic Perspectives*, 11th International Conference on Advanced Computer Information Technologies, September 15–17, Deggendorf, Germany, pp. 360–363, https://doi.org/10.1109/ACIT52158.2021.9548495

Dosi, G., Mohnen, P. (2019), *Innovation and employment: an introduction*, "Industrial and Corporate Change", 28 (1), pp. 45–49, https://doi.org/10.1093/icc/dty064

Eurostat (n.d.), https://ec.europa.eu/eurostat/web/main/home (accessed: 10.04.2021).

Falk, M., Biagi, F. (2015), *Empirical studies on the impacts of ICT usage in Europe*, "Institute for Prospective Technological Studies Digital Economy Working Paper", No. 2015/14, https://www.econstor.eu/handle/10419/202215 (accessed: 10.04.2021).

Falk, M., Biagi, F. (2016), *Relative demand for highly skilled workers and use of different ICT technologies*, "Applied Economics", 49 (9), pp. 903–914.

Falk, M., Hagsten, E. (2018), *Employment impacts of market novelty sales: evidence for nine European Countries*, "Eurasian Business Review", 8, pp. 119–137, https://doi.org/10.1007/s40821-017-0098-0

Flynn, J., Dance, S., Schaefer, D. (2017), *Industry 4.0 and Its Potential Impact on Employment Demographics in the UK*, "Advances in Manufacturing Technology XXXI ", 6, pp. 239–244, https://doi.org/10.3233/978-1-61499-792-4-239

Frey, C., Osborn, M. (2017), *The future of employment: How susceptible are jobs to computerization?*, "Technological Forecasting and Social Change", 114, pp. 254–280, https://doi.org/10.1016/j.techfore.2016.08.019

Fukao, K., Miyagawa, T., Kil Pyo, H., Rhee, K., Takizawa, M. (2020), *The impact of information and communications technology investment on employment in Japan and Korea*, [in:] B.M. Fraumeni (ed.), *Measuring Economic Growth and Productivity. Foundations, KLEMS Production Models, and Extensions*, Elsevier Inc., London–San Diego–Cambridge–Oxford, pp. 283–297, https://doi.org/10.1016/B978-0-12-817596-5.00013-5

Gagniuc, P.A. (2017), *Markov Chains: From Theory to Implementation and Experimentation*, John Wiley & Sons, New York, https://doi.org/10.1002/9781119387596

Goaied, M., Sassi, S. (2019), *The effect of ICT adoption on labour demand: A cross-region comparison*, "Regional Science", 98 (1), pp. 3–16, https://doi.org/10.1111/pirs.12321

Herman, E. (2020), *The Influence of ICT Sector on the Romanian Labor Market in the European Context*, "Procedia Manufacturing", 46, pp. 344–351, https://doi.org/10.1016/j.promfg.2020.03.050

Jorgenson, D.W., Vu, K.M. (2016), *The ICT revolution, world economic growth, and policy issues*, "Telecommunications Policy", 40 (5), pp. 383–397, https://doi.org/10.1016/j.telpol.2016.01.002

Koziuk, V., Hayda, Y., Dluhopolskyi, O., Martynyuk, V., Klapkiv, Y. (2020), *Efficiency of environmental taxation in EU countries: comparative analysis*, "Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu", 5, pp. 115–121, https://doi.org/10.33271/nvngu/2020-5/015

Latif, Z., Mengke, Y., Danish, Latif, S., Ximei, L., Pathan, Z.H., Salam, S., Jianqiu, Z. (2017), *The dynamics of ICT, foreign direct investment, globalization and economic growth: Panel estimation robust to heterogeneity and cross-sectional dependence*, "Telematics and Informatics", 35 (2), pp. 318–328, https://doi.org/10.1016/j.tele.2017.12.006

Marcolin, L., Miroudot, S., Squicciarini, M. (2016), *Routine jobs, employment and technological innovation in global value chains*, "OECD Trade Policy Papers", No. 187, OECD Publishing, Paris, https://doi.org/10.1787/5jm5dcz2d26j-en

Nation Master (2022), *Number of Persons Employed of ICT*, https://www.nationmaster.com/nmx/ranking/number-of-persons-employed-of-ict (accessed: 11.01.2022).

Oleksiv, I., Kharchuk, V., Shulyar, R., Dluhopolskyi, O. (2021), *Quality of Student Support at IT Educational Programmes: Case of Lviv Polytechnic National University*, 11th International Conference on Advanced Computer Information Technologies, September 15–17, Deggendorf, Germany, pp. 270–275, https://doi.org/10.1109/ACIT52158.2021.9548648

Panchenko, O., Klochko, A., Dluhopolskyi, O., Klochko, O., Shchurova, V., Peker, A. (2021), *Impact of the COVID–19 Pandemic on the Development of Artificial Intelligence: Challenges for the Human Rights*, 11th International Conference on Advanced Computer Information

Technologies, September 15–17, Deggendorf, Germany, pp. 744–747, https://doi.org/10.1109/ACIT52158.2021.9548357

Pantea, S., Sabadash, A., Biagi, F. (2017), *Are ICT displacing workers in the short run? Evidence from seven European countries*, "Information Economics and Policy", 39, pp. 36–44, https://doi.org/10.1016/j.infoecopol.2017.03.002

Peters, B., Hud, M., Dachs, B., Köhler, C. (2017), *Employment Effects of Innovations over the Business Cycle: Firm-Level Evidence from European Countries*, "SPRU Working Paper Series", No. 03, http://doi.org/10.2139/ssrn.2912140

Rutkowski, E. (ed.) (2019), *IT/ICT Sector in Poland*, Polish Agency for Enterprise Development, Warsaw, https://ict.trade.gov.pl/pl/f/v/570995/PPE_PL_IT%20ICT%20SECTOR%20IN%20POLAND.pdf (accessed: 10.04.2021).

Spedicato, G. (2020), *The Markov chain package: A package for easily handling discrete Markov Chains in R*., https://cran.r-project.org (accessed: 10.04.2021).

Spiezia, V., Polder, M., Presidente, G. (2016), *ICT and jobs: complements or substitutes? The effects of ICT investment on labour demand by skills and by industry in selected OECD countries*, "OECD Digital Economy Papers", http://hdl.voced.edu.au/10707/406130 (accessed: 8.05.2021).

Statista (2022), *Education & Science*, https://www.statista.com/markets/411/topic/962/education-science/#overview (accessed: 11.01.2022).

Tolver, A. (2016), *An introduction to Markov chains*, http://web.math.ku.dk/noter/filer/stoknoter.pdf (accessed: 22.06.2021).

Zatonatska, T., Dluhopolskyi, O. (2019), *Modelling the efficiency of the cloud computing implementation at enterprises*, "Marketing and Management of Innovations", 3, pp. 45–59, https://doi.org/10.21272/mmi.2019.3-04

Zatonatska, T., Fedirko, O. (2019), *Modeling of E-Commerce Impact on Employment in EU*, 2019 IEEE International Conference on Advanced Trends in Information Theory (ATIT), 18–20 December, Kyiv, Ukraine, pp. 304–308, https://ieeexplore.ieee.org/document/9030427 (accessed: 10.04.2021).

Zatonatska, T., Dluhopolskyi, O., Chyrak, I., Kotys, N. (2019), *The internet and e-commerce diffusion in European countries (modeling at the example of Austria, Poland, and Ukraine)*, "Innovative Marketing", 15 (1), pp. 66–75, https://doi.org/10.21511/im.15(1).2019.06

Zatonatska, T., Fedirko, O., Dluhopolskyi, O., Londar, S. (2021), *The impact of e-commerce on the sustainable development: case of Ukraine, Poland, and Austria*, IOP Conference Series: Earth and Environmental Science, Vol. 915, (ISCES) "International Conference on Environmental Sustainability in Natural Resources Management", 15–16 October, Odesa, Ukraine, https://doi.org/10.1088/1755-1315/915/1/012023

Prognozowanie stopy zatrudnienia w obszarze ICT w Unii Europejskiej

Zakorzeniona w ostatnim dziesięcioleciu tendencja do wdrażania technologii informacyjno-komunikacyjnych w przedsiębiorstwach UE spowodowała wstrząsające zmiany na rynku pracy. Ponieważ zapotrzebowanie na personel ICT rośnie, nadal istnieje potrzeba stworzenia kompleksowej strategii skutecznego zarządzania specjalistami ICT na potrzeby restrukturyzacji przedsiębiorstw. Celem badań jest identyfikacja procesów transferu pomiędzy nisko- i wysoko wykwalifikowanym personelem ICT oraz przewidywanie wskaźnika zatrudnienia w dziedzinie ICT do 2025 r. W badaniach wykorzystano łańcuch Markowa jako metodę analizy. W OPARCIU O dane statystyczne dotyczące wskaźnika zatrudnienia personelu ICT według poziomu wykształcenia opracowano model łańcucha Markowa, który opisuje procesy personelu ICT o różnym poziomie wykształcenia. Do analizy wykorzystano dane z okresu 2005–2019 do zbudowania prognozy ze względu na brak najnowszych informacji. W efekcie udowodniono, że przy pomocy procesów digitalizacji stopa zatrudnienia pracowników ICT w 2025 r. wzrośnie o 64% w porównaniu z danymi z 2018 r. Badania potwierdziły, że personel ICT będzie bardzo potrzebny do 2023 r., a co ważne, zapotrzebowanie na pracowników o niskich i średnich kwalifikacjach będzie rosło, jak i na wysoko wykwalifikowanych. Stopa zatrudnienia w dziedzinie ICT będzie na wyższym poziomie w 2022 r., ponieważ sprzyjające warunki ekonomiczne dla przyjęcia ICT mu pomogą. Rosnące zapotrzebowanie na personel ICT o niskim i średnim poziomie kwalifikacji będzie zapewnione przez personel przenoszący procesy, przedsiębiorstwa i cyfryzację rządu. Największy wzrost zatrudnienia personelu ICT nastąpi do 2023 r., a w przyszłości wzrost zatrudnienia spowolni. Główną przeszkodą dla wzrostu zatrudnienia poprzez cyfryzację jest globalny kryzys gospodarczy. Wartością dodaną analizy jest prognoza, że największy wzrost zatrudnienia personelu ICT nastąpi do 2023 roku, ale po będzie mało miejsce spowolnienie wzrostu zatrudnienia. Główną przeszkodą we wzroście zatrudnienia poprzez cyfryzację jest światowy kryzys gospodarczy z różnych powodów.

Słowa kluczowe: wdrożenie ICT, cyfryzacja, zarządzanie zatrudnieniem, popyt na pracę, łańcuch Markowa

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.20

A Comparison of the Effects of Capital and Labour Taxes in CEE Countries

Piotr Krajewski https://orcid.org/0000-0002-5377-9578
Ph.D., Associate Professor at the University of Lodz, Faculty of Economics and Sociology, Department of Macroeconomics, e-mail: piotr.krajewski@uni.lodz.pl

Katarzyna Piłat https://orcid.org/0000-0002-9364-8863
Ph.D., Assistant Professor at the University of Lodz, Faculty of Economics and Sociology, Department of Economic Mechanisms, e-mail: katarzyna.pilat@uni.lodz.pl

Abstract

The aim of the article is to quantify and compare the impact of capital and labour tax on the economies of Central and Eastern Europe (CEE). The impulse-response functions presented in the paper show that output reacts differently to changes in the taxation of labour and capital. Although there is some heterogeneity in the magnitude and persistence of tax effects between the analysed CEE countries, the simulations generally indicate that the negative impact of increased capital taxation on GDP is stronger than for labour taxation. More importantly, however, the negative effects of higher taxation on capital are more persistent than in the taxation of labour. This is largely because higher capital taxation strongly reduces savings and the desired stock of capital, which has important long-term macroeconomic consequences.

Keywords: capital tax, labour tax, CEE countries

JEL: E62, H20, H30

Received: 6.10.2021. Verified: 2.03.2022. Accepted: 18.05.2022

Introduction

Taxes are an indispensable element in any market economy, enabling the financing of public administration, national defence, justice, police, education, and health care, among others. However, there is another side to the same coin. Increasing taxes, with the remaining conditions unchanged, limits economic activity. The vast majority of studies indicate that an increase in tax rates has a statistically significant, negative impact on GDP (cf. Baxter and King 1993; Mertens and Olea 2018; Owen 2019; Alinaghi and Reed 2021). The negative impact of a tax increase on GDP results from two main factors. Firstly, higher taxes reduce net income, which according to the multiplier model, has a significant impact on aggregate demand and, consequently, production. Secondly, higher tax rates distort entities' decisions due to an increase in the tax wedge.

The first of the above mechanisms affects aggregate demand, regardless of the tax category. In particular, this Keynesian mechanism occurs both with lump-sum taxes and distortionary taxes, i.e. taxes that depend on labour or capital income. However, this is not valid for the supply-side mechanism.

The supply-side mechanism impacts decisions of households and firms, in particular, decisions concerning labour and saving. The supply-side effects of taxes are, therefore, crucially dependent on what kind of taxes are analysed. On the one hand, taxes on wages directly affect the tax wedge in the labour market. On the other hand, taxes on income from capital has a direct impact on the differences between net and gross income from capital. Moreover, lump-sum taxes, despite their impact on current disposable income, according to the Ricardian equivalence (cf. Barro 1974), do not influence households' microeconomic decisions and, consequently, do not have supply-side effects.

Supply-side effects are, therefore, heterogeneous. This phenomenon results from the possible distorting impact of a tax on individual decisions of microeconomic entities and not from the aggregate impact of taxes on disposable income. As a result, studies that consider the supply-side mechanisms of tax impact usually show that the effects of fiscal changes are heterogeneous, and that the results depend on, among others, the country surveyed (see, e.g. Ohanian 1997; Ardagna 2001; Romer and Romer 2010).

The article aims to quantify and compare the impact of labour and capital tax on the economies of Central and Eastern Europe (CEE). Estimations have been made for two kinds of income taxes, i.e. taxes on labour and taxes on capital. The analysis was based on a model that considers the distorting influence of these taxes on the tax wedges and consequently on entities' decisions. Estimates of the supply-side impact of individual taxes were based on a dynamic general stochastic model developed for the three CEE economies: the Czech Republic, Hungary and Poland.

The dynamic general stochastic model makes it possible to examine, compare and interpret the heterogeneity of the impact of particular types of taxes on the analysed economies. However, the simulations assume that the increase in taxation takes place *ceteris paribus*; that is, the other conditions are unchanged. Such an assumption allows for the most precise separation of the effects of individual taxes.

The value added of the paper is a two-dimensional analysis of the effects of taxes, i.e. the analysis of the heterogeneity of tax effects among CEE countries and a comparison of labour tax effects and capital tax effects.

The structure of the article is as follows. Firstly, the principles of the theoretical model and fiscal disturbances are presented. Then the effects of an increase in capital and labour tax are shown, respectively. The final section concludes.

The model

The model assumes that households are homogeneous, and that the utility of a household depends on consumption and leisure. The household utility function (u_t) takes the form:

$$u_t = \left(\frac{1}{1-\sigma_c} (C_t^j - \nu_t)^{1-\sigma_c} - \frac{(l_t^j)^{1+\sigma_l}}{1+\sigma_l} \right), \tag{1}$$

where:

C_t^j – consumption of household *j*,

ν_t – the impact of consumption habits on utility,

l_t^j – the labour of household *j*,

σ_c – the inverse of the intertemporal elasticity of consumption,

σ_l – the inverse of labour supply elasticity,

$j \in \langle 0,1 \rangle$.

Household consumption habits depend on the aggregate consumption in the previous period, in contrast to the approach where consumption habits depend on the household's previous individual consumption (cf. Christiano, Eichenbaum, and Evans 2005; Fernandez-Villaverde 2010). Thus, the impact of consumption habits on utility is determined by the equation:

$$\nu_t = a_\nu C_{t-1}\,, \tag{2}$$

where:

$a_\nu \in (0,1)$.

Households maximise the expected value of the discounted utility, so they maximise the following formula:

$$E_t \sum_{t=0}^{\infty} \beta^t u\left(C_t^j - v_t, l_t^j\right), \tag{3}$$

where:

E_t – expected value in period t,

β – discount factor,

$\beta \in (0,1)$.

The model assumes that households hold financial assets in the form of one-year bonds. Thus, given that consumption is taxed, the fiscal constraint on households takes the form of the following budget constraint:

$$P_t^B \frac{B_t^j}{P_t} + C_t^j + I_t^j = \frac{B_{t-1}^j}{P_t} + Y_t^j, \tag{4}$$

where:

P_t^B – bond price,

B_t^j – bonds held by household j,

P_t – the price level of goods and services,

I_t^j – the investments of household j,

Y_t^j – the net income of household j.

The above equation can also be written as:

$$\frac{B_t^j}{R_t P_t} + C_t^j + I_t^j = \frac{B_{t-1}^j}{P_t} + Y_t^j, \tag{5}$$

where:

R_t – nominal gross return on bonds.

The nominal gross return on bonds is defined as follows:

$$R_t = \frac{1}{P_t^B} = 1 + r_t^n, \tag{6}$$

where:

r_t^n – nominal interest rate.

The level of the nominal interest rate results from the monetary policy according to the Taylor rule (1993). Thus, monetary authorities react to deviations in output from its potential level and the deviations of inflation from the inflation target. It is assumed that the higher the level of production and inflation, the higher the interest rate set by the central bank.

The total income of households is composed of the following three types of income:

- capital income,
- labour income,
- budget transfers.

Household capital income is taxed at the tax rate τ_t^k, while income from the capital at the tax rate τ_t^l. As a result, taking into account the different types of taxation, the household's net income is determined by the formula:

$$Y_t^j = \left(1-\tau_t^k\right)\left(r_t^K u_{K,t}^j k_t^j - \Psi\left(u_{K,t}^j\right)k_{t-1}^j\right) + \left(1-\tau_t^l\right)w_t^j l_t^j, \tag{7}$$

where:

τ_t^k – the tax rate on capital,

τ_t^l – the tax rate on labour,

k_t^j – the physical capital held by household *j*,

$u_{K,t}^j$ – the utilisation rate of physical capital,

$\Psi\left(u_{K,t}^j\right)$ – costs resulting from under- or overutilisation of physical capital,

w_t^j – the real wage of household *j*.

Thus, like the works of Greenwood, Hercowitz, and Huffmann (1988) and King and Rebelo (2000), the model considers the possibility of underutilisation or overutilisation of capital. It is assumed that the degree of capital utilisation affects the efficiency of its use. The model also assumes that changes in investment involve additional costs (cf. Angeloni, Coenen, and Smets 2003; Christiano, Eichenbaum, and Evans 2005). As a result, the growth function of the investment is determined by the following formula:

$$k_t = \left(1-\delta\right)k_{t-1} + \left(1 - S\left(\frac{I_t}{I_{t-1}}\right)\right)I_t, \tag{8}$$

where:

$$S'\left(\frac{I_t}{I_{t-1}}\right)<0 \text{ for } \frac{I_t}{I_{t-1}}\in(0,1), \tag{9}$$

$$S'\left(\frac{I_t}{I_{t-1}}\right)>0 \text{ for } \frac{I_t}{I_{t-1}}>1, \tag{10}$$

$$S(1)=0. \tag{11}$$

As a result, we get the following optimisation conditions for the capital value (Q_t), the level of investment and the utilisation rate:

$$\Psi'\left(u_{K,t}\right)=r_t^K, \tag{12}$$

$$Q_t S'\left(\frac{I_t}{I_{t-1}}\right)\frac{I_t}{I_{t-1}}+\beta E_t\left(Q_{t+1}\left(\frac{C_{t+1}^j-\nu_{t+1}}{C_t^j-\nu_t}\right)^{-\sigma_c} S'\left(\frac{I_{t+1}}{I_t}\right)\frac{I_{t+1}}{I_t}\right)=1, \tag{13}$$

$$Q_t=E_t\left(\beta\left(\frac{C_{t+1}^j-\nu_{t+1}}{C_t^j-\nu_t}\right)^{-\sigma_c}\left(Q_{t+1}(1-\delta)+(1-\tau_t)\left(u_{K,t}r_t^K-\Psi'\left(u_{K,t}\right)\right)\right)\right). \tag{14}$$

The model assumes that the labour market is not perfectly competitive but monopolistically competitive. Thus, the labour provided by individual households differs, giving households some monopolistic power in the labour market. The production is influenced by the evolution of the aggregate employment index, which depends on the working time of individual households, as defined by the following Dixit-Stiglitz function (Dixit and Stiglitz 1977):

$$L_t=\left(\int_0^1\left(l_t^j\right)^{\frac{1}{1+\lambda_{w,t}}}dj\right)^{1+\lambda_{w,t}}, \tag{15}$$

where:

L_t – the aggregate labour index,

$\lambda_{w,t}>0$.

The nominal wage rate W_t is therefore defined as:

$$W_t = \left(\int_0^1 \left(W_t^j \right)^{-\frac{1}{\lambda_{w,t}}} dj \right)^{-\lambda_{w,t}}, \tag{16}$$

where:

$\lambda_{w,t}$ – the markup on the labour market.

It means that the labour demand of each individual household is determined by the following equation:

$$l_t^j = \left(\frac{W_t^j}{W_t} \right)^{-\left(\frac{1+\lambda_{w,t}}{\lambda_{w,t}} \right)} L_t. \tag{17}$$

According to the Calvo (1983) scheme, only part of the wages is optimised in each period. The probability that a household will set a utility-maximising wage rate over a given period is fixed and does not depend on when it previously adjusted its wage level. On the other hand, wages that are not optimised over a given period are indexed according to the evolution of inflation.

Taking into account that in each period some households index the wage rate and some make optimisation decisions, the following formula determining the nominal wage level in the economy is obtained:

$$W_t = \left(\xi_w W_{IND,t}^{-\frac{1}{\lambda_{w,t}}} + \left(1 - \xi_w \right) W_{OPT,t}^{-\frac{1}{\lambda_{w,t}}} \right)^{-\lambda_{w,t}}, \tag{18}$$

where:

ξ_w – the probability that the household will not optimise wages during a given period,

$W_{IND,t}$ – the indexed wage rate,

$W_{OPT,t}$ – the wage rate of households that make optimisation decisions,

$\xi_w \in (0,1)$.

Aggregate demand consists of consumption, investment and government purchases. Therefore, the equation of aggregate demand, taking into account that part of the expenditure is related to the cost of under- or over-utilisation of capital, takes the form:

$$Y_t = C_t + I_t + \Psi\left(u_{K,t}\right)k_{t-1} + G_t, \tag{19}$$

where:

G_t – government purchases.

The final good is produced based on a continuum of intermediate goods indexed i∈<0,1>:

$$Y_t = \left(\int_0^1 y_t(i)^{\frac{1}{1+\lambda_{p,t}}} di\right)^{1+\lambda_{p,t}}, \tag{20}$$

where:

$\lambda_{p,t}$ – markup.

The necessary condition of cost minimisation shows that the demand for intermediate goods is determined by the following formula:

$$y_t(i) = \left(\frac{p_t(i)}{P_t}\right)^{-\frac{1+\lambda_{p,t}}{\lambda_{p,t}}} Y_t. \tag{21}$$

Intermediate goods are produced by companies that operate in a monopolistically competitive market, using the following technology:

$$y_t(i) = z_t\left(u_{K,t}k_t(i)\right)^{\theta} L_t(i)^{1-\theta} - FC, \tag{22}$$

where:

$k_t(i)$ – the capital used to produce the intermediate good *i*,

$L_t(i)$ – employment used in the production of the intermediate good *i*,

$\theta \in (0,1)$.

The condition of cost minimisation shows that:

$$\frac{W_t L_t(i)}{r_t^k u_{K,t} k_t(i)} = \frac{1-\theta}{\theta}. \tag{23}$$

The employment to capital ratio is the same for each intermediate good and, consequently, for the whole economy. As a result:

$$\frac{k_t}{L_t} = \frac{k_t(i)}{L_t(i)}. \tag{24}$$

The model assumes that prices, like wages, are set according to the Calvo (1983) scheme. Thus, only some firms set profit-optimising prices, and the rest adjust prices based on past inflation. The overall price level is therefore determined by the formula:

$$P_t = \left(\xi_p P_{IND,t}^{-\frac{1}{\lambda_{p,t}}} + \left(1-\xi_p\right) P_{OPT,t}^{-\frac{1}{\lambda_{p,t}}} \right)^{-\lambda_{p,t}}, \tag{25}$$

where:

ξ_w – the probability that the company will not optimise its price level during a given period,

$P_{IND,t}$ – the price set by the indexing companies.

$P_{OPT,t}$ – the price set by companies that make optimisation decisions based on profit maximisation.

The model parameters were estimated for each analysed country based on Bayesian estimation (cf. Adolfson et al. 2007; Ruge-Murcia 2007; Ferroni 2010) and calibration. The sample used in estimations covers the period 2000–2020. The Eurostat data was used in estimation.

Characteristics of fiscal impulses

In the model, fiscal policy affects the economy through the following variables:

- government purchases,
- capital tax rate,
- labour tax rate.

The purpose of the model is to analyse the effects of changes in capital and labour taxes in the analysed countries. The development of each of the analysed tax rates is determined by autoregressive processes:

$$\tau_t^k = \left(1-\rho_\tau\right)\overline{\tau}_k + \rho_\tau \tau_{t-1}^k + \zeta_{k,t}, \tag{26}$$

$$\tau_t^l = \left(1-\rho_\tau\right)\overline{\tau}_l + \rho_\tau \tau_{t-1}^l + \zeta_{l,t}, \tag{27}$$

where:

$\overline{\tau}_{k,}\overline{\tau}_l, > 0$,

$\rho_{\tau} \in (0,1)$,

$\zeta_{k,t} \sim N\left(0,\sigma_k^{\,2}\right)$,

$\zeta_{l,t} \sim N\left(0,\sigma_l^{\,2}\right)$.

The parameters $\overline{\tau}_{k,}\overline{\tau}_{l},>$ indicate the average level of taxation of capital and labour, respectively. The parameter ρ_{τ} indicates the persistence of fiscal disturbances.

The effects of changes in particular tax rates were estimated on the basis of simulations of distortions caused by an increase by one percentage point in the tax rate on capital and labour, respectively.

In the analysed dynamic model, changes in individual tax rates translate into the level of capital and the level of wages set by households, as well as the level of household consumption. As a result of feedback loopholes between the equations that determine the dynamics of the model, changes in taxes not only influence aggregate demand, wage levels and capital value, but they also affect other macroeconomic variables in the analysed economies.

The following subsections show the macroeconomics effects of increased taxes on capital and labour in the CEE countries.

The effects of an increase in capital taxes

The increase in capital tax rate impacts macroeconomic variables via a decrease in net capital income. A higher capital income tax rate increases the difference between the cost of capital for companies and the income that capital brings to its owners. With higher taxes on the income from the capital, the rate of return before tax on the additional investment must be higher in order to obtain a certain rate of return after tax.

The impact of an increase in the taxation of income from capital in the Czech Republic, Hungary and Poland on GDP in the analysed countries is shown in Figure 1.

Impulse-response analysis shows that an increase in capital tax rate by 1 percentage point reduces GDP by 0.4%–0.5% directly after the fiscal disturbance. The strongest negative impact of higher taxation is observed in Hungary and relatively weakest in Poland.

There is a strong persistency of the negative effects of a higher capital tax rate on output in all analysed countries. The highest persistency was observed in the Czech Republic; however, in all analysed countries, after four years (16 quarters), the decline in GDP is still significant, much higher than 0.2%.

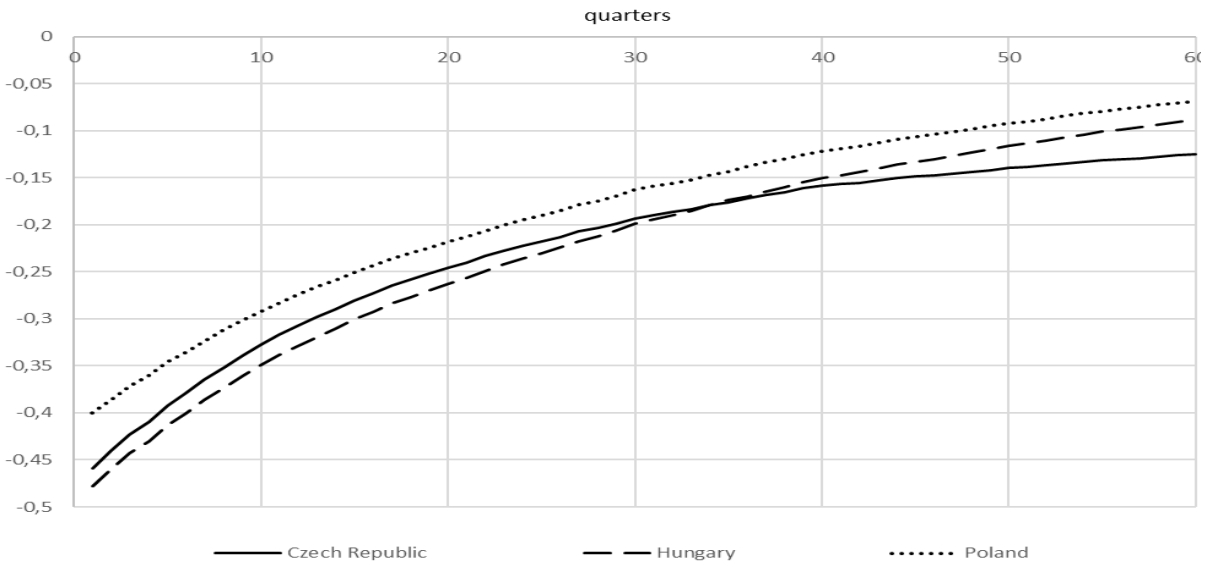


Figure 1. Impact of a 1 percentage point increase in the capital tax rate on GDP in CEE countries

Source: own study.

The high persistency of the distortion that stems from the increase in capital income taxation is because the effects of the distortion mainly affect the amount of physical capital, which is very slowly being brought back to the baseline.

As a result of the increase in capital income taxation, unsurprisingly, there are mainly adjustments in the amount of physical capital. In order to restore balance, the desired amount of physical capital is changed in such a way that the marginal product of capital is increased to the initial value determined by household consumption preferences (cf. McGrattan 1994; Ferroni 2010). The simulation shows that as a result of increased taxation of income from capital, the level of capital in all analysed CEE countries falls by more than 3%.

Changes in the evolution of capital taxation also affect the level of employment. In the analysed model, there are four channels of the impact of capital taxation on labour:

- a reduction in the amount of physical capital results in a reduction in the marginal product of labour (workers are less productive with fewer machines and equipment), which reduces demand for labour at a given wage rate,
- higher capital taxation encourages the choice of labour-intensive production techniques, according to the substitution effect.

Thus, from the theoretical point of view, the impact of an increase in taxation of income from capital on employment is not clear.

Impulse response analysis for the CEE countries shows that for the Polish economy, in the first three years after a fiscal disturbance concerning capital taxation, factors

limiting employment prevail. For Hungary and the Czech Republic, factors that limit employment prevail even longer – almost four years.

Not surprisingly, an increase in capital taxation, which causes a decrease in the desired capital level, significantly reduces investments and savings in all analysed CEE countries. However, capital recovers starting from about the fourth year after the fiscal shock. Nevertheless, the process is slow, and, as a result, capital remains below the initial level for many periods.

The reaction of consumption is interesting. In all analysed countries, immediately after the increase in capital taxation, consumption increases. This is because, in a period of high capital income taxation, households are not interested in maintaining capital which generates a low return after taxation; they replace part of the capital with consumption. As a result, investment declines and household consumption expenditure increases. However, this is a temporary process. About a year after the increase in capital taxation, consumption falls below the baseline level.

This happens for two reasons. Firstly, the higher capital taxation is temporary, and while it decreases to the baseline level, it is less and less worthwhile replacing investment in capital with consumption. Secondly, due to the cumulative effect of lower savings and investment on physical capital, the changes in capital are lagged and more persistent, which translates into a more persistent decrease in production. And a decrease in output means that households are poorer and limit their consumption.

The effects of an increase in labour taxes

Taxing labour income results in employees receiving pay that is lower than the labour costs incurred by the employer. As a result of the increase in taxes levied on wages, the difference between the cost of work for the employer and the wage received by the employee increases. At the same time, higher taxation of labour reduces households' net income. Lower household net incomes translates into a decrease in their demand for goods and services.

The impact of the tax wedge on employment depends on the wage elasticity of labour supply and the wage elasticity of labour demand. The higher the elasticity of labour demand and labour supply to the wage rate, the stronger the negative impact of increased taxes on wages on employment in a given economy.

The impact of an increase in the taxation of wages on GDP, estimated on the basis of a model developed for the CEE countries, is shown in Figure 2.

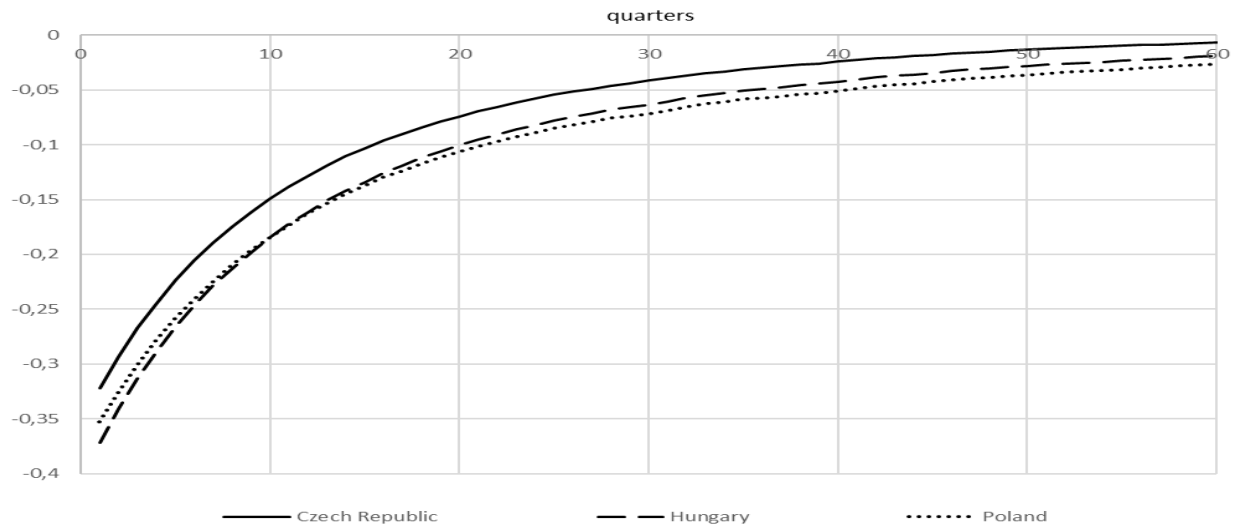


Figure 2. Impact of a 1 percentage point increase in the labour tax rate on GDP in CEE countries

Source: own study.

The impulse-response functions show that an increase in labour taxation has a negative impact on economic activity in all analysed CEE countries. In the initial period, GDP is reduced by about 0.32% in the Czech Republic, 0.35% in Poland, and 0.37% in Hungary. However, as the increase in labour tax rate is temporary, GDP gradually returns to its pre-fiscal stimulus level. After four years, the negative effects of higher taxation are weakest in Hungary – after 16 quarters, the decrease in GDP in its economy is lower than 0.1%

Similarly, as with capital tax, the responses of employment, physical capital, consumption and savings have also been examined.

Not surprisingly, the increase in labour tax rate negatively impacts employment – a higher tax wedge has the effect of reducing both labour demand and labour supply. The negative impact of a higher labour tax rate on labour supply results from the fact that the model examines temporary changes in taxation. Therefore, the intertemporal substitution of work and leisure occurs. On the other hand, with temporary tax changes, the income effect of a lower net wage is relatively less important. As a result, according to the presented estimates, in the case of temporary changes in labour taxation in all analysed CEE economies, the substitution effect is stronger than the income effect, which means that the labour supply curve is upward sloping.

The wage elasticity of labour supply is usually lower than the wage elasticity of labour demand. The elasticity of labour demand to the wage rate results from the substitution of labour for capital and the impact of higher labour costs on the profitability of production. The weaker the impact of labour costs on the profitability of production and the worse the substitution of physical capital for labour, the lower the wage elasticity of labour demand.

The model shows that the decrease in employment in all analysed CEE countries is relatively lower than the increase in taxation (it amounts to about 0.3%). It means that the elasticity of labour demand and supply to the net wage rate is relatively low.

Interestingly, the impulse-response functions show that as a result of increased labour taxation, employment and physical capital are reduced. This is due to the fact that with lower employment, the marginal capital product decreases. At the same time, it means that in the analysed CEE countries, the substitution between work and physical capital is relatively small.

Although the analysed fiscal change directly concerns wages, the changes in physical capital are greater than changes in labour in all analysed countries. In order to smooth consumption fluctuations, households significantly reduce their savings, which has a negative impact on investment and physical capital. That is, physical capital is partly converted into consumption in order to minimise the fluctuation of consumption. It consequently leads to fluctuations in capital that are even stronger than fluctuations in labour.

Conclusion

The effects of labour and capital tax increase in Central and Eastern European countries were analysed in the article. The impulse-response functions presented show that output reacts to changes in the taxation of labour and capital. Although there is some heterogeneity in the magnitude and persistence of tax effects between the analysed countries, the simulations generally show that the negative impact of increased capital taxation on GDP is stronger than for labour taxation. More importantly, however, the negative effects of higher taxation on capital are more persistent than on the taxation of labour.

In each analysed country, the negative impact on output is much more persistent when there is an increase in capital tax than an increase in labour tax. This is largely because higher capital taxation strongly reduces savings and the desired stock of capital, which has important long-term macroeconomic consequences. Indeed, the build-up of physical capital is much slower than a return to employment. As a result, approximately three or four years after a fiscal disturbance, the negative effects of higher labour taxation on output are diminishing in all analysed CEE counties, while the negative impact of capital taxation on GDP tends to remain relatively high.

The simulations assume that the increase in taxation takes place *ceteris paribus*, i.e. other conditions remain unchanged. Such an assumption allows for the most precise separation of the effects of individual taxes. At the same time, however, in real economies, tax increases usually serve a variety of purposes, including redistribution and allocation purposes. Above all, however, tax increases are usually intended to finance additional

government spending. Therefore, the effects of increases in individual taxes followed by a corresponding increase in government spending that occurs simultaneously is an interesting area for further research.

References

Adolfson, M., Laseen, S., Linde, J., Villani, M. (2007), *Bayesian estimation of an open economy DSGE model with incomplete pass-through*, "Journal of International Economics", 72 (2), pp. 481–511, https://doi.org/10.1016/j.jinteco.2007.01.003

Alinaghi, N., Reed, W.R. (2021), *Taxes and Economic Growth in OECD Countries: A Meta-analysis*, "Public Finance Review", 49 (10), pp. 3–40, https://doi.org/10.1177/1091142120961775

Angeloni, I., Coenen, G., Smets, F. (2003), *Persistence, the transmission mechanism and robust monetary policy*, "Scottish Journal of Political Economy", 50 (5), pp. 527–549, https://doi.org/10.1111/j.0036-9292.2003.05005006.x

Ardagna, S. (2001), *Fiscal Policy Composition, Public Debt, and Economic Activity*, "Public Choice", 109, pp, 301–325, https://doi.org/10.1023/A:1013021004195

Barro, R. (1974), *Are Government Bonds Net Wealth?*, "Journal of Political Economy", 82 (6), pp. 1095–117, https://doi.org/10.1086/260266

Baxter, M., King, R.G. (1993), *Fiscal Policy in General Equilibrium*, "The American Economic Review", 83 (3), pp. 315–334, https://www.jstor.org/stable/2117521 (accessed: 1.09.2021).

Calvo, G.A. (1983), *Staggered Prices in a Utility-Maximizing Framework*, "Journal of Monetary Economics", 12 (3), pp. 383–398, https://doi.org/10.1016/0304-3932(83)90060-0

Christiano, L.J., Eichenbaum, M., Evans, Ch. (2005), *Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy*, "Journal of Political Economy", 113 (1), pp. 1–45, https://doi.org/10.1086/426038

Dixit, A.K., Stiglitz, J.E. (1977), *Monopolistic Competition and Optimum Product Diversity*, "The American Economic Review", 67 (3), pp. 279–308, https://www.aeaweb.org/aer/top20/67.3.297-308.pdf (accessed: 1.09.2021).

Fernandez-Villaverde, J. (2010), *The econometrics of DSGE model*, "NBER Working Paper Series", No. 14677, National Bureau of Economic Research, Cambridge, https://doi.org/10.3386/w14677

Ferroni, F. (2010), *Did Tax Policies Mitigate US Business Cycles?*, "Banque de France Working Paper", No. 296, https://doi.org/10.2139/ssrn.1693811

Greenwood, J., Hercowitz, Z., Huffmann, G.W. (1988), *Investment, Capacity Utilization and the Real Business Cycle*, "American Economic Review", 78 (3), pp. 402–417, https://www.jstor.org/stable/1809141 (accessed: 1.09.2021).

King, R.G., Rebelo, S.T. (2000), *Resuscitating Real Business Cycles*, "NBER Working Papers", No. 7534, National Bureau of Economic Research, Cambridge, https://doi.org/10.3386/w7534

McGrattan, E.R. (1994), *The macroeconomic effects of distortionary taxation*, "Journal of Monetary Economics", 33 (3), pp. 573–601, https://doi.org/10.1016/0304-3932(94)90044-2

Mertens, K., Olea, J.L. (2018), *Marginal Tax Rates and Income: New Time Series Evidence*, "Quarterly Journal of Economics", 133 (4), pp. 1803–1884, https://doi.org/10.1093/qje/qjy008

Ohanian, L. (1997), *The Macroeconomic Effects of War Finance in the United States: World War II and the Korean War*, "The American Economic Review", 87 (1), pp. 23–40, https://www.jstor.org/stable/2950852 (accessed: 1.09.2021).

Owen, Z. (2019), *Tax Cuts for Whom? Heterogenous Effects of Income Tax Changes on Growth and Employment*, "Journal of Political Economy", 127 (3), pp. 1437–1472, https://doi.org/10.1086/701424

Romer, Ch., Romer, D. (2010), *The Macroeconomic Effects of Tax Change: Estimates Based on a New Measure of Fiscal Shocks*, "The American Economic Review", 100 (3), pp. 763–801, https://doi.org/10.1257/aer.100.3.763

Ruge-Murcia, F.J. (2007), *Methods to estimate dynamic stochastic general equilibrium models*, "Journal of Economic Dynamics and Control", 31 (8), pp. 2599–2636, https://doi.org/10.1016/j.jedc.2006.09.005

Taylor, J. (1993), *Discretion versus policy rules in practice*, "Carnegie-Rochester Conference on Public Policy", 39, pp. 195–214, https://doi.org/10.1016/0167-2231(93)90009-L

Porównanie skutków podatków nakładanych na kapitał i pracę w krajach Europy Środkowo-Wschodniej

Cel artykułu stanowi porównanie oddziaływania podatków nakładanych na dochody z pracy i kapitału na gospodarki krajów Europy Środkowo-Wschodniej. Otrzymane funkcje reakcji na impulsy fiskalne pokazują, że podatki nakładane na dochody z kapitału wpływają na PKB w odmienny sposób niż podatki nakładane na dochody z pracy. Mimo że występuje pewna heterogeniczność pomiędzy analizowanymi krajami w sile i czasie trwania efektów zmian podatkowych, to wykonane symulacje generalnie ukazują, że negatywny wpływ zwiększenia stóp podatkowych na gospodarkę jest w przypadku podatków kapitałowych silniejszy niż w przypadku podatków nakładanych na wynagrodzenia. Co ważniejsze, negatywne skutki wyższego opodatkowania dochodów z kapitału mają charakter bardziej długotrwały niż w przypadku wzrostu opodatkowania dochodów z wynagrodzeń. Wynika to z faktu, że wyższe opodatkowanie kapitału silnie ogranicza poziom inwestycji i poziom pożądanego zasobu kapitału trwałego, co generuje długoterminowe negatywne skutki dla kształtowania się produkcji w analizowanych krajach.

Słowa kluczowe: podatki kapitałowe, podatki nakładane na dochody z pracy, kraje Europy Środkowo-Wschodniej

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.21

Post-crisis Economic Environment of Two Central and Eastern European Regional Centres: A Comparative Approach

Zsuzsanna Zsibók https://orcid.org/0000-0001-9383-1134
Research fellow, Centre for Economic and Regional Studies, Institute for Regional Studies, Hungary
e-mail: zsibok.zsuzsanna@krtk.hu

Ildikó Egyed https://orcid.org/0000-0002-8711-6270
Research fellow, Centre for Economic and Regional Studies, Institute for Regional Studies, Hungary
e-mail: egyed.ildiko@krtk.hu

Abstract

Our research studies the economic background of recovery and catching-up after the global financial and economic crisis, comparing the case study areas of Cluj-Napoca in Romania and Pécs in Hungary. We use explorative statistical data analysis to describe the post-crisis regional economic environment in the context of the differential outcomes of the high-pressure economy in these two countries. Then, we analyse the evolution of the per capita gross domestic product in a decomposed form which provides insights into the main challenges of regional development in the two regional centres. The results show that long-run economic challenges must be handled with an efficiency-oriented regional policy that relies upon capital and knowledge-intensive growth.

Keywords: regional development, economic growth, Hungary, Romania, comparative analysis

JEL: O47, P25, R12

Received: 30.12.2021. Verified: 11.05.2022. Accepted: 7.06.2022

Introduction

It is commonly accepted in the literature that cities are the engines of economic development due to their important role as centres of population, economic activity and employment; their advantage lies in innovation, specialisation and better access to local and global markets (European Commission 2016, p. 11). Central and Eastern European (CEE) countries are characterised by the dominance of capital cities, while the gap between the capitals and the second-tier cities is large and growing, especially in terms of an EU-wide comparison (ESPON 2013, pp. 21–23; Rácz 2019, pp. 94–96; Szakálné Kanó and Lengyel 2021, pp. 833–837). Generally, second-tier cities make a significant contribution to the national economy (Camagni, Capello, and Caragliu 2015, p. 1070). However, in many CEE countries, secondary cities are stagnating or even shrinking in population and economic performance (Cardoso and Meijers 2016, pp. 1011–1012; Hajdú, Horeczki, and Rácz 2017, pp. 124–130). These cities can usually be found in left-behind places which lack economic dynamism and are unable to reap the benefits of globalisation. These places are mainly de-industrialised and rural regions which were not able to renew their capacities after the economic crises such as the transition crisis and the global financial and economic crisis (Lux 2021, pp. 2–3).

Although the post-transition era brought several novel trends in the development of urban networks of the CEE countries, there are signs of a large degree of path-dependence in it, especially regarding the spatial distribution of capital investments and its multifaceted corollaries. As a result, the dominance of capital cities in the CEE macro-region increased, while non-capital regions are not able to improve their development ranking (Hajdú, Horeczki, and Rácz 2017, pp. 130–137). This means that local economic development is both regionally and historically embedded (Lux 2017, pp. 15–17).

This research is part of a wider project that focuses on analysing local resources and circumstances, as the basis of place-based local development concepts in the case study areas of Cluj-Napoca, in Romania, and Pécs, in Hungary, in a comparative way. The article aims to draw lessons from a comparative analysis of the post-crisis economic environment in these two CEE regional centres. We intend to shed light on the similarities and differences in their economic context based on selected indicators. The analysis of regional differences concerning labour productivity is an important, though somewhat neglected topic in the regional development literature in CEE. The novelty of our article lies in the fact that we examine the differential impact of the post-crisis growth cycle on two selected secondary cities and their hinterland, focusing on labour productivity and employment.

Initially, we can point out that Cluj and Pécs are both located in 'hollowing-out' regions, as described by Lux (2017, p. 23). That is, they are considered nationally important development poles with several competitive sectors, but they are economically isolated from

their underdeveloped environment and are remote from the capital cities and other economic hubs, too. Therefore, synergies with their wider hinterland remain unrealised, and their international embeddedness is weaker.

The remainder of this article is organised as follows: the next section introduces the general post-crisis economic environment in Hungary and Romania. The focus then turns to the sub-national level, followed by a description of the methods and data used. The third section presents the results of our empirical analysis, while the last section provides concluding remarks.

Post-crisis recovery in the high-pressure economy in Hungary and Romania in the 2010s

After the global financial and economic crisis, CEE countries underwent remarkable economic development. This was because economic policies were positioned towards sustaining a 'high-pressure economy' to address the challenges of the post-crisis recovery, most notably, the productivity slowdown (Callaghan 2021, p. 1). This concept was first used by Okun (1973, p. 207) and then adapted by Ball (2009, pp. 25–26) in the context of the post-crisis economic policy recommendations (National Bank of Hungary 2016, p. 16). Counter-cyclical economic policy measures were proposed to drive the economy back to the potential output level. However, these measures were continued later on, and became pro-cyclical, thereby sustaining a high-pressure economy during the late 2010s.

The main features of the high-pressure economy in Hungary and Romania were mostly similar. The concept itself means that the economy grows beyond the potential level because economic policy keeps strong pressure on the demand side of the economy. The international and domestic monetary environment was supportive through near-zero nominal (and negative real) interest rates and quantitative easing measures. This was combined with an expanded fiscal margin due to the low government budget deficit and low or declining government debt. After the first few years of the post-crisis recovery, despite the increasing labour market participation, labour shortage became an increasing challenge, and domestic policies were not prepared to handle this in the short run. With gradually enhancing economic dynamism, unemployment shrank and the employment rate significantly increased.

Nevertheless, the labour market became tighter as the share of the working-age population started to decline as a result of ageing and outmigration (Suchácek and Pytliková 2017, pp. 211–214). Labour shortage and unemployment coexisted due to skill mismatches, which adversely affected labour productivity. This process put a strong upward pressure on wages, which facilitated a demand-side pressure on the economy (National Bank of Hungary 2016, p. 16). During this period, the influx of investments was intensive, thanks to EU programmes and the partly government-supported foreign direct in-

vestments. However, the investment rate was not able to reach the pre-crisis level in Romania, and it reached that level only by 2018 in Hungary.

The distribution of the benefits of this upsurge in the second half of the 2010s was uneven in space (Figure 1) and across the different groups of society. Generally, those areas that were able to increase their performance more were already better off (with the exception of the capital city of Budapest), while the lagging regions were not able to proportionately converge to the national average.

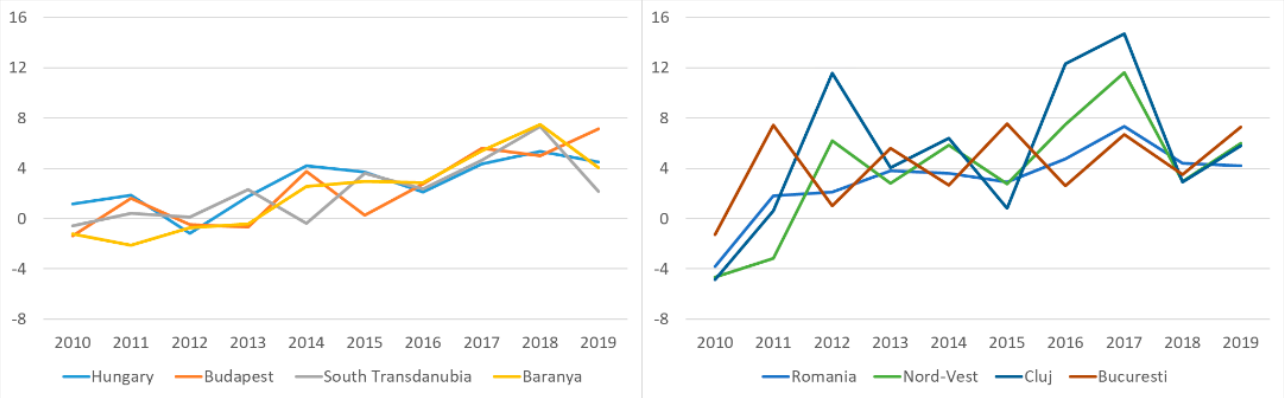


Figure 1. GDP growth (at constant prices computed in national currency) in selected territorial units in Hungary and Romania, %

Source: own elaboration based on Eurostat (2022), *Gross domestic product*... and AMECO (n.d.).

The long-term economic performance of the countries and regions is largely determined by their economic resilience, the extent to which they can resist shocks and then recover afterwards. In many cases, economically stronger areas may be affected more severely in the initial phase of a recession, as was the case immediately after the 2008/2009 crisis. However, their recovery can also be stronger since these areas have a better capacity to revive and renew their productive capacities.

In contrast, more backward regions that have not experienced steep economic downturns have undergone hysteretic downward shifts in their post-recession economic growth (see Gardiner, Lewney, and Martin 2021, p. 165). Here, we evaluate resilience with the help of GDP data measured at constant prices and examine how fast the regions were able to reach the 2008 level again.

Hungary, as a whole, was able to restore its pre-crisis level of GDP in 2014, measured at constant 2015 prices. However, 11 out of the 20 NUTS3 regions (including the capital city of Budapest) reached it at a later stage. Baranya county was one of those counties that restored their pre-crisis GDP level the most slowly, only in 2017. Similarly to Hungary, Romania reached its 2008 GDP volume in 2014. But at the sub-national level, only around a third of the NUTS3 regions had recovered by that year, while most counties recovered only after 2015. The capital city, Bucharest (Bucuresti), bounced back to the 2008 GDP level in 2013, while the recovery

of Cluj was even faster, having already been achieved by 2012. Figure 1 above indicates that the high-pressure economy started after the early years of the previous decade in Romania, but it strengthened only in the last few years of the 2010s in Hungary.

Second-tier cities after the global financial and economic crisis in Hungary and Romania

Although the 2008/2009 global financial and economic crisis resulted in a sudden drop in the economic performance of both Hungary and Romania, catching up to the EU average continued in the 2010s (obviously because roughly all areas were hit by the crisis to some extent). The first part of the economic recovery was characterised by a slower convergence, which gradually strengthened by the end of the decade. In terms of per capita GDP at purchasing power standard, Hungary developed from 66% in 2010 to 73% in 2019 relative to the EU27 average, while the respective change was even greater in Romania, from 52% to 69% (Table 1). Generally, all areas at the sub-national level were able to benefit from the high-pressure economy to a greater or lesser extent during the last decade. At the same time, regional inequalities are persistent in both countries, and there are hardly any signs that second-tier cities are able to break out from path dependency (ESPON 2013, pp. 63–64; Benedek and Lembcke 2017, pp. 122–123).

Hungary has five major second-tier cities outside the capital: Debrecen, Szeged, Miskolc, Pécs and Győr, and three other cities which are above or close to a population of 100,000 (Nyíregyháza, Kecskemét and Székesfehérvár). Romania has seven major growth pole cities: Brasov, Cluj-Napoca, Constanta, Craiova, Iasi, Ploiesti and Timisoara (Benedek 2016, p. 287), and a dozen other cities with more than 100,000 inhabitants.

The city of Pécs ranks fifth among the Hungarian cities in terms of population. However, it is located in a relatively underdeveloped region: both Baranya county and the whole South Transdanubia NUTS2 region can be described as peripheral (Berkes 2020, pp. 69–70; Egyed and Rácz 2020, p. 120), ranking permanently among the 20 poorest NUTS2 regions of the EU in terms of GDP per inhabitant. Baranya and Cluj counties have similar urbanisation rates (65%), and their respective NUTS2 regions are classified by the EU Regional Innovation Scoreboard as emergent innovators (similarly to other NUTS2 regions in the two countries, apart from Budapest, the only moderate innovator). Cluj county, as the second-largest economic centre in Romania behind the capital region, is more developed than the national average, while the other counties in the Nord-Vest NUTS2 region are underdeveloped. The economic performance of Cluj county ranks highest among the Hungarian and Romanian NUTS3 regions outside the capital cities; at the same time, Baranya county reaches only a middle position (it ranks 13th out of the 19 non-capital regions). Generally, while the economic convergence of Hungary

somewhat decelerated after the global financial crisis, Romania was able to achieve a stable rate of convergence towards the EU average, which was also refleected by the performance at the sub-national level.

Table 1. GDP per inhabitant (in PPS, purchasing power standards) as a percentage of the EU27 average in selected spatial units in Hungary and Romania, %

Spatial level	Spatial unit	2010	2019
national	Hungary	66	73
NUTS3	Budapest	145	151
NUTS2	South Transdanubia	45	50
NUTS3	Baranya	44	49
national	Romania	52	69
NUTS3	Bucuresti	122	182
NUTS2	Nord-Vest	44	64
NUTS3	Cluj	61	95

Source: own elaboration based on Eurostat (2022), *Gross domestic product*...

Table 2. Selected economic and demographic indicators at different spatial levels in Hungary and Romania, 2019

Spatial level	Spatial unit	GDP (million PPS)	Population	Population aged 15–64	Economically active population (15–64)
Hungary					
national	Hungary	222,784	9,771,140	6,327,100	4,594,700
Percentage shares					
NUTS2	Budapest	37.19	17.92	17.69	18.49
NUTS2	South Transdanubia	6.12	8.98	8.88	8.4
NUTS3	Baranya	2.49	3.68	–	–
Romania					
national	Romania	419,962	19,375,840	12,930,400	8,760,700
Percentage shares					
NUTS2	Bucuresti-Ilfov	27.66	11.97	12.46	13.47
NUTS2	Nord-Vest	12.25	13.16	13.34	13.45
NUTS3	Cluj	5.02	3.66	–	–

Source: own elaboration based on Eurostat (2022), *Average annual population*...; Eurostat (2022), *Economically active population by sex, age*...; Eurostat (2022), *Gross domestic product*...; Eurostat (2022), *Population by sex, age*...

The Nord-Vest NUTS2 region accounts for around 12% of the total Romanian GDP, and within this, Cluj county accounts for around 5%. Unfortunately, Pécs and Baranya county do not play a comparable role within the Hungarian economy. The South Transdanubia NUTS2 region produced around 6% of the national GDP, within which Baranya produced around 2.5% in 2019 (Table 2).

Data and methods

This paper uses empirical analyses with the help of explorative statistical methods in a comparative manner. Using descriptive statistics, we relate the economic performance of the areas surrounding Pécs and Cluj-Napoca (measured at the NUTS3 level) with that of the wider regions (NUTS2 level) and the national performance. These statistics provide guidance when assessing the degree of the co-movement between the economic dynamics of the sub-national levels of the two city regions and the national economies.

In the second part of our paper, we propose a decomposition method common in the growth accounting literature, which investigates the change in per capita GDP and calculates the contribution of its underlying factors to the total change. In this exercise, we decompose total per capita GDP change into two components: the contribution of productivity change and the contribution of the employment rate change. Productivity is measured as GDP (computed at constant prices in PPS) divided by the number of employees[1]; the employment rate is calculated as the number of employees divided by the total population (Equation 1).

$$\frac{GDP}{population} = \frac{GDP}{employees} \cdot \frac{employees}{population}. \quad (1)$$

On this basis, the contribution of the underlying factors to the change in per capita GDP can be computed as described in Equation 2:

$$GDPpc_{t1} - GDPpc_{t0} = (Prod_{t1} - Prod_{t0}) \cdot Emp_{t0} + (Emp_{t1} - Emp_{t0}) \cdot Prod_{t1}, \quad (2)$$

where *GDPpc* indicates per capita GDP, *Prod* is labour productivity, *Emp* is employment rate, and t_0 and t_1 are time indices indicating the beginning and the end of the given period.

1 From the Labour Force Survey of the Eurostat (lfst_r_lfe2emp) which is available at the NUTS2 level and shows employment in the age group 15 years or over.

Our data are collected from the Eurostat and AMECO[2] databases at the national, NUTS2 and NUTS3 levels and cover the period between 2010 and 2019. To ensure full comparability, this time, we omit the use of national statistical office databases. Besides focusing on GDP as the most common measure of economic performance, our study also investigates its underlying factors, including important demographic and employment indicators in regional disaggregation.

Results

In the light of the facts presented above, we summarise the results of an empirical analysis which relies upon the decomposition of the change in per capita GDP (detailed in Table 3) to its two main underlying factors, the contribution of productivity change and the contribution of employment rate change (see Equation 2). As suggested by the second section of this paper, the previous decade can be divided into two sub-periods: the first period is characterised by slow post-crisis recovery, as the 2008/2009 crisis was a W-shaped crisis in Hungary and Romania; while the second part, and especially the last few years, were a relatively high-growth period in both countries (Figure 1). For this reason, we divide the 2010s into two equal periods and analyse the change in per capita GDP between 2010 and 2015, and then between 2015 and 2019.

Table 3. The dynamics of per capita GDP in selected territorial units in Hungary and Romania (million PPS, at constant 2015 prices)

	Hungary	South Transdanubia	Baranya	Romania	Nord Vest	Cluj	EU
2010	18.88	12.74	12.59	15.05	12.85	17.71	26.49
2015	19.25	12.80	12.38	15.53	13.65	19.21	27.46
2019	19.69	13.57	13.38	17.87	16.31	24.48	29.46

Source: own elaboration based on Eurostat (2022), *Gross domestic product…*

Our results show high variation between the two countries and among the different territorial levels[3] within them, as well as the two sub-periods of the previous decade (Figure 2). In general, Romania achieved larger per capita GDP growth in both sub-periods than Hungary at all spatial levels. The Nord Vest region seems to be a positive outlier in both periods because it developed above the national average. In the first half of the decade, employment growth had a larger role than productiv-

2 The variable "Price deflator gross domestic product [PVGD]" is collected from AMECO to calculate GDP and labour productivity at constant prices – AMECO (n.d.).

3 Proper data are available only at the NUTS2-level disaggregation.

ity growth, but after 2015, productivity became more important. In contrast, South Transdanubia developed more slowly than the national average, and the contribution of employment growth was counterbalanced by decreasing productivity between 2010 and 2015 (measured at constant prices). During the second half of the period, the dominant source of per capita GDP growth was the contribution of employment growth.

The results are somewhat different if we compare GDP values measured in national currencies instead of PPS (Figure 3). Benedek (2021, pp. 11–12) emphasises that the relative dynamics of the national currencies with respect to other foreign currencies have a notable impact on the GDP values measured in PPS. Due to the national monetary policy strategy, the exchange rate of the Romanian leu is relatively stable vis-á-vis the euro or other foreign currencies.

Figure 2. The contribution of productivity change and employment rate change to total per capita GDP change between 2010 to 2015 and 2015 to 2019 in selected territorial units in Hungary and Romania (thousand PPS at constant prices)

Source: own elaboration based on Eurostat (2022), *Average annual population*...; Eurostat (2022), *Employment (thousand persons)*...; Eurostat (2022), *Gross domestic product*..., and AMECO (n.d.).

In contrast, the Hungarian national currency is constantly devaluating, in line with its monetary policy stance. A second source of distortion may be the difference between the consumer basket of the different countries within the European Union. As a result, these facts have differential impacts when GDP values are calculated in PPS. In terms of the per capita GDP values calculated in national currencies (at constant prices), the positive impact of productivity growth seems to be much larger in Romania between 2010 and 2015, and its negative impact was smaller in Hungary in comparison to the PPS values. In the second half of the 2010s, productivity had a positive impact in both countries, especially in Romania, while employment growth continued to play an important role in Hungary.

The contributions of the productivity and the employment rate are certainly not independent of each other. Employment was rather low after the economic and financial crisis, especially in Hungary, and as a result of a strong policy commitment (Czirfusz 2020, pp. 11–12), it significantly increased during the 2010s. Furthermore, the increase was higher in the lagging areas of Hungary, which means that a significant convergence occurred among the different parts of the country. However, extensive employment growth took place in those segments of the labour market that are characterised by a below-average efficiency. Generally, the newly integrated employees had lower education and skills and were employed in jobs with lower value added. Consequently, the average productivity decreased in the first years of the post-crisis recovery in Hungary, but not in Romania.

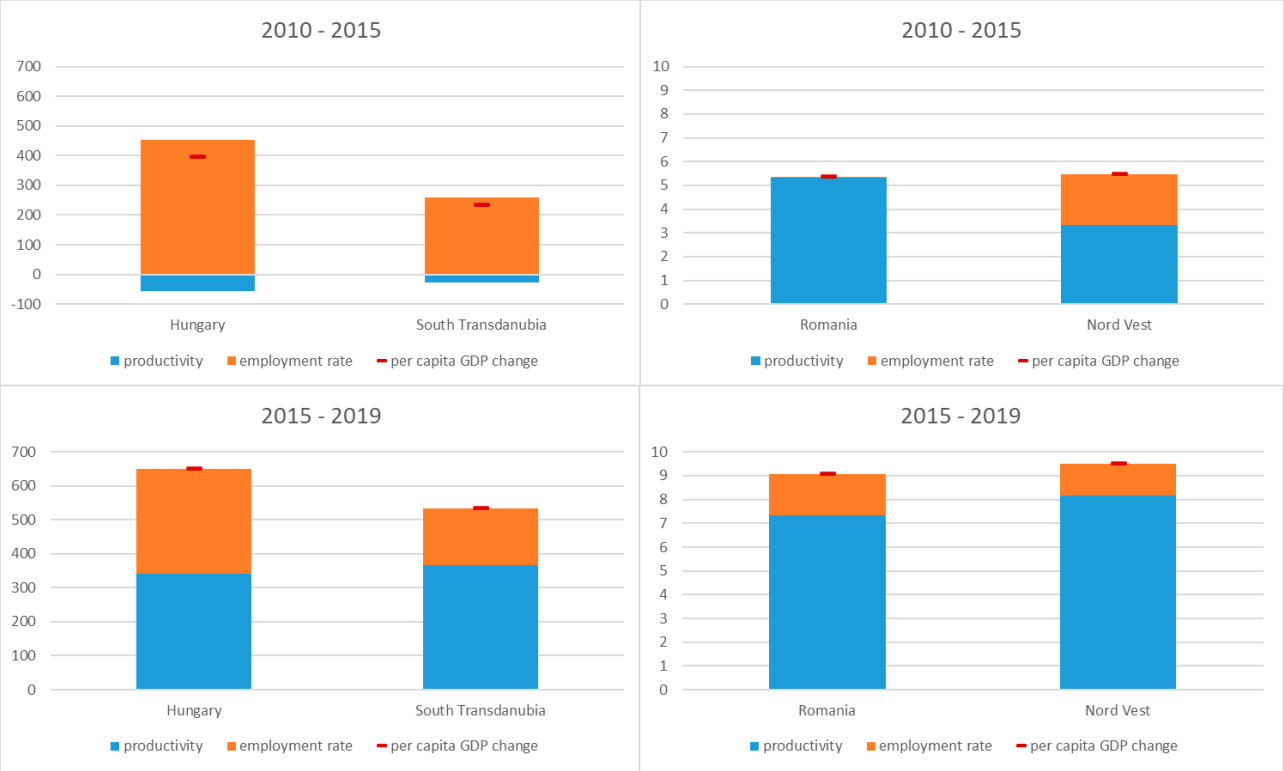


Figure 3. The contribution of productivity change and employment rate change to total per capita GDP change between 2010 to 2015 and 2015 to 2019 in selected territorial units in Hungary and Romania (thousand units of national currency at constant prices)

Source: own elaboration based on Eurostat (2022), *Average annual population…*; Eurostat (2022), *Employment (thousand persons)…*; Eurostat (2022), *Gross domestic product…*, and AMECO (n.d.).

As an important feature of the high-pressure economy, the labour market became tight in the 2010s, and labour shortage emerged as a serious challenge compounded by persistent unemployment, especially in the lagging regions. The most relevant factor behind the labour shortage is the ageing of the population (Kozlovskyi et al. 2020, pp. 46–48), mostly as a consequence of the outmigration of the skilled and younger cohorts of the working-age population and partly due to natural demographic processes.

Between 2010 and 2019, the share of the working-age population within the total population shrank from 68.6% to 66.1% in Hungary, and from 68.1% to 65.8% in Romania. At the same time, South Transdanubia and Baranya had a slightly worse position compared to the national average in 2019 (with 65.5% and 65.8%, respectively), while the Nord Vest region and Cluj county recorded better shares compared to the Romanian average (with 66.7% and 68.0%, respectively). The most favourable situation can be found in Cluj county, while the rest of the Nord Vest region seems to have decoupled from that.

Due to the lack of a critical mass of endogenous resources and embeddedness in international networks, a similar decoupling cannot be detected for the economic position of Pécs within its wider region. These trends are likely to persist in the long run. Therefore, the dominant source of economic convergence is expected to be efficiency upgrading, i.e. increasing productivity by improving the quality of human resources and the capital intensity of the economy.

A number of academic and policy documents refer to the problem of the middle-income trap, which means that throughout the process of economic catching-up, the speed of growth starts to decline at a point in time, thereby the excess growth disappears before full convergence could take place. Iammarino et al. (2020, p. 11) suggest that 'middle-income-trap regions' are expected to fall within a GDP per capita range between 75 and 120% of the EU average in PPS. Consequently, the middle-income trap could be a relevant challenge for the FDI-driven economic model in the CEE countries (Lux 2017, p. 17). Strong FDI inflows boosted by trade liberalisation (Singh and Gál 2020, pp. 75–77) paved the way for convergence until the global financial and economic crisis. However, this development model appears to have reached its limit. Gál (2019, p. 681) showed that the direction of the causality between regional economic development and FDI inflow is not straightforward, based on evidence that FDI prefers regions that are already better off rather than taking risks with marginal locations. Due to the substantial risk of private and public investment concentrating on regions with better economic prospects, national governments are urged to pursue more explicit territorial investment strategies, especially in peripheral regions that cannot take advantage of the FDI-driven economic model.

Lux (2017, pp. 21–23) differentiates between three types of post-industrial development paths in CEE countries.

1. Central regions are the most successful areas that are integrated into global metropolitan networks; they specialise in high value-added sectors as well as corporate and public command and control functions.

2. Intermediate regions successfully combine industrial and tertiary sources of competitiveness and have a favourable environment for industrial development. They are increasingly integrated into global production networks, and their competitiveness is mainly driven by FDI together with their strong historical foundations.
3. Peripheral, 'hollowing out' regions are those that lost their old industrial base or originally lacked endogenous accumulation processes. The main resources they offer are cheap, mostly unskilled labour and basic infrastructure. There are few competitive SMEs, FDI branch plants and successful clusters, but they are disconnected from their territorial context because they exist in isolation in an underdeveloped environment.

In the light of this triple typology of regions, one can recognise that the region surrounding Pécs belongs to the third, peripheral category, while the region around Cluj is more representative of the second, intermediate category, with some attributes of central regions, for instance, favourable sectoral and functional specialisation, and relatively better endowed with human capital (Fan, Urs, and Hamlin 2019, pp. 2–3). Cluj-Napoca, as a major educational, cultural, scientific and economic urban centre, was ranked among the 11 "tier 1" cities of Romania owing to its fast-growing population, developed service economy and important transport hub function (Veres 2020, pp. 546–547; Romanian Parlament 2001). It was rebranded as a "metropolitan pole with international potential" under the spatial planning system for 2014–2020. In terms of FDI, Cluj county has decoupled from the rest of the Nord-Vest region, concentrating 44% of the regional FDI stock (2,059 M euro) in 2019 (RNB 2020, p. 14). The high-road strategy to competitiveness that emphasises skills upgrading and innovation that Cluj followed appears more advantageous to overcome the middle-income trap in the long run.

However, these chances are much smaller for Pécs (Gál and Páger 2017, pp. 231–232). Its role as a university-backed 'knowledge centre' notwithstanding, the case of Pécs appears to confirm the finding of Iammarino et al. (2020, p. 48) that "especially in low-income regions, human capital accumulation alone is insufficient to fend against the risk of stagnation, unless an environment is offered where the acquired skills can be put to productive use." The city's locational disadvantages in terms of the traditional drivers of competitiveness such as skills, innovation, economic diversity, connectivity or governance capacities have confined it to the margin of dominantly FDI-driven re-industrialisation, while Cluj, as a winner of transition processes, is well integrated into global production networks.

The majority of the 203 large firms of the Nord-Vest Region that provide the backbone of the regional economy are located in Cluj county (86) and Bihor county (49). Cluj-headquartered MOL Romania, Transylvania's largest trading company, is a top innovation performer in the services sector (Csíki and Szász 2020, pp. 353–355). Conversely, as a long-lasting effect of persistent deindustrialisation post–2000, Hungary's Baranya

county is falling behind the rest of the Hungarian counties in terms of per capita production values (43% of the national level in 2018).

The University of Pécs, as the major catalyst for development in the region, contributes around 15–20% of the GDP of Pécs (Rácz, Kovács, and Horeczki 2021, p. 216). The leadership role of universities in implementing the knowledge-based economy is particularly valorised in the peripheral CEE regions where incentives for academic entrepreneurship are weaker (Erdős and Varga 2012, pp. 233–236), given the heavy concentration of business R&D expenditure in the developed knowledge economy regions of Europe (Figure 4).

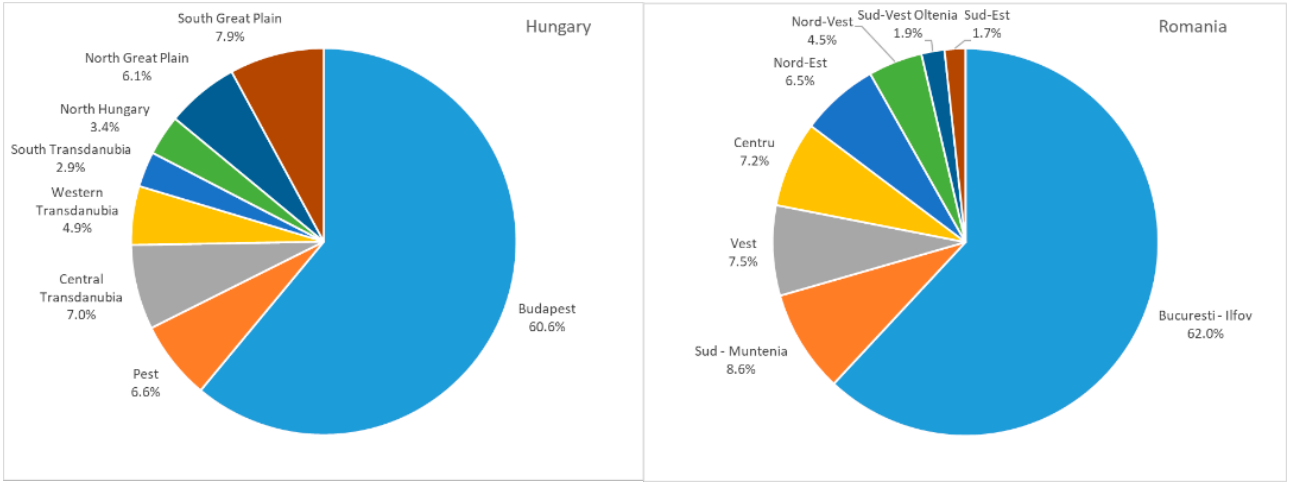


Figure 4. The share of regional gross domestic expenditure on R&D (GERD) in national GERD in Hungary and in Romania, 2019

Source: authors' elaboration based on Eurostat (2022), *GERD by sector...* and Institutul National de Statistica (2021).

In terms of business R&D intensity, the Nord-Vest (0.09%) and the South Transdanubia (0.36%) NUTS2 regions are lagging far behind the EU level of 1.42% (European Commission 2020, p. 231). In the research presented by Gál (2020, pp. 18–19), Pécs typifies lagging peripheral regions where the weakness of the local business environment undermines the success of university-driven territorial innovation systems (see also Olejnik and Żółtaszek 2020, p. 105). The downward trajectory of Pécs as a shrinking city would more likely be reversed by pursuing a development strategy attuned to the needs of the "hidden sectors" described by Lux (2021, p. 2). Despite their significant job retention potential, these secondary or tertiary sectors suffer from policy neglect, but they are key to promoting the diversification and resilience of peripheral urban and regional economies. In Pécs, biotechnology, the health care industry and the machine industrial cluster may offer opportunities for new path creation.

Besides mainstream national government policies, explicit urban policies and supranational resources were found to exert a palpable influence on reshaping the post-re-

cession development trajectories of the studied cities. Having undergone large-scale revitalisation and with 10% of its working population enrolled in IT and start-ups, Cluj has emerged as a major IT hub and is home to the top ranking Romanian HE institution (Babes-Bolyai University) as well as 28 public R&D institutions (six of which are institutes of the Romanian Academy), a leading technical university (TUCN), three industrial parks and a world-class ICT cluster at the vanguard of smart city initiatives. TUCN was the first Romanian university to receive a 21 million euro EIB loan from the European Strategic Investment Fund for its strategic development investments between 2021–2025.

Under a broader strategy of economic rebalancing, Cluj-Napoca with its seven clusters, was designated a national growth pole along with other core cities (Braşov, Craiova, Constanţa, Iaşi, Timişoara, and Ploieşti) in Romania's urban growth pole strategy (Benedek 2016, p. 287).

Pécs, as a "pole of life quality", also prioritised cluster development, relying on its competitive advantages, such as the health, cultural and environment industries, as part of the post-recession economic rebalancing agenda that focused on the five Hungarian core cities. The city has successfully blended national urban development programmes with local development resources to enhance the research, development and innovation potential and capacity development in higher education, connected to the internationalisation strategy of the University of Pécs, the largest employer in the region.[4]

A preferable long-run economic development strategy should rely upon a strong commitment to finding the right sectoral and functional specialisation. Along the value chain, the manufacturing stage ensures the lowest added value, while those stages that require high-skilled work, such as R&D, after-sales services, and financial services, offer the best opportunities for technological and productivity upgrading (see, e.g., Nagy 2021, p. 116).

In conclusion, we call for proactive policy initiatives in favour of retaining and/or establishing endogenous development potential for both lagging and intermediate regions. An important element of this is an environment that is supportive of local entrepreneurial activities, especially in the SME sector, and human capital accumulation. Also important are local economies that provide jobs featuring promising upgrading capacity, innovation potential, and international openness (Iammarino et al. 2020, pp. 82–87).

4 See, e.g. the Modern Cities Program (2015–), which promotes urban infrastructural developments and economic and functional diversification in the 23 county seats. Loosely connected to fragmented reindustrialisation efforts in non-core cities (Fekete 2019, pp. 40–41; Lux 2019, pp. 59–61), the large-scale urban development programme with its approx. 11 billion euro budget finances 270 investment operations, combining public investment (two-third of total resources), EU-funded operational programmes and municipal resources.

Conclusion

This paper investigated the regional development context of two secondary cities in Central and Eastern Europe. We applied explorative statistical data analysis to describe the post-crisis regional economic environment in the context of the differential regional outcomes of the high-pressure economy in Hungary and Romania. The evolution of per capita gross domestic product was studied in a decomposed form, which revealed the differential contribution of productivity growth and employment growth to the regional development of the two regional centres, Pécs and Cluj and their respective regions. Our findings confirm that both regions could reap the benefits of the economic upswing in the late 2010s, but not to the same extent. Hungary, as a whole, and the South Transdanubia region, in particular, have based their economic growth on extensive employment expansion while neglecting productivity improvement.

This is in contrast to the economic development of Romania and the Nord Vest region, which have relied more upon productivity growth in this period. A positive impact of the favourable sectoral and functional specialisation of Cluj county was detected in terms of post-crisis economic growth. In contrast, the economic convergence of Hungary's Baranya county is much slower, which strongly undermines the chances of Pécs to overcome the middle-income trap in the short or medium run. Therefore, proactive policy initiatives are essential in favour of retaining and/or establishing endogenous development potential for both regions. Our exploratory research identified important disparities in labour productivity dynamics between the two countries and regions. An in-depth analysis of these disparities is needed to reveal their main underlying causes; therefore, our future research will examine the two cities at the micro level. A comparative, firm-level analysis is expected to yield novel insight into the nature of the observed productivity differentials.

Acknowledgements

This paper was written within the framework of the Hungarian-Romanian Academic Bilateral Research Programme and the János Bolyai Research Scholarship of the HAS.

References

AMECO (n.d.), *Price deflator gross domestic product [PVGD]*, https://db.nomics.world/AMECO/PVGD (accessed: 9.05.2022).

Ball, L. (2009), *Hysteresis in Unemployment: Old and New Evidence*, "NBER Working Papers", No. 14818, National Bureau of Economic Research, Cambridge, http://www.nber.org/papers/w14818 (accessed: 9.06.2021).

Benedek, J. (2016), *The Role of Urban Growth Poles in Regional Policy: The Romanian Case*, "Procedia-Social and Behavioral Sciences", 223, pp. 285–290, https://doi.org/10.1016/j.sbspro.2016.05.368

Benedek, J. (2021), *Regionális egyenlőtlenség és gazdasági felzárkózás. Magyarországi és romániai régiók összehasonlító vizsgálata*, "Észak-magyarországi Stratégiai Füzetek", XVIII, 1, pp. 4–14, https://doi.org/10.32976/stratfuz.2021.15

Benedek, J., Lembcke, A.C. (2017), *Characteristics of recovery and resilience in the Romanian regions*, "Eastern Journal of European Studies", 8 (2), pp. 95–126, https://ejes.uaic.ro/articles/EJES2017_0802_BEN.pdf (accessed: 9.06.2021).

Berkes, J. (2020), *The Economic Structure and Performance of the Catchment Area of the Hungarian Regional Centers*, "DETUROPE – The Central European Journal of Regional Development and Tourism", 12 (3), pp. 58–81, https://doi.org/10.32725/det.2020.022

Callaghan, C.W. (2021), *Lessons and insights from the global productivity slowdown: A research management agenda*, "African Journal of Science, Technology, Innovation and Development", https://doi.org/10.1080/20421338.2021.1945775

Camagni, R., Capello, R., Caragliu, A. (2015), *The Rise of Second-Rank Cities: What Role for Agglomeration Economies?*, "European Planning Studies", 23 (6), pp. 1069–1089, https://doi.org/10.1080/09654313.2014.904999

Cardoso, R.W., Meijers, E.J. (2016), *Contrasts between first-tier and second-tier cities in Europe: a functional perspective*, "European Planning Studies", 24 (5), pp. 996–1015, https://doi.org/10.1080/09654313.2015.1120708

Csíki, O., Szász, L. (2020), *Ipar és szolgáltató szektor*, [in:] J. Benedek (ed.), *Erdély – Tér, Gazdaság és Társadalom*, Kolozsvári Egyetemi Kiadó, Cluj-Napoca, pp. 326–366.

Czirfusz, M. (2020), *Foglalkoztatás*, [in:] M. Czirfusz (ed.), *Területi kihívások és területi politikák Magyarországon, 2010–2020*, Centre for Economic and Regional Studies Institute for Regional Studies, Budapest.

Egyed, I., Rácz, Sz. (2020), *The Role of Territorial Capital in Urban Renewal in a Non-Core Central European City*, "DETUROPE – The Central European Journal of Regional Development and Tourism", 12 (3), pp. 108–132, https://doi.org/10.32725/det.2020.024

Erdős, K., Varga, A. (2012), *Academic entrepreneurs in post-socialist Central European countries: Evidence from the Hungarian biotechnology sector*, [in:] R. Capello, A. Olechnicka, G. Gorzelak (eds.), *Universities, Cities, and Regions: Loci for Knowledge and Innovation Creation*, Routledge, London, pp. 229–245, https://doi.org/10.4324/9780203097144

ESPON (2013), *Second Tier Cities and Territorial Development in Europe: Performance, Policies and Prospects*, Final Report, ESPON & European Institute of Urban Affairs, Liverpool John Moores University, Luxembourg, https://www.espon.eu/sites/default/files/attachments/SGPTD_Final_Report_-_Final_Version_27.09.12.pdf (accessed: 9.06.2021).

European Commission (2016), *The State of European Cities 2016*, Publications Office of the European Union, Luxembourg.

European Commission (2020), *Science, research and innovation performance of the EU 2020. A fair, green and digital Europe*, Publications Office of the European Union, Luxembourg,

https://ec.europa.eu/info/sites/default/files/srip/2020/ec_rtd_srip-2020-report.pdf (accessed: 28.10.2021).

Eurostat (2022), *Average annual population to calculate regional GDP data (thousand persons) by NUTS 3 regions [nama_10r_3popgdp]*, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_3popgdp&lang=en (accessed: 9.05.2022).

Eurostat (2022), *Economically active population by sex, age and NUTS 2 regions (1 000) [lfst_r_lfp2act]*, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfst_r_lfp2act&lang=en (accessed: 9.05.2022).

Eurostat (2022), *Employment (thousand persons) by NUTS 3 regions [nama_10r_3empers]*, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_3empers&lang=en (accessed: 10.05.2022).

Eurostat (2022), *GERD by sector of performance and NUTS 2 regions*, https://ec.europa.eu/eurostat/databrowser/view/rd_e_gerdreg/default/table?lang=en (accessed: 28.10.2021).

Eurostat (2022), *Gross domestic product (GDP) at current market prices by NUTS 3 regions [nama_10r_3gdp]*, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_3gdp&lang=en (accessed: 9.05.2022).

Eurostat (2022), *Population by sex, age, educational attainment level and NUTS 2 regions (1 000) [lfst_r_lfsd2pop]*, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfst_r_lfsd2pop&lang=en (accessed: 9.05.2022).

Fan, P., Urs, N., Hamlin, R.E. (2019), *Rising innovative city-regions in a transitional economy: A case study of ICT industry in Cluj-Napoca, Romania*, "Technology in Society", 58, 101139, https://doi.org/10.1016/j.techsoc.2019.05.003

Fekete, D. (2019), *A Modern városok program jelentősége a hazai városfejlődésben*, "Tér és Társadalom", 33 (1), pp. 27–43, https://doi.org/10.17649/TET.33.1.3066

Gál, Z. (2019), *Az FDI szerepe a gazdasági növekedés és a beruházások területi differenciálódásában Magyarországon*, "Közgazdasági Szemle", LXVI (6), pp. 653–686, https://doi.org/10.18414/KSZ.2019.6.653

Gál, Z. (2020), *A Pécsi városrégió innovációs rendszere*, Research report, University of Pécs, Pécs, https://ktk.pte.hu/sites/ktk.pte.hu/files/uploads/rierc/r-reports/RIERC%20kutata%CC%81si%20besz%C3%A1mol%C3%B3%202020-007%20-%20Ga%CC%81l%20Zolta%CC%81n.pdf (accessed: 21.10.2021).

Gál, Z., Páger, B. (2017), *The changing role of universities and the innovation performance of regions in Central and Eastern Europe*, [in:] G. Lux, G. Horváth (eds.), *The Routledge Handbook to Regional Development in Central and Eastern Europe*, Routledge, London–New York, pp. 225–239, https://doi.org/10.4324/9781315586137-14

Gardiner, B., Lewney, R., Martin, R. (2021), *Sectoral and spatial impacts of the Covid–19 recession*, [in:] P. McCann, T. Vorley (eds.), *Productivity and the Pandemic. Challenges and Insights from Covid–19*, Edward Elgar Publishing, Cheltenham–Northampton, pp. 160–172, https://doi.org/10.4337/9781800374607.00018

Hajdú, Z., Horeczki, R., Rácz, Sz. (2017), *Changing settlement networks in Central and Eastern Europe with special regard to urban networks*, [in:] G. Lux, G. Horváth (eds.), *The Routledge*

Handbook to Regional Development in Central and Eastern Europe, Routledge, London–New York, pp. 123–140, https://doi.org/10.4324/9781315586137-8

Iammarino, S., Rodríguez-Pose, A., Storper, M., Diemer, A. (2020), *Falling into the Middle-Income Trap? A Study on the Risks for EU Regions to be Caught in a Middle-Income Trap*, Publications Office of the European Union, Luxembourg, https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/middle_income_trap_en.pdf (accessed: 11.05.2021).

Institutul National de Statistica (2021), *Repere economice şi sociale regionale – Statistică teritorială 2021*, https://insse.ro/cms/ro/content/repere-economice-%C5%9Fi-sociale-regionale-statistic%C4%83-teritorial%C4%83-carte-1 (accessed: 28.10.2021).

Kozlovskyi, S., Pasichnyi, M., Lavrov, R., Ivanyuta, N., Nepytaliuk, A. (2020), *An Empirical Study of the Effects of Demographic Factors on Economic Growth in Advanced and Developing Countries*, "Comparative Economic Research. Central and Eastern Europe", 23 (4), pp. 45–67, https://doi.org/10.18778/1508-2008.23.27

Lux, G. (2017), *Reintegrating economic space. The metropolitan-provincial divide*, [in:] G. Lux, G. Horváth (eds.), *The Routledge Handbook to Regional Development in Central and Eastern Europe*, Routledge, London–New York, pp. 15–28, https://doi.org/10.4324/9781315586137

Lux, G. (2019), *A Modern városok program újraiparosítási törekvései*, "Tér és Társadalom", 33 (1), pp. 44–65, https://doi.org/10.17649/TET.33.1.3067

Lux, G. (2021), *Manufacturing in the Post-Industrial City: The Role of a „Hidden Sector" in the Development of Pécs, Hungary*, [in:] W. Cudny, J. Kunc (eds.), *Growth and Change in Post-socialist Cities of Central Europe*, Routledge, London, pp. 94–112, https://doi.org/10.4324/9781003039792

Nagy, B. (2021), *The Restructuring of the European Pharmaceutical Industry between 2000 and 2018*, "Comparative Economic Research. Central and Eastern Europe", 24 (2), pp. 103–118, https://doi.org/10.18778/1508-2008.24.14

National Bank of Hungary (2016), *Növekedési jelentés*, Budapest, https://www.mnb.hu/letoltes/novekedesi-jelentes-2016-hu.PDF (accessed: 9.06.2021).

Okun, A. (1973), *Upward Mobility in a High-Pressure Economy*, "Brookings Papers on Economic Activity", 1, pp. 207–261, https://doi.org/10.2307/2534087

Olejnik, A., Żółtaszek, A. (2020), *Tracing the Spatial Patterns of Innovation Determinants in Regional Economic Performance*, "Comparative Economic Research. Central and Eastern Europe", 23 (4), pp. 87–108, https://doi.org/10.18778/1508-2008.23.29

Rácz, Sz. (2019), *Development Processes of Regional Centres in Central and Southeast Europe – From State Socialism to Dependent Market Economies*, "DETUROPE – The Central European Journal of Regional Development and Tourism", 11 (2), pp. 92–100, https://doi.org/10.32725/det.2019.017

Rácz, Sz., Kovács, S., Horeczki, R. (2021), *Pécs*, [in:] J. Rechnitzer, J. Berkes (eds.), *Nagyvárosok Magyarországon*, Ludovika Kiadó, Budapest, pp. 207–218.

RNB (2020), *Investiţiile străine directe în România în anul 2019*, Banca Naţională a României, Bucureşti, https://www.bnr.ro/DocumentInformation.aspx?idInfoClass=9403&idDocument=35274&directLink=1 (accessed: 25.10.2021).

Romanian Parlament (2001), *Legea nr. 350 din 6 iulie 2001 privind amenajareateritoriului şi urbanismul*, Monitorul Oficial nr. 373 from 10th July, Bucureşti.

Singh, D., Gál, Z. (2020), *Economic Freedom and its Impact on Foreign Direct Investment: Global Overview*, "Review of Economic Perspectives", 20 (1), pp. 73–90, https://doi.org/10.2478/revecp-2020-0004

Suchácek, J., Pytliková, M. (2017), *The regional dimension of migration and labour markets in Central and Eastern Europe*, [in:] G. Lux, G. Horváth (eds.), *The Routledge Handbook to Regional Development in Central and Eastern Europe*, Routledge, London–New York, pp. 211–224, https://doi.org/10.4324/9781315586137-13

Szakálné Kanó, I., Lengyel, I. (2021), *A kelet-közép-európai országok térségeinek konvergenciaklubjai*, "Területi Statisztika", 99 (9), pp. 821–843, https://doi.org/10.20311/stat2021.9.hu0821

Veres, V. (2020), *Kutatás-fejlesztés*, [in:] J. Benedek (ed.), *Erdély – Tér, Gazdaság és Társadalom*, Kolozsvári Egyetemi Kiadó, Cluj-Napoca, pp. 532–550.

Otoczenie gospodarcze dwóch ośrodków regionalnych Europy Środkowej i Wschodniej po kryzysie: podejście porównawcze

Opracowanie przedstawia wynik badania ekonomicznych podstaw dla ożywienia gospodarczego i procesu nadrabiania zaległości po globalnym kryzysie finansowym i gospodarczym, w oparciu o porównanie studium przypadku regionów Cluj-Napoca w Rumunii i Pécs na Węgrzech. Wykorzystano eksploracyjną analizę danych statystycznych do opisu otoczenia gospodarczego regionów po kryzysie w kontekście zróżnicowanych wyników gospodarki będącej w stanie trwałego rozgrzania w tych dwóch krajach. Następnie przeanalizowano ewolucję produktu krajowego brutto per capita w postaci zdekomponowanej, co pozwoliło na wgląd w główne wyzwania rozwoju regionalnego w obu ośrodkach regionalnych. Wyniki analizy wskazują, że do długoterminowych wyzwań gospodarczych należy podchodzić przy pomocy polityki regionalnej zorientowanej na efektywność, która opiera się na kapitało- i wiedzochłonnym wzroście.

Słowa kluczowe: rozwój regionalny, wzrost gospodarczy, Węgry, Rumunia, analiza porównawcza

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.22

Using Acemoglu and Robinson's Concept to Assess Leviathans in CEECs in the Long Term

Rafał Matera https://orcid.org/0000-0003-3683-0439
Ph.D., Associate Professor at the University of Lodz, Chair of History of Economics, Faculty of Economics and Sociology, Lodz, Poland, e-mail: rafal.matera@uni.lodz.pl

Abstract

The main objective of the paper is to use the following terms of Daron Acemoglu and James Robinson – Despotic, Real, Paper, Shackled Leviathans – to check and evaluate the state of democracy, governance and social power in Central and Eastern European Countries (CECCs). Six states were included in the study: Poland, Czechia, Slovakia (before 1993 Czechoslovakia), Hungary, Romania and Bulgaria. Based on a historical analysis, Leviathan types were identified in the interwar period, communism, and the transition time. In the most recent period (the twenty-first century), eight democracy and freedom indices were presented, which take into account the quality of governance, the state of institutions and the potential of social capital in the six CEECs. The usefulness of these indices for assessing whether (and when) a country managed to shackle Leviathan were checked.

Keywords: CEECs, Acemoglu & Robinson Concepts, Types of Leviathan, Shackled Leviathan

JEL: D7, H1, K4, N4, O5, P2, P5

Fingers are crossed
Just in case
Walking the dead
Where are we now?
Where are we now?

David Bowie 'Where Are We Now?' (2013)

Received: 7.03.2022. Verified: 2.06.2022. Accepted: 28.06.2022

Introduction

I use the concepts and terms of Daron Acemoglu and James A. Robinson (A&R) to check and evaluate the state of democracy, freedom, governance and social power in six Central Eastern European Countries (6CEECs), in a long period of time. Using A&R's terminology of different kinds of Leviathans and on the basis of historical sources and a variety of indices, I classify, categorise and match 6CEECs accordingly. This analysis includes more than a century of time (since 1918).

In the assessment I use historical description, pointing to decisive facts and legislation acts influencing the quality of the state (Leviathan). In the most recent period (twenty-first century) I use the democracy and freedom indices, which take into account the quality of governance, the state of institutions and the potential of social capital. I check the usefulness of these indices to assess whether a country managed to shackle Leviathan.

In the study I take into account six countries: Poland, Czechia, Slovakia (before 1993 Czechoslovakia), Hungary, Romania, Bulgaria. These are all former members of the Warsaw Pact and the Council for Mutual Economic Assistance (COMECON, CMEA), also the Central European Free Trade Agreement (CEFTA) and finally current EU countries. Four of them became EU members in 2004 and two of them in 2007. I do not take into account other EU countries from the former USSR (Lithuania, Latvia and Estonia) and Yugoslavia (Slovenia and Croatia). The six countries studied are the largest in terms of population from the EU's Eastern bloc. Furthermore, Slovakia, the smallest of the countries studied, is larger in population than EU's members of the former USSR or Yugoslavia.

I use the following methods in completing the article: critical exegesis of theorists' texts; critical historical and institutional analysis and comparative statics analysis.

Acemoglu and Robinson's concept of Leviathan in brief

A&R like to popularize their scientific ideas. They managed to publish two brilliant bestsellers. After *Why Nations Fail* (Acemoglu and Robinson 2012) they released an equally comprehensive and similarly capacious *Narrow Corridor* (Acemoglu and Robinson 2019). The first mentioned book explained the institutional hypothesis in a crossing world scale. The authors minimized the importance of environmental, cultural, or perceptional impediments to economic development, increasing and underlining the role of institutions (Dzionek-Kozłowska and Matera 2015; 2020; 2021). A&R claim the institutional order 'must feature secure private property, an unbiased system of law, and a provision of public services that provides a level playing field in which people can exchange and contract; it also must permit the entry of the new businesses and al-

low people to choose their careers' (Acemoglu and Robinson 2012, pp. 74–75). Such an approach was more developed in their latest book *Narrow Corridor*.

There is also one strong thing in common between both A&R's books. The authors attach great importance to small, seemingly insignificant differences that appear at critical junctures in history, which is in fact the essence of the concept of path dependence (David 1985; Puffert 2002). In *Narrow Corridor* they go a step further, as they try to be more specific in explaining the factors that have a significant impact on the chosen paths of development. They do this in different historical periods, giving examples and detailed description from the Middle Ages (the Black Death), through to the beginning of modernity (discovering America) or contemporary history (the collapse of the Eastern Bloc), using the example of Poland, Russia and Tajikistan (Acemoglu and Robinson 2019, pp. 281–291).

The main research question of A&R's book is why and how societies have achieved or failed to achieve liberty (Acemoglu and Robinson 2019, p. xi; McElroy 2021). How have some societies managed to reach a situation in which, on the one hand, we have a centralized power protecting against 'the war of all against all', and on the other, this power is kept in check (shackled) by ordinary people? And finally: 'how those shackles emerge, and why only some societies have managed to develop them' (Acemoglu and Robinson 2019, p. 27).

The starting point of A&R's narration is Thomas Hobbes' concept of a state of anarchy (called Warre) and the opportunities to prevent it (Hobbes 2020). The solution would be the creation of a state with a monopoly on the use of violence (called Leviathan). The simplest definition of the Leviathan is a group of political elites (rulers, politicians) and sometimes economic elites (Acemoglu and Robinson 2019, p. 72). How do we bring this about and stop the '*bellum omnium contra omnes*'? It can be done by force, or by a kind of social contract under which everyone submits. According to A&R, Hobbes did not care which path was chosen, as long as the Leviathan was established, because only then would the violence be stopped. A&R criticize Hobbes' position on this aspect (Acemoglu and Robinson 2019, pp. 11–12) by pointing out two issues:

1) that the control of violence is sometimes possible even in stateless societies (with an Absent Leviathan – which is a bit misleading at first sight, because realistically with an Absent Leviathan there is no state. And this was, for example, the situation in Nigerian Lagos at the dawn of the twenty-first century) or in the societies with so-called 'cage of norms' (also best observed long-term in India, where society collectively imposes a caste system);

2) the establishment of a centralized authority does not always lead to a state better than a state of 'the war of all against all', because the state has a monopoly on violence, but this does not automatically mean that the life of 'ordinary people' will be bet-

ter – the key is the respect of civil liberties. When these are not respected, we have a Despotic Leviathan. This was precisely the situation in USSR, PRC or North Korea.

There are naturally intermediate options too. To the mentioned set of Leviathans should be added Paper Leviathan (Acemoglu and Robinson 2019, pp. 367–368) – a term introduced for the first time by A&R in 2016. This is the case in which the state has people staffed in all positions in government but offers no services to its citizens. It is the situation in which '[…] while society cannot really control or stop a process of state formation, as in the above post-colonial societies, they may be able to withdraw from it and deny it legitimacy' (Acemoglu and Robinson 2016, p. 21). Colombia (described in *Paths*) or Argentina (described in *Narrow Corridor*) are good (rather bad) examples of such a Leviathan.

There is also a Real Leviathan in A&R's earlier publication (Acemoglu and Robinson 2016, p. 29), of which Rwanda during the ethnic drama in 1990s would be the best (rather the worst) example. 'It was precisely a highly top-down, authoritarian, and non-democratic set of institutional structures and exercise of power that was of crucial importance in the administration of the genocide. Such forces are still present and potentially destructive' (Acemoglu and Robinson 2016, p. 33). Since A&R do not use the term 'Real Leviathan' in their *Narrow Corridor* and instead operate with the term 'Despotic Leviathan', we can consider that these are the same forms of the most enslaved state.

After this enumeration of types of Leviathans (Absent, Despotic, Paper, Real) and filled with plenty of examples, A&R conclude that the power of the state and the power of society must be in balance, and once in balance the state can offer its citizens more and more, as long as society also grows in power, in order to be able to contain the growing power of the state.

So in order not to fall into the trap of Warre or into the 'cage of norms' or into the yoke/claws of a Despotic Leviathan '[…] We need a state that has the capacity to enforce laws, control violence, resolve conflict, and provide public services but is still tamed and controlled by assertive, well-organized society' (Acemoglu and Robinson 2019, p. 24). The authors call this 'nirvana' 'Shackled Leviathan', and the space between a government guaranteeing security and the social force controlling too much power of the government is named the Narrow Corridor.

In the next sections I will try to shackle A&R's theory of Leviathans. It is really difficult to question the historical content of a fascinating book. Instead, it is worth subjecting the theory to empirical verification, looking at the past and present situation in the 6CEECs through the prism of this concept. Thus, I will first define the types of Leviathan for the studied countries (the next part of the paper) since 1918. Then I will try to answer whether and possibly which countries managed to shackle Leviathan.

Concise historical review and types of Leviathans in CEECs

Before WWII

Based on the broad descriptions of A&R in *Narrow Corridor* and their other works, we know what characteristics each Leviathan has. Although the differences between them are often blurred (especially between Despotic/Real and Paper Leviathans).

In principle, we have initial doubts about the classification of CEECs before 1918. To begin with, we must remember that not all of them were independent. Poland was under partition for 123 years. It was part of more or less despotic regimes. After 1795, the former Polish territory and its inhabitants were part of Czarist Russia, the Kingdom of Prussia (since 1871 the German Empire) and the Austrian Empire (since 1867 the Austro-Hungarian Monarchy) with a small dose of relative autonomy (Koryś 2018). Czechia, Slovakia and Hungary were within the borders of the Austrian Empire, although the latter had been in the role of a co-hosting absolute monarchy since 1867 (Judson 2016). Romania formally declared independence in 1877 (confirmed by the Treaty of Berlin in 1878), becoming independent from the Ottoman Empire, although there was already an autonomous principality from Austria and Turkey. Finally, the Bulgarian state was created as a result of a dramatic uprising, following the Treaty of San Stefano (1878), but was largely dependent on the Ottomans. Bulgaria became an independent tsarism only in 1908.

All the partitioning countries were despots. They were absolutist, ruled by tsars, emperors, kings, sultans. They were ruthlessly Despotic Leviathans. Although one can theorize whether they did not have the features of a Paper Leviathan. Could it have been better? Let us focus on the definition of A&R: 'To the extent that it has any powers, it is despotic, reppressive, and arbitrary. It is fundamentally unchecked by society, which it continually tries to keep weak, disorganized, and discombobulated. It provides its citizens little protection from Warre, and doesn't try to free them from the cage of norms. This is all because Paper Leviathan doesn't care about the welfare of its citizens and certainly not about their liberty' (Acemoglu and Robinson 2019, p. 368).

However, there are some doubts as to the determination of 'little protection from Warre'. The biggest problem is with the word 'little'. The question is: what groups and how many people were affected by this protection? Were the close people of the tsar or sultan protected under this system, or slightly larger groups of elites in Germany or Austria? This was probably not enough as a characteristic feature of a Paper Leviathan. Even independent Romania and Bulgaria did not have the features of a state where an informed society had formed. Before 1918, the inhabitants of CEECs were located within different borders, exposed to conflicts, uprisings and wars (the Balkan Wars). All CEECs were

more or less subordinated from partitioning powers or neighbouring empires, and societies were enslaved and/or completely fractured.

What changes occurred in CEECs' political systems as a result of the end of WWI, the declaration of independence by some of these countries and the provisions of the Treaty of Versailles? The interwar period was too short for the CEECs to shackle Leviathan. The first step, rather, was to stop the time of Warre, to stop internal struggles, to stop illegal takeovers of power, and finally to form the Leviathan. In the case of Czechoslovakia this was a more successful process, in the case of Poland and Romania partly successful (only for a shorter period). In the case of Hungary and Bulgaria one can speak of failed attempts. Even when it was possible to escape from Warre, the newly created states fell into the clutches of the Paper Leviathan or even the Despotic Leviathan.

Only Czechoslovakia functioned in the whole interwar period as a democratic state. It had some of the characteristics of a Shackled Leviathan, although even this country had too short a time for inclusive political and economic institutions to function effectively. However, there are also critical assessments of the Czechoslovak democracy sometimes called the Masaryk's republic, pointing out its limitations and failures (Kopeček 2019). Moreover, the development of democracy was mainly halted by the external political situation and the bad examples set by neighbours.

The National Assembly unanimously adopted the Constitution in February 1920. It remained unchanged until the collapse of the state in 1939. In its very first article the document set out the principle of national sovereignty. It recognized the close unity of the Czech and Slovak nations. The country was to be a democratic republic, guaranteeing respect for fundamental civil liberties, including those of national minorities. The final failure of the democratic experiment in 1938 was not the result of the weakness of the state, but rather due to the policy of Nazi Germany and the European powers, which were unable to oppose it.

Poland also made an attempt to shackle the Leviathan, although it failed quite quickly. After the surrender of power by Chief Józef Piłsudski, Poland operated on the basis of the so-called Provisional Constitution (Kaczmarczyk-Kłak 2018), and additionally struggling for more than two years with uprisings and war with Bolshevik Russia. A strongly democratic constitution was promulgated in March 1921, but the political system was still very unstable. During the first seven years of the Republic there were as many as 14 governments, and in 1922 the president was even assassinated. Despite this, the limping democracy bravely resisted authoritarian solutions. In May 1926, however, there was a *coup d'état* for which Piłsudski was responsible, and although the Constitution was not formally amended until 1935, 13 years before the outbreak of war there had been a monopoly of party (strictly linked with Piłsudski) power, and the rights of minorities and large sections of society had not been

respected. Poland was thus a typical Paper Leviathan (especially revealing during the Great Depression) with the features of Despotic (Real) Leviathan.

In the remaining CEECs, there were also times when Warre dominated state stabilization. Once Warre had been stopped, however, the Real Leviathan was revealed, in which a governing administration, centred around authoritarian rulers, would destroy the opposition (the mechanism was similar to the Polish one). In the case of Hungary, the communists came to power less than six months after the republic had been proclaimed, creating the Hungarian Soviet Republic. After over 100 days of their rule, the power was taken over by the nationalists, starting the authoritarian rule of Miklos Horthy, who became regent after the 1920 elections. He remained in this position until 1945. The constitutional foundations were still modified, and their essence was the assumption that the royal power was to be exercised by the aforementioned regent (called *kormanyzo*). Hungary, instead of a republic, therefore remained a monarchy, although without a king (Molnar 2001). Nationalist, and in the 1930s showing increased interest in fascism, Hungary was thus a classic Real Leviathan.

In Romania, after a period of chaos (revolutionary movements and general strikes), in 1923 the constitution of 1866 was replaced with a new liberal regulation, although it retained the monarchical form of the state, but also introduced certain limitations to the so far role of the king. He retained the right of legislative initiative and the right of sanctions against laws passed by parliament, but lost any significant influence on the functioning of the national representation. 'It was, basically, a fluid mixture of authoritarianism and democracy' (Boia 2001, p. 104). Such a system did not significantly improve the low levels of education and the public's awareness of their rights. Therefore, there was little resistance to the constitutional changes of 1938, which led to a significant limitation of the powers of the parliament (in connection with the dissolution of political parties) and to the concentration of state power in the hands of the monarch as well as the government subordinated to him. In practice, the king relied on the military who constituted the main basis of his power, and this very model persisted during the war (though the royal dictatorship itself did not last long) (Hitchins 2014).

Among the CEECs, Bulgaria was the most unstable. The proportions between Warre and Leviathan were to the disadvantage of the latter. The periods of political instability were much longer than the brief periods of shackling Leviathan. In the interwar period, drastic fights for power took place (such as coups, attempts to assassinate the tsar and murders of politicians). In the atmosphere of revolutionary unrest, strikes were nevertheless managed by a people's government in 1919 with prime minister Alexander Stambolijski. The tsar was losing real power, which was a positive tendency, but there was no stability at the level of the government and parliament. In 1923, a fascist *coup d'état* took place while the former prime minister was murdered. The regime of right-wing movements persisted until WWII. Elements of parliamentary democra-

cy were briefly noticeable in the early 1930s, but already in 1934 another *coup d'état* was made by the military from the fascist organization. There was another restriction of civil liberties. The short-term Paper Leviathan was then replaced by the Real Leviathan. Only such a country could join the Axis Bloc (Crampton 2005) in 1941. Thus, in the Real Leviathans of Bulgaria and Hungary, Nazi ideology and practice found their way more easily.

Table 1. The Main features of the political system in 6CEECs in interwar period

Country	Official and real political systems	No. of elections (in brackets mostly free, rather fair, non-boycotted elections)	Range of voter turnout. Min–max	No. of parties (in brackets groups of civil representatives) in parliament. Min–max	Repression of the opposition and civic society	Suffrage of women, year of granting voting rights (fully)	Total no. of governments since 1918*
POLAND	Parliamentary republic. Authoritarianism since 1926	6 (2)	47–78	1 (2 including nonpartisans members)–12	Yes	1918	30 till 1939
CZECHO--SLOVAKIA	Parliamentary republic. Democracy with some defects	4 (4)	90–92	14–16	No	1920	10 till 1938 12 till 1939
HUNGARY	Republic till 1920. Soviet Republic in 1919. Kingdom (Regency). Authoritarianism since 1920	6 (0)	52–88	8–17	Yes	1919 (fully 1945)	19 till 1939 25 till 1944
ROMANIA	Partly liberal constitutional monarchy in 1920s. Authoritarianism in 1930s	12 (6)	66–77	1–15	Yes	1929 (fully 1946)	37 till 1940
BULGARIA	Tsardom. Constitutional monarchy with defects. Authoritarianism in 1930s	8 (4)	54–86	2–10	Yes	1937 (fully 1944)	12 till 1939 18 till 1946

* The closing dates of the governments' activities for each country vary due to the fact that they lost their partial or full independence (sovereignty) at different times. Some CEECs were occupied by Nazi Germany, others were allied with Axis powers or neutral at various times during WWII.
Source: own table's concept based on data from: Ramet (2020); Austin (2021); POLVAL1 (n.d.); Wikipedia (n.d.), *Wybory parlamentarne w II Rzeczypospolitej*; Wikipedia (n.d.), *Elections in Czechoslovakia*; Wikipedia (n.d.), *1920 Hungarian parliamentary election*; Wikipedia (n.d.), *Elections in Romania*; Wikipedia (n.d.), *Category: Parliamentary elections in Bulgaria*.

The more important conclusions from Table 1 include the following: more democratic systems existed only in Poland (briefly) and Czechoslovakia (longer). If there were no

authoritarian powers, the parliamentary majorities became unstable. Therefore, frequent elections were organized (mainly Romania and Bulgaria). The most active governments were in Romania and Poland, while the most stable in terms of the organization of elections and governments was in Czechoslovakia. All countries experienced the multiparty system, but in the case of Poland, Romania, Bulgaria and de facto Hungary (Janos 1982, p. 213), there was a party monopoly or groups supporting the regent, tsar, king, marshal (former chief). One could observe a very high turnout in all countries, but in Poland, Hungary and Bulgaria during the periods of the state crisis it dropped to around 50%. There were persecutions of the opposition, *coups d'état*, general strikes and prisons for political opponents in five of the six countries. Full voting rights for women only existed in Poland and Czechoslovakia. So only the latter country managed to shackle Leviathan, but even this did not prevent it from its dramatic end.

After WWII

In the interwar period, there were many common features between the Leviathans from the CEECs, but also some variations were observed. After WWII, the characteristics of the political systems in CEECs were much more similar. This was due to the imposition of ready-made solutions by the USSR and the relatively coherent actions of the communist parties. At the beginning, radical system reforms were favoured by the expectations of a large group of society: peasants counting on free land and workers who were guaranteed full employment.

Beyond any doubt, the communist systems in the CEECs had all the characteristics of a Despotic (Real) Leviathan. One can only differentiate the scale of the persecution of society by Leviathan in individual countries.

Among political extractive institutions we may distinguish: the primacy of a new ideology aimed at the abolition of private property; lack of free elections (the first elections after WWII were held under great pressure from the authorities, their results were falsified, and the next elections were a farce, with society forced to vote for certain party representatives); monopoly of communistic parties; special privileges for the authorities; society was enslaved, and in extreme cases there was also democide (Rummel 1994).[1]

1 Rummels' calculations in *Death of government* indicated 110 mln dead as a result of communist democide from 1900 to 1987. In contrast, Benjamin Valentino (2004) stressed that most communist regimes did not commit mass crimes. From the CEECs he noted 50,000 killed during the worst period in Bulgaria and Romania. The number of victims of democide in these countries can therefore vary greatly: from tens to hundreds of thousands. In the case of Hungary, there were between a thousand and tens of thousands of victims. In the case of Poland and Czechoslovakia between a hundred and a thousand victims of uprisings, strikes and the hardest period of the Stalinist regime. More information on the difficulty of identifying the number of victims of communism can be found in *The black book of Communism* (Courtois et al. 1999).

As part of the most destructive economic extractive institutions, we can indicate: specific legal acts – nationalization of the industry (until 1948 this was carried out in all five CEECs, of which in Hungary it was already over 80% in the hands of the state, and even 97% in Bulgaria (Skodlarski 2012, p. 337)); collectivization of agriculture (the new authorities liquidated landowners' ownership, allocating land to smallholders and landless peasants and creating state and cooperative farms); exchange of money without market laws. State ownesrship of factors of production (capital, labour, land); central management and planning; bureaucracy, controlled system; administrative price formation; no competition between economic agents; no commercial institutions; isolationism in innovation and autarkic international trade (at the end of the 1940s, already 40% of CSSR and 80% of Bulgaria's foreign trade was linked with the USSR); full employment (and compulsory work); permanent shortages on the market. Studies of János Kornai (1992), Oskar Lange (1962) and Michał Kalecki (1993) will be useful here, theoretically, to understand the mechanisms of the system, with Ivan Berend (1996) showing the operation of the system in excellent examples from CEECs.

The hardest power of Despotic Leviathan was visible at the end of the 1940s and in the 1950s, although we may observe the politics of power and harassment of society as a result of mass protests in each country in the following decades as well: during the 1968 Czechoslovak Revolution, in Poland in 1968, 1970, 1976 or 1981 (introduction of the Martial Law), to a lesser extent during the regime of János Kadar in Hungary; to a greater extent during the regime of Todor Zhivkov (Bulgaria), and especially Nicolae Cauşescu (Romania).

A&R write quite extensively about the harbingers and causes of the collapse of the communist system in CEE at the very end of the 1980s and the beginning of the 1990s. They show the mechanisms that made Poland shackle Leviathan, while Russia and Tajikistan did not succeed it (Acemoglu and Robinson 2019, p. 290, Figure 3).

The democratization of the political system (the organization of free elections at various levels, the appointment of new governments) slightly preceded or occurred in parallel. The economic situation of the postcommunist countries was thus differentiated, almost half a century after the war and after half a century of despotism. There was a lack of institutions necessary in a market economy, that is, institutions protecting private property and the rights of society and individual individuals. There was also no economic information circulation system. No rules for the operation of institutions such as stock exchanges applied. The conditions of competition were not defined and there were no anti-monopoly offices. The price system had been distorted by universal subsidies and direct regulation; the currency was inconvertible. The industry was overdeveloped at the expense of the service sector. These countries inherited from the collectivist system a deep market imbalance, rising inflation, deformed economic and social structures, decapitalized productive assets, low economic efficiency, disturbed ecological balance and a large-

ly Sovietized society. The technological and infrastructural gap in relation to industrialized countries clearly increased together with the increase in the external debt. Under these difficult conditions, the painful process of systemic stabilization and transformation began (Brada 1993; Sachs 1993; Blanchard, Froot, and Sachs 1994; Schweickert et al. 2013; Henry 2014). The result of this process was the establishment (restoration) of democracy and the introduction of capitalism.

Complementing figure released by A&R (Acemoglu and Robinson 2019, p. 290), Shackled Leviathan, next to Poland, can be boldly included in this group, including Hungary, Czechoslovakia (since 1993 the Czech Republic and Slovakia), but also Bulgaria and Romania with some delays. The CEECs escaped from the Despotic Leviathan (they did not stay with Russia, Belarus or most Asian satraps) or did not enter the Absent Leviathan's path like Tajikistan (or in shorter periods, like Ukraine or Moldova).

Table 2. The proposal of international institutional guarantees for shackled Leviathan in 6CEECs

	Council of Europe membership	NATO membership	Europe agreement's signature	Acceptance of the EU accession candidacy	Beginning of negotiations on EU accession	EU accession
POLAND	1991	**1999**	**1991**	**1994**	**1998**	**2004**
CZECHIA	1993	**1999**	1993	1996 (!)	**1998**	**2004**
SLOVAKIA	1993	2004	1993	1995	2000	**2004**
HUNGARY	**1990**	**1999**	**1991**	**1994**	**1998**	**2004**
ROMANIA	1993	2004	1993	1995	2000	2007
BULGARIA	1992	2004	1993	1995	2000	2007

Leaders are bolded.
Sources: own table's concept based on: Council of Europe (n.d.); NATO (2022); EUR-Lex (2007).

However, international institutional protection (Table 2) decided about the quick shackling of Leviathan and entering the Narrow Corridor. Initially, the leader of CEECs was Poland, in which the empowerment effect (A&R's term from Acemoglu and Robinson 2012, pp. 455–462) was active as a result of Solidarity's activity in the 1980s. It was certainly a kick-start to the fastest changes since the very beginning of 1989. Hungary, inspired by the Polish model of round-table talks, and Czechoslovakia, after the Velvet Revolution, also started to join European structures. Romania and Bulgaria followed these leaders a little later. A measure of being in Shackled Leviathan could be the membership of CEECs both in the Council of Europe, in NATO (responsible for regional and global security), and in the EU. Membership in the Council of Europe on its own does not seem to be sufficient, especially in the light of Russia's membership (Pacześniak 2014). The institutional confirmation of Shackled Leviathan could also be the stages of negotiations

with NATO and the EU in the second half of the 1990s. Poland, Czechia and Hungary were slightly ahead in this respect. The accession to the EU itself was a kind of institutional guarantee for the countries in the Narrow Corridor.

In reaching Shackled Leviathan and staying in the Narrow Corridor, the regional Red Queen effect can be interpreted in an interesting way. The CEECs did not run equally for democracy. Political changes began faster, but more evolutionarily than revolutionarily in Poland, then in Hungary and Czechoslovakia. The latter, however, due to the internal process of disintegration, was not included in the *Poland and Hungary: Assistance for Reconstruction of the Economy* (PHARE) programme for the two change leaders. In Romania and Bulgaria, however, the changes were more revolutionary. The *coup* took place in the streets (Romania) or inside the communist party (Bulgaria). The transformation was therefore more than two years behind the leaders. At the end of the 1990s, the trio of Poland, Czechia and Hungary were leaders at joining NATO and during the accession negotiations. But then these countries slowed down, were quickly caught up by Slovakia, which, after the era of Vladimir Mečiar, managed to enter the EU at the same time as the mentioned three. Thus, Bulgaria and Romania lagged only two and a half years in relation to the top four. As of 1 January, 6CEECs had already entered the EU together. But was it a smooth run? The next section discusses this issue.

CEECs in indices of democracy, rule of law and freedom

I assume all the 6CEECs managed to Shackle Leviathans and have been in the Narrow Corridor since the 1990s, receiving EU guarantees. Is EU membership a permanent and full guarantee of maintaining this state of affairs? Can there be shifts within the Narrow Corridor due to too much government power or too weak social control of the government's activities? How can this state be verified? This can be done by indicating the trends in changes in the measurements (if any) of both these measures. I assess the measurement of these trends based on eight independent indices of eight different institutions. They regularly monitor the state management process and the state of democracy in most countries of the world, including all the countries described, in the long-term (since 1970s), in the medium-term (from the moment of their accession to the EU or shortly after: 2006–2010, and in the short-term (since 2015).

It does not stop at an in-depth evaluation of the methodology of all these rankings. Generally, however, it can be stated that the assessment of governance is difficult to question methodologically. On the other hand, it is more difficult to assess social power, because it is largely based on surveys while not on real action. For example, there is no detailed record of social protests against the authorities. This is already work for another study.

Tendencies after EU accession

I begin by comparing the 6CEECs with the Democracy Index first published by *The Economist* in 2006. This is based on 60 indicators in five different categories that indicate measures of pluralism, civil freedom and political culture.

Table 3. Scores and places of 6CEECs in democracy index by economist intelligence unit: 2006, 2015, 2020. Scores: 0-to–10 rating scale

STATE	2006		2015		2020		CHANGE (+/-) SCORE (PLACE) 2006–2015	CHANGE (+/-) SCORE (PLACE) 2015–2020
	SCORE	PLACE	SCORE	PLACE	SCORE	PLACE		
POLAND	7,3	46	7,09	48	6,85	50	–0,21 (–2)	–0,24 (–2)
CZECHIA	8,17	18	7,94	25	7,67	31	–0,23 (–7)	–0,27 (–6)
SLOVAKIA	7,4	41	7,29	43	6,97	47	–0,11 (–2)	–0,32 (–4)
HUNGARY	7,53	38	6,84	54	6,56	55	–0,69 (–16)	–0,28 (–1)
ROMANIA	7,06	50	6,68	59	6,40	62	–0,38 (–9)	–0,28 (–3)
BULGARIA	7,10	49	7,14	46	6,71	52	+0,04 (+3)	–0,43 (–6)

Source: *The World in 2007. Democracy Index* (2007); The Economist Intelligence Unit (2015; 2020); Wikipedia (n.d.), *Democracy Index*.

The Democracy Index classifies countries into four groups: full democracies; flawed democracies; hybrid regimes; and authoritarian regimes. Of the 6CEECs, only the Czech Republic between 2006 and 2013 was included in the group of states with full democracy. Indeed, this country ranks highest in all editions of the CEECs and there is a clear gap between this country and the rest of the group. Compared to 2006 and 2020 all 6CEECs not only fell in the ranking, but their level of democracy was rated lower. They were considered flawed democracies, relatively safe and distant from hybrid regimes.

Looking at the interstate Red Queen effect, CEECs ran slower than other countries in the last 15 years. Or else the rest of the index countries ran faster. More surprising are the dips in the score, not the places. And so Poland ran with a noticeable change of place. It was the highest in 2014, in 40th place with a level of 7.47, and the lowest in 2019 (57th position and a level of 6.62). In the case of Poland, political culture and the functioning of the government were assessed the worst. Civil liberties and the election process were rated the best. In 2020, with CEECs in the governance efficiency subranking, Czechia was the highest, then Slovakia, Poland, Bulgaria, Romania and finally Hungary.

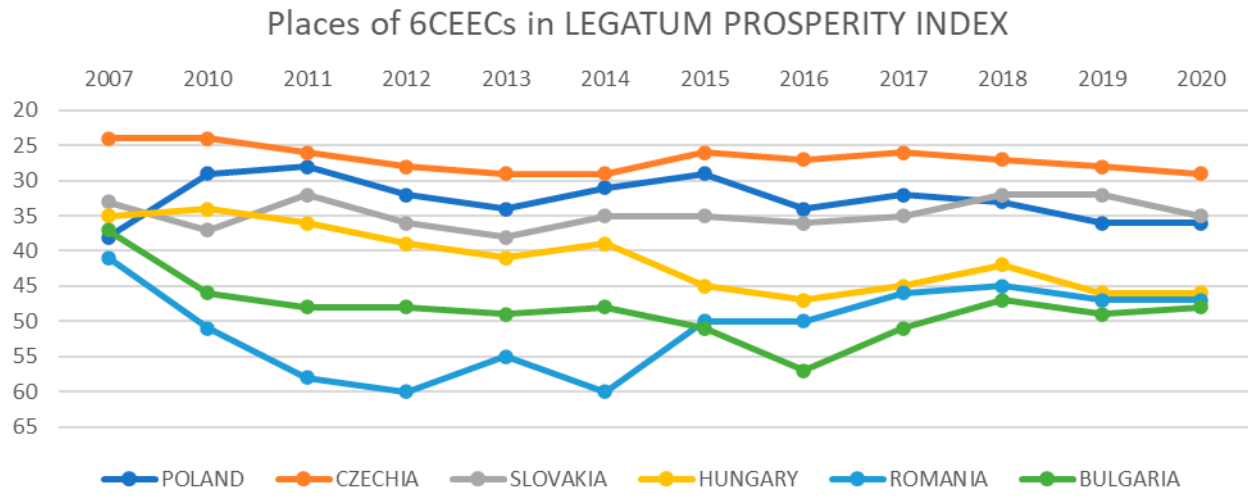
The Legatum Prosperity Index (LPI) created and published annually since 2007 by the Legatum Institute evaluates countries on the promotion of their residents flour-

ishing, reflecting both economic and social well-being. The methodology and pillars of the index changed over time. The latest indices take into account nearly 300 different indicators from over 80 different source databases. The index focuses on good governance (legal predictability) and the strength of society. When assessing Leviathan, categories such as safety, personal freedom, governance and social capital should be taken into account in particular.

Table 4. Places and score (2020) of 6CEECs in Legatum Prosperity Index by the Legatum Institute: 2007, 2015–2020. Score: 0 to 100 rating scale

	2007	2015	2016	2017	2018	2019	2020 (score)	CHANGE (+/-) PLACE 2007–2015	CHANGE (+/-) PLACE 2015–2020
POLAND	38	29	34	32	33	36	36 (69.14)	+9	–7
CZECHIA	24	26	27	26	27	28	29 (73.12)	–2	–3
SLOVAKIA	33	35	36	35	32	32	35 (69.63)	–2	0
HUNGARY	35	45	47	45	42	46	46 (66.13)	–10	–1
ROMANIA	41	50	50	46	45	47	47 (64.92)	–9	+3
BULGARIA	37	51	57	51	47	49	48 (64.40)	–14	+3

Source: Legatum Institute for Global Development (2007; 2015; 2016; 2017; 2018; 2019, 2020).



Graph 1. Places of 6CEECs in Legatum Prosperity Index: 2007, 2010–2020

Source: See sources in table 4.

In the LPI, full scores are only available for the year 2020, therefore it is worth to focus on the promotion measures (helpful in the assessment of the Red Queen effect). Czechia is also leading in this index with the CEECs, although in 2015 the difference

between it and Poland was very small. The latter country also achieved the greatest advance between 2007 and 2015. In the same period, Bulgaria, Hungary and Romania recorded the greatest declines. In the 2015–2020 period, three CEECs fell in the ranking, two moved up, and Slovakia retained its place. Poland recorded the greatest decline. In terms of governance, Czechia was the best in 2015–2020, followed by Slovakia and Poland. In turn, according to the social capital assessment, as many as four CEECs in 2020 were in the second hundred countries of the world (Bulgaria out of 112, Poland out of 115, Czechia out of 127, and Romania out of 124, with the biggest decrease being the share of Poland and Czechia). According to the LPI, in the period 2007–2020 only Czechia and Slovakia were moving at a relatively equal pace. Hungary lost the most. Poland moved quickly through 2015 to lose almost all of its promotion in the next five years. Finally, Bulgaria and Romania lost their positions until 2015, only to recover slightly since 2016.

Next, the Fragile State Index (FSI) published by The Fund for Peace since 2006, assesses external and internal political risks and potential conflicts for policymakers and the general public. The foundation collects thousands of reports and information from around the world, detailing existing social, economic and political pressure.

The results of CEECs in the FSI are presented in Table 5 (the lower the position, the greater the stability). In the years 2006–2015, all countries from the region recorded significant progress in political stability and resistance to conflicts (of which Poland made the greatest). In 2015–2020, however, the CEECs did not go evenly: the largest decline was recorded in Poland and Hungary, and the remaining countries slightly advanced. In the latest report from 2021, Slovakia (which jumped over its Western neighbour) and Czechia were considered very stable (higher up were sustainable and very sustainable countries). Poland and lower rated Romania, Hungary and Bulgaria were marked as more stable economies. Thus, they were far from the next, lower-rated groups of countries in terms of warnings and alerts.

The next two indices focus on assessing the freedom of states. The Human Freedom Index (HFI) measures broadly defined freedom, and the Index of Economic Freedom (IEF) focuses on the economic aspects. Only two CEECs (Romania and Bulgaria) slightly improved the score of freedom between 2008 and 2018. Czechia, Slovakia, and especially Poland and Hungary, lowered significantly their score (Table 6). The one and only promotions within ten years in HFI were achieved by Bulgaria and Romania. Czechia down 4 places, Poland – 10, Slovakia – 14, and Hungary 17.

Table 5. Indicators and places of 6CEECs in Fragile State Index by the Fund for Peace: 2006, 2015–2020.
Indicators: 120 (the worst) to 0 (the best) rating scale. Places (in brackets): the lower the better

	2006	2015	2016	2017	2018	2019	2020	CHANGE (+/-) INDICATOR (PLACES) 2006–2015	CHANGE (+/-) INDICATOR (PLACES) 2015–2020
POLAND	47.9 (115)	39.8 (153)	40.7 (152)	40.8 (151)	41.5 (148)	42.8 (144)	41 (145)	+8.1 (+38)	–1.2 (–8)
CZECHIA	41.8 (119)	37.4 (154)	40.8 (151)	40.1 (152)	39.0 (153)	37.6 (154)	35.7 (155)	+4.4 (+35)	+1.7 (+1)
SLOVAKIA	49.9 (112)	42.6 (149)	44.9 (144)	44.3 (144)	42.5 (147)	40.5 (148)	38.2 (151)	+7.3 (+37)	+4.4 (+2)
HUNGARY	46.7 (116)	49.1 (139)	52.7 (135)	52.0 (135)	50.2 (134)	49.6 (134)	47.6 (135)	–2.4 (+23)	+1.5 (–4)
ROMANIA	62.6 (102)	54.2 (132)	52.9 (134)	50.9 (136)	49.4 (137)	47.8 (137)	46.7 (136)	+8.2 (+30)	+7.5 (+4)
BULGARIA	62.1 (103)	55.4 (130)	53.7 (132)	53.7 (132)	51.7 (133)	50.6 (132)	49.2 (133)	6.7 (+27)	+6.2 (+3)

Source: Fragile States Index (2020).

Table 6. Scores and places of 6CEECs in Human Freedom Index by the Fraser Institute and the Cato Institute: 2008, 2015, 2018. Results: 0-to–10 rating scale

	HFI 2008		HFI 2015		HFI 2018		CHANGE (+/-) SCORE (PLACES) HFI 2008–2015	CHANGE (+/-) SCORE (PLACES) HFI 2015–2018
	SCORE	PLACE	SCORE	PLACE	SCORE	PLACE		
POLAND	8,10	35	8,12	34	7,72	45	+0,02 (+1)	–0,40 (–11)
CZECHIA	8,37	20	8,42	20	8,29	24	+0,05 (0)	–0,13 (–4)
SLOVAKIA	8,29	22	8,05	36	7,95	36	–0,24 (–14)	–0,10 (0)
HUNGARY	8,14	32	7,86	43	7,61	49	–0,28 (–11)	–0,25 (–6)
ROMANIA	8,06	36	8,22	28	8,09	32	+0,16 (+8)	–0,13 (–4)
BULGARIA	7,89	41	7,85	44	7,93	37	–0,04 (–3)	+0,08 (+7)

Source: Vásquez and McMahon (2020).

In the IEF, Poland (+37) and Romania (+37) achieved the highest advancement in positions between 2008 and 2020. In turn, the largest decrease was recorded by Slovakia (–25). Slovakia and Hungary results in 2020 were lower than in 2008. Thus, the CEECs did not run evenly. In the case of Poland, the upward trend was from 2009 to 2016. Then, until 2018, a slight decrease was noticeable. In Czechia, the decline occurred only in 2011–2012, then there was an increase. Slovakia was in a very high position after joining the EU, and began to be touched by declines from 2013. Hungary and Romania faced y / y fluctuations, and only Bulgaria saw a strong trend from 2010. In the 2020 index only Czechia and Bulgaria were qualified for the 'mostly free' group of countries. The rest of the 6CEECs were considered 'moderately free'.

Table 7. Scores and places of 6CEECs in Index of Economic Freedom by the Heritage Foundation: 2008, 2015, 2020. Score: 0-to–100 rating scale

	2008		2015		2020		CHANGE SCORE (PLACE) 2008–2015	CHANGE SCORE (PLACE) 2015–2020
	SCORE	PLACE	SCORE	PLACE	SCORE	PLACE		
POLAND	59.5	83	68.6	42	69.1	46	+9.1 (+41)	–0.50 (–4)
CZECHIA	68.5	37	72.5	24	74.8	23	+4.0 (+13)	+2.3 (+1)
SLOVAKIA	68.7	35	67.2	50	66.8	60	–1.5 (–15)	–0.4 (–10)
HUNGARY	67.2	43	66.8	54	66.4	62	–0.4 (–11)	–0.4 (–12)
ROMANIA	61.5	68	66.6	57	69.7	38	+5.1 (+11)	+3.1 (+19)
BULGARIA	62.9	59	66.8	55	70.2	36	+3.9 (+4)	+3.4 (+19)

Source: *2008 Index of Economic Freedom* (2008); Miller and Kim (2015); Miller et al. (2020).

In addition to the mainstream indices measuring government performance, there is also short-term (middle-short term), and less cross-sectional studies and reports. The V-Dem Institute – a project affiliated with the University of Gothenburg, publishes a ranking of the top autocratizing states (not the worst autocracies, but those sliding fastest into autocracy). In the first two places of this infamous ranking from the period 2010–2020 there were two CEECs: Poland and Hungary. Poland's Liberal Democracy Index (LDI) fell from 0.83 to 0.49 (–0.34), which was a drop from Liberal Democracy to Electoral Democracy. Hungary, which was second, fell at the same time by 0.31 (from 0.68 to 0.37), which meant a decrease for this country from Electoral Democracy to Electoral Autocracy (V-Dem Institute 2021). The process of autocratization of Poland and Hungary was also highlighted in other research (Szczepański and Kalina 2019; Ilonszki and Dudzińska 2021; Petrova and Pospieszna 2021).

A detailed analysis of LDI ranking in 2019 was carried out by Maerz et al. (2020). In the case of Hungary, four categories were downgraded: CSO repression; bias media; freedom of academic and cultural expression; and government media censorship efforts had been visible since 2009, in Poland since 2015. In the case of the key categories: free and fair elections, the collapse has been visible in Hungary since 2013, in Poland since 2018 (Maerz et al. 2020). Poland and Hungary have thus suffered a kind of collapse after constant assaults on the judiciary and restrictions on the media and civil society. Based solely on the LDI, there would not be much argument to keep Hungary in the Narrow Corridor. Poland was on its thin border. Both countries had a gigantic problem in shackling Leviathan in the last 5 (Poland) to 10 (Hungary) years.

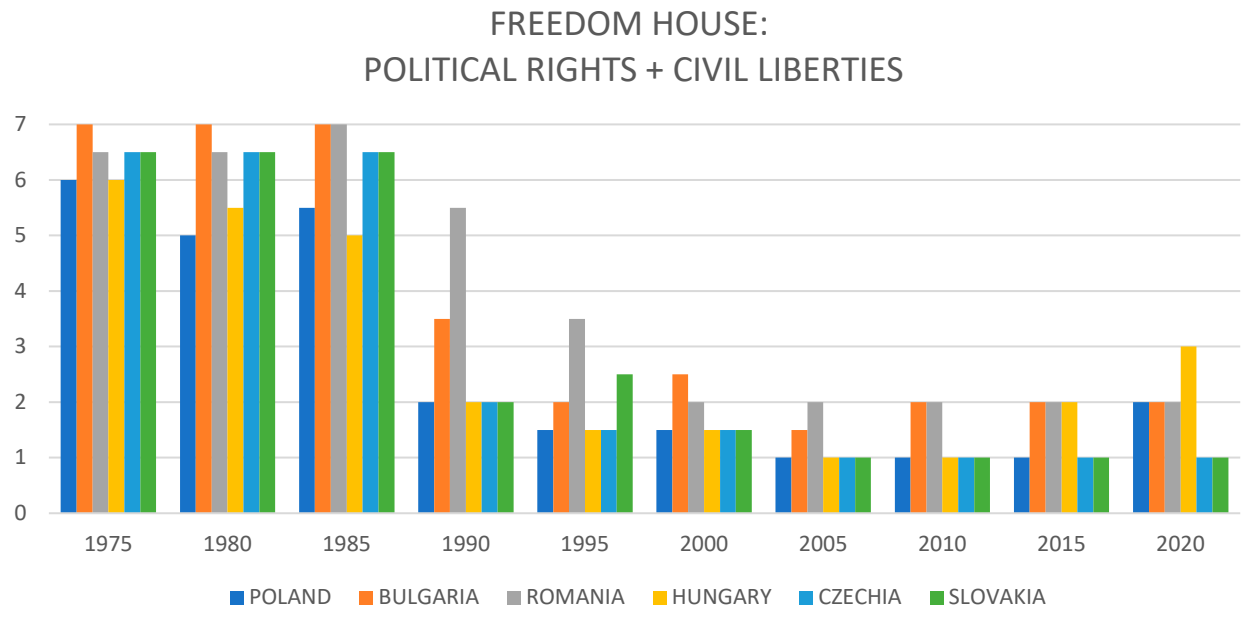
Of the other indices there is also the World Justice Project Rule of Law Index (consisting of 8 factors and 44 subfactors), but it does not include Slovakia, so I will not deal with comparative detailed data. In the first ranking in 2015, Czechia was the 6CEECs' leader (20th place); just behind it, Poland (21st). Romania was 32nd, Hungary 37th and Bulgaria 45th. In 2020, Czechia moved up to the 18th position, Poland fell to 28th (the score fell from 0.71 to 0.66). The worst category was the constraints of government powers, where Poland fell from the 18th place (score 0.77) to 51st (0.58). The results in the Open Government category were also worse (dropping from the 20th to 37th position). In the overall index, Romania maintained its position between 2015 and 2020, Hungary fell to 60th place, and Bulgaria to 63rd (World Justice Project 2015; 2020).

Tendencies in the longer-term

The eighth index referred to shows changes over a longer period. This is why it will be discussed at the end, to make it easier to see the Red Queen effect. Founded in 1941 Freedom House is the longest running non-profit NGO assesing global political sys-

tems and values. Based in Washington D.C., since the 1970s the organization has been monitoring in annual reports the state and changes in democracy, political freedom and human rights in over 200 countries and territories around the world. The Global Freedom report group them into: 'free', 'partly free' and 'not free'. Of the 6CEECs, 5 were classified as free in 2021, only Hungary was in 'partly free' group. Also current democracy reports indicate the specific outcome of democracy, with detailed percentage level, scores and terminology. In 2021 among 6CEECs the Czech Republic had highest percentage of democracy (76) classified with Slovakia (72%) as 'consolidated democracy'. Poland (60%), Bulgaria (58%) and Romania (57%) were classified as 'semi-consolidated democracies' and Hungary (45%) was in the lower group of transitional or hybrid regime (Freedom House n.d., *Countries…*).

Freedom House also specialises in Freedom of the Press and Freedom of the Internet reports. However, particularly useful for observing changes in CEECs is the Nations in Transit report which deals with governance in the nations of the former Soviet Union and Eastern Europe (29 countries and territories in total). All of them whose combined average ratings for personal rights and civil liberties fell between 1.0 and 2.5 (or 3 since 2003 reports) were designated 'free'; between 3.0 (3.5 since 2003) and 5.5 (5 since 2003) 'partly free', and between 5.5 (5 since 2003) and 7.0 'not free' (Freedom House 2021). Graph 2 shows average score of both political rights and civil liberties taking into account the socialist, transition and contemporary periods of 6CEECs (results for the Czech Republic and Slovakia were standardised during the existence of Czechoslovakia until 1993).



Graph 2. Scores in Freedom House Index. Score: 1-to–7 rating scale. The lower score, the higher democracy and freedom

Source: Freedom House (n.d.).

As far back as in the 1970s 5CEECs had centrally planned economies with minimum existence of private property. Therefore, it is not surprising that Freedom House generally rated them as 'not free' although there were brief exceptions in the history of Poland or Hungary where both were classified as 'partly free' (due to greater civil liberties). In the late 1980s and early 1990s, all 5CEECs (since 1993 6CEECs) entered the path from the real socialism to democracy and market economy by introducing and implementing similar institutional reforms. In spite of these similarities, their level of success in democratisation and economic reform was different, but not significantly different, compared to the former USSR countries of Moldova, Belarus, Russia and Ukraine (Dzionek-Kozłowska and Matera 2021, p. 667). In 2020, after three decades of transition, Czechia and Slovakia were assessed best (with 1.0 score both in political rights and civil liberties), Poland, Bulgaria and Romania were still 'free' but with lower score 2.0. Hungary with 3.0 score was on the border between groups of 'free' and 'partly free' countries which meant in practice being also on the edge of the Narrow Corridor.

CEECs were together in the socialist bloc, but differed in the degree of freedom and democratisation, and so these differences (albeit in a different configuration of countries) can be seen in the third decade of twenty-first century. The smallest differences were in the period 2005–2015, where the spread was less than one point in the Freedom House assessment. When following the transformation period, Bulgaria and Romania were the fastest to shorten the distance to the top. The situation was most stable in Czechia and Slovakia. In turn, the biggest slump occurred in Hungary (since 2010 which is in line with János Kornai's and many other researchers' opinions: Bretter, 2016, pp. 39–40), and to a lesser extent in Poland (since 2015).

Discussion and conclusion

In the concept of A&R, governance matters and so too do social capital matters. Published independent indices by various institutions from various countries indicate the threats and progress of individual countries. These indices are not perfect, and their methodology differs. But their results are not fundamentally different from the 6CEECs' assessment. There are much smaller differences in the assessment of the quality of governance.

Much greater differences in the 6CEECs occur in the assessment of social capital, the controlling role of society over government activities. The low position in some rankings (especially Legatum) is puzzling. In the assessment of social activities supervising the government, the published indices can be supplemented by, for example, the number of nongovernmental organizations (both local and international). One can also point to long-term stimuli for changes and greater social awareness, such as the impact of education (using the traditional HDI). In the case of media activities, their limitation by the authorities, the ability to control the authorities, detailed measurements are presented

in the World Press Freedom Index. Eventually, direct social control of government actions can take place through social protests (not the same as registered strikes). Next to elections, this is the most direct pressure on the government. A protest does not necessarily pose a threat to a nascent democracy. Instead, it can, in certain situations, facilitate democratic consolidation. This happens when protest is used as a means to articulate demands for reform of the system, and not as a method of questioning the legitimacy of the regime. In a democracy, protest is accepted as a legitimate method of expressing public discontent or public dialogue with the authorities, especially when coordinated by legitimate organizations and expressed through widely accepted strategies (Eckstein and Gurr 1975, p. 452). From a historical perspective, this was also proved by North, Wallis, and Weingast (2009), stressing that politics has an impact on the quality of life, and some societies managed, as a result of protesting, opposition and even revolution, to adjust the direction of the policy of governments or new governments to expectations, or at least some part of expectations. On the other hand, North Wallis, and Weingast (2009) show that some societies have not succeeded in meeting any of these expectations.

The number of protests, their intensity, massiveness and even length is poorly measurable, few institutions register them, and even if they do, they do so part-time (Carnegie Endowment for International Peace n.d.). In the last five years, the number of protesters in the largest protests in Poland has exceeded 100,000 (in October 2016 Black Protest; July 2017 defence of the judiciary; November 2020 Women's Strike; October 2021 EU Membership support); in Czechia this figure is even around 200,000 (November 2019); Slovakia 65,000 (February–March 2018); in Hungary 100,000 (April 2018); in Romania as much as 600,000 (2017–2019), and in Bulgaria 400,000 (2020). I assume that these mass protests still help maintain all 6CEECs in the Narrow Corridor. In the case of CEECs, protests are a strong argument in favour of government control, but the evaluation of these protests and their consequences requires further detailed measurements, especially the impact on changing governments' decisions, for example, withdrawing from the law, calling new elections, etc.

The trend of 6CEECs ratings in several key categories – political stability, government effectiveness and especially rule of law from the mid-1990s to 2008 – was promising for the whole region (Kaufmann, Kraay, and Mastruzzi 2009, pp. 84–94). On the basis of detailed reports in the long-term, it should be assumed that entering the Narrow Corridor was a process, and accession to the EU was not the moment of joining it, but rather the crowning achievement of that process.

Where are we now? (see motto) Where are the 6CEECs now in the map of democracy? In the case of the 4CEECs (excluding Czechia and Slovakia), the tendency in the assessment of political stability, government effectiveness, and especially the rule of law, is decreasing or, according to other indices, level at most (but not increasing). Government actions led to an increase in civil resistance. This is often the only

way the government can act in a dishonest way. Fortunately, the tripartite division of power is still holding up (although shaking), and it happens that the results of local elections are in opposition to the parliamentary elections. Free or partly free media also exists, although they operate in a much more difficult environment than 10 or 20 years ago. Social mobilization both in the streets and in the media may therefore deter more radical actions by governments. In this context, Czechia and Slovakia may feel comfortable in the Narrow Corridor and run fairly evenly. Czechia, however, and especially Poland, have slowed down the pace, especially when it comes to the quality of governance. Hungary is hanging on to the borders of the Narrow Corridor with only one hand, Poland maybe with two (or one and a half). Romania and Bulgaria are trying to reach a higher level, but they are also running unevenly. It is therefore imperative for the entire group to stabilize the pace of both government action and that of society. Waiting for the next elections in each of the CEECs is a struggle to stay in the Narrow Corridor. After all, history from the interwar period may repeat itself. While in the 1920s, and especially in the 1930s, external factors contributed to the state of autocracy, the current crisis of democracy is mainly caused by internal politics. Back in 2015, it was difficult to predict that Europe's economic growth champion(s) (Piątkowski 2018) would suffer from democratic deficit.

Only two countries in the CEECs have had episodes of democracy and thus Shackled Leviathan in the interwar period. Poland had it for a very short time, Czechoslovakia for a slightly longer period, but both countries were prevented from entering the Narrow Corridor for a longer time. A renewed opportunity for the entire 6CEECs emerged in the 1990s after the collapse of communism and the centrally planned economy. The countries took advantage of this by following the path of international support through membership of the Council of Europe, NATO and eventually the EU. Unfortunately, in the second decade of the third millennium and especially in the second half of the second decade of the twenty-first century, there were visible difficulties in staying on track within the Narrow Corridor. The problems with the rule of law (Hungary, Poland) and greater political instability (Bulgaria, Romania) meant that for four out of the six CEECs being in the Narrow Corridor became strongly threatened. A&R did not give specific criteria for when a state falls out of this ideal space between the power of government and its control by society, but with the Democracy, Freedom and Rule of Law indices we can observe that in the absence of a trend reversal, the Shackled Leviathan can be replaced at any time by the Paper Leviathan or even by the Despotic Leviathan.

References

2008 Index of Economic Freedom (2008), https://www.heritage.org/index/pdf/2008/index2008_executivesummary.pdf (acccessed: 11.10.2021).

Acemoglu, D., Robinson, J.A. (2012), *Why Nations Fail. The Origins of Power, Prosperity and Poverty*, Crown Business, New York.

Acemoglu, D., Robinson, J.A. (2016), *Paths to Inclusive Political Institutions*, [in:] J. Eloranta, E. Golson, A. Markevich, N. Wolf (eds.), *Economic History of Warfare and State Formation*, Springer, Singapore, pp. 3–50, https://doi.org/10.1007/978-981-10-1605-9_1

Acemoglu, D., Robinson, J.A. (2019), *The Narrow Corridor. States, Societies and the Fate of Liberty*, Penguin Random House, London.

Austin, R.C. (2021), *A History of Central Europe. Nations and States Since 1848*, Palgrave Macmillan, Toronto, https://doi.org/10.1007/978-3-030-84543-8

Berend, T.I. (1996), *Central and Eastern Europe, 1944–1993. Detour from the Periphery to the Periphery*, Cambridge University Press, Cambridge, https://doi.org/10.1017/CBO9780511581748

Blanchard, O.J., Froot, K.A., Sachs, J.D. (1994), *The Transition in Eastern Europe*, University of Chicago Press, Chicago, https://doi.org/10.7208/chicago/9780226056814.001.0001

Boia, L. (2001), *Romania. Borderland of Europe*, Reaktion Books, London.

Brada, J.C. (1993), *The Transformation from Communism to Capitalism: How Far? How Fast?*, "Post Soviet Affairs", 9 (2), pp. 87–110, https://doi.org/10.1080/1060586X.1993.10641361

Bretter, Z. (2016), *The Name of the Game: The Regime of National Collaboration*, [in:] Z. Bretter, Z. Vörös, A. Schmidt, A. Bagieńska-Masiota, *Hungary and Poland in Times of Political Transition. Selected Issues*, Faculty of Political Science and Journalism Adam Mickiewicz University, Poznań, pp. 39–55.

Carnegie Endowment for International Peace (n.d.), *Global Protest Tracker*, https://carnegieendowment.org/publications/interactive/protest-tracker (accessed: 20.12.2021).

Council of Europe (n.d.), *Our member States*, https://www.coe.int/en/web/about-us/our-member-states (accessed: 20.12.2021).

Courtois, S., Werth, N., Panné, J.-L., Paczkowski, A., Bartošek, K., Margolin. J.-L. (1999), *The Black Book of Communism. Crimes, Terror, Repression*, Harvard University Press, Cambridge–London.

Crampton, R.J. (2005), *A Concise History of Bulgaria*, Cambridge University Press, New York, https://doi.org/10.1017/CBO9780511996870

David, P. (1985), *Clio and the Economics of QWERTY*, "The American Economic Review", 75 (2), pp. 332–337.

Dzionek-Kozłowska, J., Matera, R. (2015), *New Institutional Economics Perspective on Wealth and Poverty of Nations. Concise Review and General Remarks on Acemoglu and Robinson's Concept*, "Scientific Annals of the 'Alexandru Ioan Cuza' University of Iasi: Economic Sciences", 62, pp. 11–18.

Dzionek-Kozłowska, J., Matera, R. (2020), *Which Institutions Are Really Needed to Reach Wealth? A Clarification of Acemoglu and Robinson's Concept*, "Historyka. Studia Metodologiczne", 50, pp. 377–395.

Dzionek-Kozłowska, J., Matera, R. (2021), *Institutions without Culture: On Daron Acemoglu and James Robinson's Theory of Economic Development*, "Journal of Economic Issues", 55 (3), pp. 656–676, https://doi.org/10.1080/00213624.2021.1945885

Eckstein, H., Gurr, R.T. (1975), *Patterns of Authority: A Structural Basis for Political Inquiry*, Wiley, New York.

EUR-Lex (2007), *Rozszerzenie 2004: podjęte wyzwanie – UE 25*, https://eur-lex.europa.eu/legal-content/PL/TXT/?uri=LEGISSUM%3Ae50017 (accessed: 20.12.2021).

Fragile States Index (2020), *Global Data (2020)*, https://fragilestatesindex.org/data/ (accessed: 15.01.2022).

Freedom House (2021), *Country and Territory Ratings and Statuses*, 1973–2021, Database, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiw-fqs-ja_4AhWKz4sKHSWaBsYQFnoECAUQAQ&url=https%3A%2F%2Ffreedomhouse.org%2Fsites%2Fdefault%2Ffiles%2F2021-02%2FCountry_and_Territory_Ratings_and_Statuses_FIW1973-2021.xlsx&usg=AOvVaw0WHvGBxSi7UckPWBYiAN1E (accessed: 15.01.2022).

Freedom House (n.d.), *Countries and Territories*, https://freedomhouse.org/countries/nations-transit/scores (accessed: 15.01.2022).

Freedom House (n.d.), https://freedomhouse.org (accessed: 15.01.2022).

Henry, M. (2014), *From Communism to Capitalism. Theory of Catastrophe*, Bloomsbury Publishing, London–New York.

Hitchins, K. (2014), *A Concise History of Romania*, Cambridge University Press, New York, https://doi.org/10.1017/CBO9781139033954

Hobbes, T. (2020), *Leviathan, Mint Editions*, West Margin Press, Berkeley.

Ilonszki, G., Dudzińska, A. (2021), *Opposition behaviour against the Third Wave of Autocratization: Hungary and Poland Compared*, "European Political Science", 20, pp. 603–616, https://doi.org/10.1057/s41304-021-00325-x

Janos, A.C. (1982), *The Politics of Backwardness in Hungary, 1825–1945*, Princeton University Press, New Jersey.

Judson, P.M. (2016), *The Habsburg Empire. A New History*, The Belknap, Press of Harvard University Press, Cambridge, https://doi.org/10.4159/9780674969346

Kaczmarczyk-Kłak, K. (2018), *System rządów w Polsce w latach 1918–1922*, „Studia Prawnicze KUL", 1 (73), pp. 57–80, https://doi.org/10.31743/sp.633

Kalecki, M. (1993), *Collected Works*, vol. IV, Clarendon Press, Oxford.

Kaufmann, D., Kraay, A., Mastruzzi, M. (2009), *Governance Matters VIII . Aggregate and Individual Governance Indicators 1996–2008*, "Policy Research Working Paper", No. 4978, World Bank, https://doi.org/10.1596/1813-9450-4978

Kopeček, M. (2019), *Czechoslovak Interwar Democracy and Its Critical Introspections*, "Journal of Modern European History", 17 (1), pp. 7–15, https://journals.sagepub.com/doi/10.1177/1611894418820217 (accessed: 11.10.2021).

Kornai, J. (1992), *The Socialist System. The Political Economy of Communism*, Oxford University Press, Clarendon Press, New York, https://doi.org/10.1515/9780691228020

Koryś, P. (2018), *Poland from Partitions to EU Accession. A Modern Economic History, 1772–2004*, Palgrave Macmillan, Cham, https://doi.org/10.1007/978-3-319-97126-1

Lange, O. (1962), *Problems of Political Economy of Socialism*, People's Publishing House, New Delhi.

Legatum Institute for Global Development (2007), *The 2007 Legatum Prosperity Index. A Global Assessment of Wealth and Wellbeing*, https://www.prosperity.com/download_file/view_inline/2855 (acccessed: 15.06.2022).

Legatum Institute for Global Development (2015), *The Legatum Prosperity Index*, https://www.prosperity.com/download_file/view_inline/2833 (acccessed: 15.06.2022).

Legatum Institute for Global Development (2016), *The Legatum Prosperity Index*, https://www.prosperity.com/download_file/view_inline/2884 (acccessed: 15.06.2022).

Legatum Institute for Global Development (2017), *The Legatum Prosperity Index*, https://li.com/wp-content/uploads/2019/03/pdf55f152ff15736886a8b2ff00001f4427.pdf (acccessed: 15.06.2022).

Legatum Institute for Global Development (2018), *2018 Legatum Prosperity Index*, https://li.com/reports/2018-legatum-prosperity-index/ (acccessed: 15.06.2022).

Legatum Institute for Global Development (2019), *2019 Legatum Prosperity Index*, https://li.com/reports/2019-legatum-prosperity-index/ (acccessed: 15.06.2022).

Legatum Institute for Global Development (2020), *The Legatum Prosperity Index. A tool for transformation*, https://docs.prosperity.com/2916/0568/0539/The_Legatum_Prosperity_Index_2020.pdf (acccessed: 15.06.2022).

Maerz, S.F., Luhrmann, A., Hellmeier, S., Grahn, S., Lindberg, S.I. (2020), *State of the World 2019: Autocratization Surges – Resistance Grows*, "Democratization", 27 (6), pp. 909–927, https://doi.org/10.1080/13510347.2020.1758670

McElroy, B. (2021), *Book Review: The narrow corridor: States, societies, and the fate of liberty, Acemoglu, Daron and Robinson, James A., Penguin, New York, NY 2020. 576 pp. $20.00 (paper)*, "Governance. An International Journal of Policy, Administration, and Institutions", 34 (2), pp. 592–594, https://doi.org/10.1111/gove.12585

Miller, T., Kim, A.B. (2015), *2015 Index of Economic Freedom. Promoting Economic Opportunity and Prosperity*, The Heritage Foundation, https://www.heritage.org/index/pdf/2015/book/highlights.pdf (acccessed: 11.10.2021).

Miller, T., Kim, A.B., Roberts, J.M., Tyrrell, P. (2020), *Highlights of the 2020 Index of Economic Freedom*, The Heritage Foundation, https://www.heritage.org/index/pdf/2020/book/2020_IndexofEconomicFreedom_Highlights.pdf (acccessed: 11.10.2021).

Molnar, M. (2001), *Concise History of Hungary*, Cambridge University Press, New York.

NATO (2022), *Member countries*, https://www.nato.int/cps/en/natolive/topics_52044.htm (accessed: 15.04.2022).

North, D.C., Wallis, J.J., Weingast, B.R. (2009), *Violence and Social Orders. A Conceptual Framework for Interpreting Recorded Human History*, Cambridge University Press, Cambridge, https://doi.org/10.1017/CBO9780511575839

Pacześniak, A. (2014), *Promocja demokracji i praworządności*, [in:] A. Florczak, A. Lisowska, (eds.) *Organizacje międzynarodowe w działaniu*, Agencja Reklamowa OTO, Wrocław, pp. 227–243.

Petrova, T., Pospieszna, P. (2021), *Democracy Promotion in Times of Autocratization: The Case of Poland, 1989–2019*, "Post-Soviet Affairs", 37 (6), pp. 526–543, https://doi.org/10.1080/1060586X.2021.1975443

Piątkowski, M. (2018), *Europe's Growth Champion. Insights from the Economic Rise of Poland*, Oxford University Press, New York.

POLVAL1 (n.d.), *The Elections to the Polish Parliament (Sejm) 1919–1947*, https://web.archive.org/web/20110720181318/http://www.elisanet.fi/daglarsson/dokumentit/polval1.htm#26.1.1919 (accessed: 15.06.2022).

Puffert, D.J. (2002), *Path Dependence in Spatial Networks: The Standarization of Railway Track Gauge*, "Explorations in Economic History", 39 (3), pp. 282–314, https://doi.org/10.1006/exeh.2002.0786

Ramet, S.P. (ed.) (2020), *Interwar East Central Europe, 1918–1941. The Failure of Democracy-building, the Fate of Minorities*, Routledge, New York, https://doi.org/10.4324/9780429027222

Rummel, R. (1994), *Death by Government*, Transaction Publishers, New Brunswick.

Sachs, J. (1993), *Poland's Jump to the Market Economy*, MIT Press, Cambridge, https://doi.org/10.7551/mitpress/5430.001.0001

Schweickert, R., Ahlborn, M., Frank, K., Orosz, Á., Sikulová, I., Szanyi, M. (2013), *Large-Scale Transformation of Socio-Economic Institutions – Comparative Case Studies on CEECs. Interim Report*, "Working Paper", No. 16, European Commisssion.

Skodlarski, J. (2012), *Historia gospodarcza*, Wydawnictwo Naukowe PWN, Warszawa.

Szczepański, J., Kalina, P. (2019), *The Road to Autocratization? Redefining Democracy in Poland*, "Studia Europejskie", 23 (3), pp. 121–132.

The Economist Intelligence Unit (2015), *Democracy Index 2015. Democracy in an age of anxiety*, https://www.yabiladi.com/img/content/EIU-Democracy-Index-2015.pdf (accessed: 11.10.2021).

The Economist Intelligence Unit (2020), *Democracy Index 2020. In sickness and in health?*, https://pages.eiu.com/rs/753-RIQ-438/images/democracy-index-2020.pdf (accessed: 11.10.2021).

The World in 2007. Democracy Index (2007), https://www.economist.com/media/pdf/DEMOCRACY_TABLE_2007_v3.pdf (accessed: 11.10.2021).

V-Dem Institute (2021), *Autocratization Turns Viral. Democray Report 2021*, https://www.v-dem.net/static/website/files/dr/dr_2021.pdf (acccessed: 15.06.2022).

Valentino, B. (2004), *Final Solutions: Mass Killing and Genocide in the 20th Century*, Cornell University Press, Ithaca.

Vásquez, I., McMahon, F. (2020), *The Human Freedom Index 2020. A Global Measurement of Personal, Civil, and Economic Freedom*, Cato Institute and the Fraser Institute, Washington–Vancouver, https://www.cato.org/sites/cato.org/files/2021-03/human-freedom-index-2020.pdf (accessed: 11.10.2021).

Wikipedia (n.d.), *1920 Hungarian parliamentary election*, https://en.wikipedia.org/wiki/1920_Hungarian_parliamentary_election (accessed: 15.01.2022).

Wikipedia (n.d.), *Category: Parliamentary elections in Bulgaria*, https://en.wikipedia.org/wiki/Category:Parliamentary_elections_in_Bulgaria (accessed: 15.01.2022).

Wikipedia (n.d.), *Democracy Index*, https://en.wikipedia.org/wiki/Democracy_Index (accessed: 15.04.2022).

Wikipedia (n.d.), *Elections in Czechoslovakia*, https://en.wikipedia.org/wiki/Elections_in_Czechoslovakia (accessed: 15.01.2022).

Wikipedia (n.d.), *Elections in Romania*, https://en.wikipedia.org/wiki/Elections_in_Romania (accessed: 15.01.2022).

Wikipedia (n.d.), *Wybory parlamentarne w II Rzeczypospolitej*, https://pl.wikipedia.org/wiki/Wybory_parlamentarne_w_II_Rzeczypospolitej (accessed: 15.01.2022).

World Justice Project (2015), *WJP Rule of Law Index 2015 Report*, https://worldjusticeproject.org/our-work/publications/rule-law-index-reports/wjp-rule-law-index-2015-report (accessed: 15.04.2022).

World Justice Project (2020), *World Justice Project Rule of Law Index® 2020*, https://worldjusticeproject.org/sites/default/files/documents/WJP-ROLI-2020-Online_0.pdf (acccessed: 15.04.2022).

Wykorzystanie koncepcji Acemoglu i Robinsona do oceny Lewiatanów w krajach Europy Środkowo-Wschodniej w długim okresie

Celem artykułu było wykorzystanie następujących pojęć z koncepcji Darona Acemoglu i Jamesa Robinsona: despotyczny, realny, papierowy i poskromiony Lewiatan, do oceny stanu demokracji, siły rządów i mobilizacji społecznej w Europie Środkowo-Wschodniej w długim okresie. W badaniu uwzględniono: Polskę, Czechy, Słowację (przed 1993 r. Czechosłowację), Węgry, Rumunię i Bułgarię. Na podstawie analizy historycznej wyodrębniono typy Lewiatanów w okresie międzywojennym, w czasach komunizmu i transformacji. W najnowszym okresie (XXI wiek) wykorzystano do tego osiem indeksów demokracji i wolności, które mierzą i oceniają jakość rządzenia, stan instytucji i potencjał kapitału społecznego w sześciu krajach Europy Środkowo-Wschodniej. Sprawdzono przydatność tych indeksów do oceny, czy i kiedy danemu krajowi udało się poskromić Lewiatana.

Słowa kluczowe: kraje Europy Środkowo-Wschodniej, koncepcje Acemoglu i Robinsona, typy Lewiatanów, Lewiatan poskromiony, wąski korytarz

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.23

Similarity and Granger Causality in Polish and Spanish Stock Market Sectors During the COVID–19 Pandemic

Dorota Żebrowska-Suchodolska https://orcid.org/0000-0003-1230-6413
Ph.D., Warsaw University of Life Sciences – SGGW, Warsaw, Poland
e-mail: dorota_zebrowska_suchodolska@sggw.edu.pl

Iwona Piekunko-Mantiuk https://orcid.org/0000-0003-1973-0700
Ph.D., Bialystok University of Technology, Kleosin, Poland, e-mail: i.piekunko@pb.edu.pl

Abstract

Capital markets react almost immediately to crises. Such relationships can be both international and local. The research focuses on the stock markets of two countries: Spain and Poland. These countries are often compared in terms of various economic and social criteria. The research covers the period from March 3, 2019, to March 31, 2021. The aim is to identify sectors and indices similar to each other at the local level and to identify, among pairs of similar indices, those that provide a boost to another sector. The research uses the hierarchical cluster analysis method (Ward's method) and the Granger causality test. This work presents a novel approach to sectoral comparison at the local level.

Keywords: coronavirus, economic sectors, financial volatility, similarity

JEL: C32, C38, G01, G14

Received: 23.01.2022. Verified: 19.05.2022. Accepted: 7.06.2022

Introduction

Situations related to economic crises are a frequent topic of research in the literature. The penultimate crisis, which took place between 2007 and 2009, was largely caused by the turbulence of the US economy. Since March 2020, the global economy has been facing a new crisis that was triggered by a completely different, non-financial determinant, i.e. the SARS-Cov–2 virus, which causes the extremely infectious COVID–19 disease.

Financial markets, especially currency and capital markets, react to crises almost immediately, discounting the future economic and social consequences of changes in the environment (Pražák and Stavárek 2017, pp. 7–9; Pera 2019, pp. 124–125; Šimáková and Ruskova 2019, p. 119). Capital markets, as connected vessels, are particularly interdependent during crises (Syllignakis and Kouretas 2011, pp. 719–729). These dependencies may be inter- or intraregional (Gębka and Serwa 2007, p. 203). An interesting study in this context was presented by Akhtaruzzaman, Boubaker, and Sensoy (2021, p. 16), who, examining the interdependence of China and G7 countries, showed that Chinese and Japanese financial and non-financial firms are net transmitters of the spread of returns and volatility to other G7 countries during the COVID–19 period, indicating that financial contagion follows the same path as COVID–19.

Just a few months after the outbreak of the pandemic, numerous studies appeared in the literature on this period. It became clear to everyone that the consequences of the new pathogen would be felt not only in the area of medicine and public safety, but also in social and economic life. In terms of capital markets, research has focused primarily on the reactions of stock market indices to information on the number of cases of the disease (Ashraf 2020; Harjoto et al. 2020; Heyden and Heyden 2021) or increased stock market volatility (Ali, Alam, and Rizvi 2020; Baek, Mohanty, and Glambosky 2020; Onali 2020; Ramelli and Wagner 2020; Souza de Souza and Augusto 2020; Zaremba et al. 2020; Adnan and Hasan 2021; Albulescu 2021; Mazur, Dang, and Vega 2021; Narayan, Gong, and Ali Ahmed 2021). They often cover short series, which may not always reliably verify hypotheses. Moreover, studies focus on entire markets represented by major stock indices showing aggregate values (Żebrowska-Suchodolska, Karpio, and Kompa 2021). Such a study assumes homogeneous effects on sectoral performance, meaning that COVID–19 has the same effect on all sectors. Narayan and Sharma (2011, p. 3262) argued that sectors are heterogeneous and, therefore, likely to respond differently to market shocks. Since little attention has been paid in the literature to individual market sectors, their similarities, or causality, there is a need to address this issue more broadly. The paper fills a research gap in the context of a sectoral comparison of the stock markets of Poland and Spain during the pandemic.

Poland and Spain are often compared on various economic and social criteria. Both countries are among the largest countries in the European Union – Spain is the fourth

and Poland the fifth-largest economy in the EU – and they are classified as developed markets. However, the way stock trading is organised, as well as the size of the markets, are markedly different. In Spain, assets are traded on four regional stock exchanges, with the Bolsa de Madrid being the largest. At the end of 2020, a total of 2738 companies were listed on the Spanish market, while the total capitalisation amounted to USD 797.3 billion, which was 4.8% lower than the previous year (World Federation of Exchanges). Meanwhile, trading of assets in Poland takes place on a single exchange, the Warsaw Stock Exchange. At the end of 2020, the total number of companies listed on the Polish market was more than three times lower than on Spanish exchanges, at 806. However, capitalisation increased by 17.1%, reaching USD 177.5 billion at the end of 2020 (World Federation of Exchanges).

Despite this large divergence in market size, the MSCI country indices (Morgan Stanley Capital International Indices, the oldest and most widely used stock market index by portfolio investors) for the two markets have recently shown significant similarity (Figure 1).

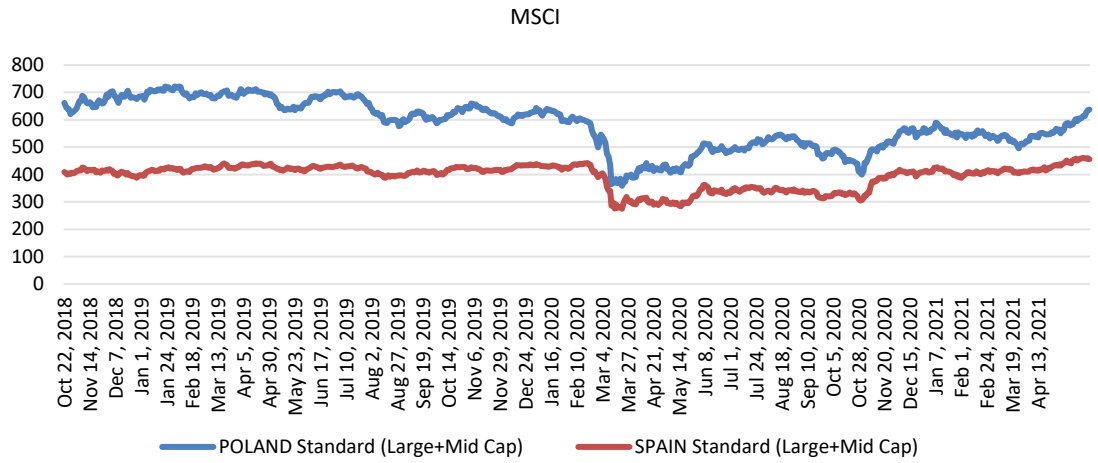


Figure 1. MSCI Poland and MSCI Spain indices

Source: based on MSCI Indexes (n.d.).

MSCI indices are often a benchmark of investment portfolio composition for global and regional investors, and especially for investment funds. We have therefore compared the returns of national MSCI indices calculated for European stock exchanges over the one-year period following the announcement of the COVID–19 pandemic by the World Health Organisation (WHO) (Table 1). This comparison gave a very different picture of the market from what was observed at the very beginning of the pandemic (March 2020). Only 1 of the 28 indices generated a negative return, and the vast majority gave a higher return than before the outbreak.

Table 1. Annual return of the MSCI European stock exchange indices (11.03.2020–11.03.2021)

Rank	Country	Price return (%)	Rank	Country	Price return (%)
1	SWEDEN	64.08	15	SPAIN	23.38
2	NETHERLANDS	58.28	16	PORTUGAL	22.27
3	AUSTRIA	54.87	17	UNITED KINGDOM	22.10
4	NORWAY	51.71	18	CROATIA	21.46
5	IRELAND	49.46	19	CZECH REPUBLIC	21.05
6	DENMARK	49.06	20	BELGIUM	19.31
7	FINLAND	43.76	21	SWITZERLAND	18.62
8	GERMANY	41.99	22	LITHUANIA	17.99
9	ITALY	38.46	23	HUNGARY	15.32
10	SLOVENIA	38.03	24	GREECE	10.32
11	FRANCE	37.93	25	BULGARIA	7.41
12	ROMANIA	27.85	26	BOSNIA AND HERZEGOVINA	5.41
13	UKRAINE	27.12	27	TURKEY	2.74
14	POLAND	24.67	28	ESTONIA	–6.71

Source: calculations based on MSCI (n.d.).

Poland and Spain were ranked 14th and 15th in this comparison, respectively, achieving similar rates of return despite having radically different epidemiological and economic conditions. Poland was one of the countries that coped best with the spread of the pandemic in the initial period, while Spain was one of the countries worst affected, especially in the first and second waves. The first case of COVID–19 infection in Spain was recorded on 1.02.2020, and at the beginning of March, the number of infected exceeded 100. On 28.03.2020, it already exceeded 100,000. One day later, the total number of deaths exceeded 5 thousand. For comparison, in Poland, on 26.03.2020, the total number of infections exceeded 1000, and on 7.04.2020, the total number of deaths exceeded 100 (Phan and Narayan 2020, pp. 2141–2142). By March 15 2021, more than 3.2 million cases had been reported in Spain, with just over 2 million in Poland (World Health Organization n.d.).

Given these differences and similarities, the subject of this research is the market sectors of the Spanish and Polish stock exchanges. The research covers the period from March 3, 2019, to March 31, 2021. The objective of the research is to identify sectors and indices similar to each other at the local level and to identify, among pairs of similar indices, those that provide a boost to another sector. The research used the hierarchical cluster analysis method (Ward's method) and the Granger causality test.

Stock markets during the COVID–19 pandemic

When COVID–19 was spreading in China (as of 17.11.2019), becoming a growing problem not only for the province of Hubei, where it appeared, but for a growing area of China, the reactions of the capital markets did not foreshadow such serious consequences. However, with each passing month, the public health situation worsened, with negative economic and social consequences. This culminated in March 2020, when the World Health Organization (11.03.2020) declared a global pandemic (World Health Organization 2020), thus causing an unprecedented shock to global financial markets. As demonstrated by Baker et al. (2020, pp. 744–746), no previous infectious disease pandemic has affected stock markets as much as COVID–19. The Dow Jones Industrial Average (DJIA) index fell by 6400 points in just four trading days, the equivalent of about 26%. By comparison, the DJIA fell 24.5% on 28–29 October 1929 and 22.6% on October 19 1987 (Mazur, Dang, and Vega 2021, pp. 1, 3).

The study by Nguyen shows that the COVID–19 pandemic negatively affected stock markets around the world, although the onset varied across countries. The first signs of significant volatility in Asia appeared just before the end of December 2019, when rumours of a strange disease started to emerge. Next, right at the beginning of 2020, stock markets in Europe experienced a slowdown, but large declines appeared starting from week 7 of 2020. In the US and Canadian stock markets, there was no volatility until week 8. From February 24, the situation began to change dramatically. Stock markets entered another phase, called by some the fever phase (Ramelli and Wagner 2020, p. 662; Wagner 2020, p. 440). In the US, in the month between February 24 and March 24, there were 18 price spikes (±2.5%) during 22 trading days – more than ever before in history. The frequency of such price spikes was 20 times higher than the average since 1900, and, it should be noted, the large daily movements in stock prices were bidirectional (Baker et al. 2020, p. 746).

The Chicago Board Option Exchange Volatility Index (known as the VIX), often referred to as the "fear index", showed a significant increase. Compared to previous high-risk cases, such as the September 11, 2001, terrorist attack (41.75), the 2008 global financial crisis (46.72), the 2011 US debt crisis (48) or the 2018 US-China trade conflict, COVID–19 with a VIX score of 84.57 is seen as a critical challenge for capital markets (Nguyen 2020). "Coronavirus has emerged as a bane for the financial markets with unexpected levels of uncertainty and high volatility. Within 100 days, nearly 30% of wealth has eroded off the bourses globally" (Ali, Alam, and Rizvi 2020, p. 6).

As shown by Zaremba et al. (2020, p. 2), conducted on data from 67 countries, the increase in volatility is not only the result of factors directly related to the pandemic, but also policy responses to COVID–19. Government interventions significantly and decisively increase volatility in international equity markets. Similar conclusions were

reached by Aharon and Siev (2021), who studied emerging markets. Heyden and Heyden (2021) demonstrated that only the first information about the number of deaths negatively impacted equity markets, and that policy responses (isolation, travel bans, stimulus packages) did not calm equity markets. Instead, they worsened the situation by fuelling investor uncertainty and increasing volatility. Interventions, particularly closures, disrupt economic activity, which is reflected in negative returns in financial capital markets. Most of these interventions appear to be associated with the creation of additional economic uncertainty (Aharon and Siev 2021).

The COVID–19 pandemic and related policy responses triggered a historically large wave of capital reallocations between markets toward safe assets, amplifying volatility (ElFayoumi and Hengge 2020, p. A1: 3). During the initial phase of the pandemic (Q1 2020), investors' herding behaviour was evident in international equity markets, amplifying uncertainty (Kizys, Tzouvanas, and Donadelli 2021, p. 9). In the current world, market sentiment in response to an outbreak can be quickly amplified through social media, which then stimulates trading activity and causes extreme price movements (Zhang, Hu, and Ji 2020, p. 2). As demonstrated by Liu et al. (2020, p. 4), investor sentiment is a transmission channel for the impact of the COVID–19 outbreak on stock markets.

The Spanish economy has been hit hard by the pandemic. From the beginning of January 2020 to March 16, 2020, the main index of the Spanish stock exchange (IBEX35) lost nearly 37%, with drops of more than 14% on the day after the WHO announced the pandemic (March 12, 2020) and nearly 8% on the day after the lockdown was introduced (March 16, 2020). The service sector, subject to the greatest government restrictions, suffered the most. On March 12, 16 and 23, the sector index fell –14.84, –18.23, and –12.67%, respectively (based on Refinitiv data). In the second quarter of 2020, Spain's GDP contracted by 18.5%, and the unemployment rate rose to 15.5% (Henríquez et al. 2020). Since then, the situation has slowly started to improve.

The situation was different in Poland, where the pandemic was just beginning to spread. Nevertheless, stock market reactions were similar. Between the beginning of January and March 16, 2020, the main index (WIG20) lost over 31%, and the worst day was also the day after the pandemic was announced (down 13.28%). At the same time, the broad market index (WIG) lost 36% (World Federation of Exchanges 2021). In the second quarter, Poland's GDP contracted by 8.2% (GUS 2020a), and the unemployment rate was 3% (GUS 2020b). Here, too, the situation began to improve.

Research data and methodology

The research for the Spanish stock exchange covered the following sectors: petrol and power, basic material industry and construction, consumer foods, consumer services, financial services and real estate, and technology and telecommunications. The data were comprehensive, i.e. they included listings for sectors that included companies from the Madrid, Barcelona, Bilbao and Valencia stock exchanges.

In order to compare the results, the following sectors of the Warsaw Stock Exchange were taken into account in the research: energy, mining, fuels, construction, chemicals, food, clothing, automotive, pharmaceuticals, media, games, banks, telecommunications, IT, and real estate. Abbreviations for sectors and indices of particular stock exchanges were also introduced (Table 2).

Table 2. Introduced assays for testing

Index/sub-index Spanish Stock Exchange	Designation	Index/sub-index Polish Stock Exchange	Designation
petrol	H1	energy	P1
materials	H2	mining	P2
goods	H3	oil & gas	P3
services	H4	construction	P4
financial	H5	chemicals	P5
technology	H6	food	P6
IBEX	H7	clothes	P7
		moto	P8
		medicine	P9
		media	P10
		games	P11
		banks	P12
		telecommunications	P13
		IT	P14
		developers	P15
		WIG	P16

Source: own study.

The data concerned daily closing prices for the period 3.03.2019–31.03.2021. The whole period was divided into two sub-periods, where the date of the division was the lowest value of the closing price of the main stock exchange indices. In this way, periods

of similar length were adopted for the study. Furthermore, quotations of the IBEX35 and WIG indices were adopted for the research. Both indices are seen as images of the condition of individual stock exchanges. They gave a picture related to the situation on the Spanish and Polish markets. They were also the basis for setting the split date for the sectoral indices. For the Spanish stock exchange, the split date was March 16, 2020, and for the Warsaw stock exchange, it was March 12, 2020.

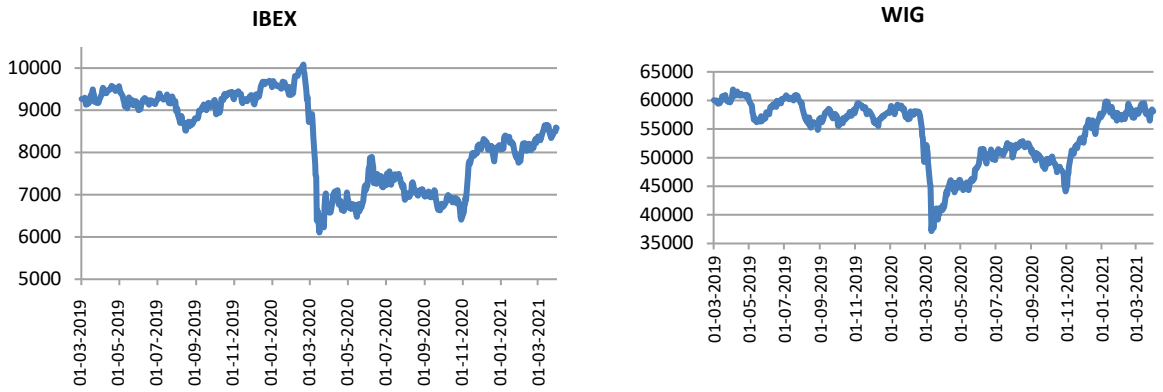


Figure 2. Quotations of the IBEX35 and WIG indices

Source: own study.

The research was conducted within each stock exchange separately and consisted of several stages. The first stage involved determining basic descriptive statistics for the index and stock sub-indices. They gave the basic knowledge about the behaviour of quotations in individual periods separately for each stock exchange. Characteristics such as mean, median, standard deviation, skewness and kurtosis, and rate of return (in %) were determined here.

The second step was to find sectors and indices that were similar in terms of price performance and volatility. However, due to the differences in scales between the sectors or between a sector and a country's market index, it became impossible to compare the indices among themselves. Therefore, a normalization transformation of the form had to be applied:

$$z_{ij} = \frac{p_{ij} - \min\limits_{i} p_{ij}}{R_j} \tag{1}$$

where p_{ij} is the value of the j-th variable for object i; $\min\limits_{i} p_{ij}$ $(i = 1,2,\ldots,n)$ is the smallest value of the j-th variable; R_j is the range of the j-th variable; $j = 1,2,\ldots,m$.

The chosen unitisation transformation brought the quotations of the indices down to a spread of 1, but left proportional variation in the quotations of the stock indices

in terms of standard deviation. This is particularly important for further research on determining similar groups in terms of volatility.

For the data of each sector in each sub-period after the unitisation transformation, the mean and standard deviation were determined. The variables would not be correlated with each other, which allowed us to proceed to the cluster analysis. Ward's method (Ward 1963) was used to find industries and indices similar to each other. It is a hierarchical method that groups objects into homogeneous clusters characterised by minimum variance. Its implementation starts by marking an index treated as an object as a one-element cluster. Then, by determining the distances between the clusters, objects are combined to form a new two-element cluster. Next, a new distance matrix is determined, in which the distances of objects from the resulting cluster are calculated according to the adopted binding rule. In Ward's method, the binding involves minimising the sum of squares of deviations inside the clusters. The procedure is continued until all objects are collected in one cluster. The distance in Ward's method is understood as the Euclidean distance. The cut-off point was determined using a graph showing the distances between clusters at the moment they merge. The visible flattening gave information about the distant clusters and thus about the corresponding cut-off point.

Finding industries and indices similar to each other allows us to proceed to step three. For pairwise similar industries and indices, one-way dependence was examined using the Granger causality test. It aims to identify the indices that cause changes in the indices from a given pair taken for the study.

This step started by determining the daily logarithmic rate of return according to the formula:

$$r_t = \ln \frac{p_t}{p_{t-1}} \tag{2}$$

where p_t, p_{t-1} – quotations of indices at time t and t–1.

The stage of testing unidirectional dependencies is preceded by the test of non-stationarity of the series of returns, as such an assumption is required in the Granger causality test. The Dickey-Fuller test (ADF) was used here, in which the null hypothesis of non-stationarity of thse tested series is put forward against the alternative hypothesis of its stationarity (Dickey and Fuller 1979; 1981).

The starting point is the following equations (Granger 1981):

$$y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_i y_{t-i} + \varepsilon_t \tag{3}$$

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i y_{t-i} + \sum_{i=1}^{k} \gamma_i x_{t-i} + \eta_t \tag{4}$$

where y_t, x_t – time series representing the realisation of stationary stochastic processes; α_0, α_i, β_0, β_i, γ_i for $i = 1,2,\ldots,k$ – structural coefficients of both models estimated by the classical least squares method; ε_t i η_t – random components; k – order of delays.

Since the dependence is examined here unidirectionally, lagged variables x_t and y_t are taken as explanatory variables in the models. In order to ascertain the effect of variable x_t on y_t, the coefficients γ_i are tested, posing the null hypothesis regarding the variance of the random components that $H_0 : \sigma^2(\varepsilon_t) = \sigma^2(\eta_t)$, against the alternative hypothesis that $H_0 : \sigma^2(\varepsilon_t) \neq \sigma^2(\eta_t)$.

The Wald version of the test statistic is of the form:

$$G = \frac{N\left(S^2(\varepsilon_t) - S^2(\eta_t)\right)}{S^2(\varepsilon_t)} \tag{5}$$

where $S^2(\varepsilon_t)$, $S^2(\eta_t)$ – estimators of respective residual components in (3) and (4); N – sample size.

The value of Ward's version statistic is compared with the critical value of the $\chi^2(k)$ distribution, where k is the lag order of the y and x variables. The research was conducted at significance levels of 0.1, 0.05 and 0.01 and lag row k = 5.

The research based on the methods mentioned above will verify the following research hypotheses:

H_1: There is a similarity between industries (H1 and H3), (H4 and H5) for the Spanish stock market.

H_2: The fuel sector is driving changes in the food sector, and the financial sector is driving changes in the services sector for the Spanish stock exchange.

H_3: There is a similarity between sectors P11 and P14 for the Warsaw Stock Exchange.

H_4: In the second sub-period, there is less correlation between sectors.

Empirical results

The successive stages described in Chapter 3 will help realize the research objective and verify the research hypotheses.

The first stage is implemented by descriptive statistics for price quotations of the IBEX35 index and individual sectors of the Spanish stock exchange. When comparing the basic characteristics of the index quotations in both periods, it is possible to see both lower average and median values in period two. After a sharp decline, sectors were unable to catch up despite the upward trend. Volatility, as measured by standard deviation, outside the sectors of industry and construction and technology and telecommunications was higher in period two.

For the Warsaw Stock Exchange, the situation is slightly different. In the second period, there are sectors for which the average and median values are higher than in the first period: construction, chemicals, moto, games, and IT. Except for the chemical industry, these sectors, which were in an upward trend in period one after a sharp downturn, achieved higher results than in period one. In these cases, the pandemic period did not harm these industries, and one might be tempted to say that these industries benefited from the pandemic.

In the next step, the variables were unitised, and Ward's method was applied, taking into account the mean and standard deviation of the indices. As a result, the clusters shown in Figures 3 and 4 were distinguished for the Spanish stock exchange.

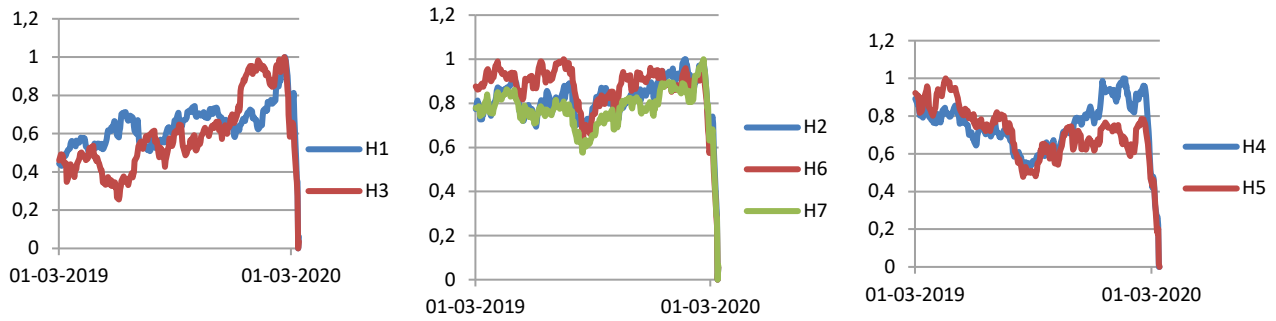


Figure 3. Clusters in the 1st sub-period for the Spanish stock exchange

Source: own study.

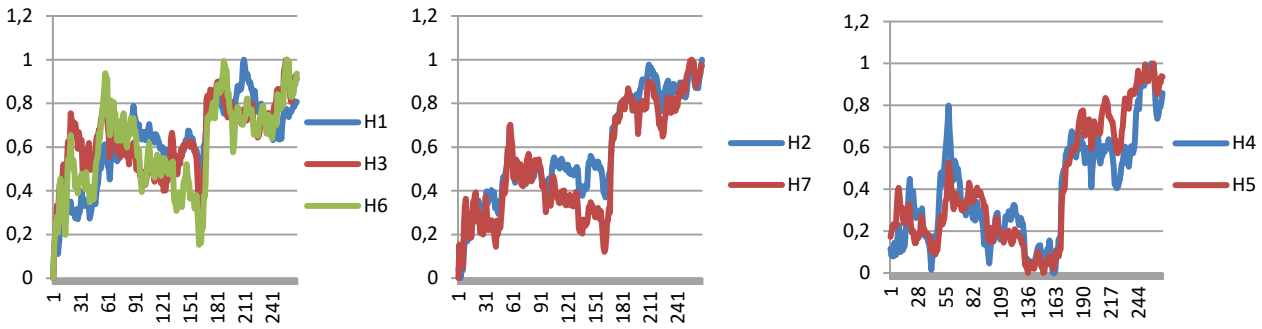


Figure 4. Clusters in the second sub-period for the Spanish stock exchange

Source: own study.

Cluster one included the energy and fuel industries, which were in an upward trend during period one. Cluster two included industry and construction, technology and telecommunications and the IBEX35 index. These sectors thus largely influenced the quotations of the IBEX25 index itself. Cluster three, which included the financial and consumer services industries, was in a downtrend in period one.

In sub-period two, the technology and telecommunications sector moved from cluster two to cluster one. Focus three remained identical. Thus, in both sub-periods, one may notice the similarity of the same sectors.

A similar procedure was carried out for the Polish stock exchange. The resulting clusters are presented in Figures 5 and 6.

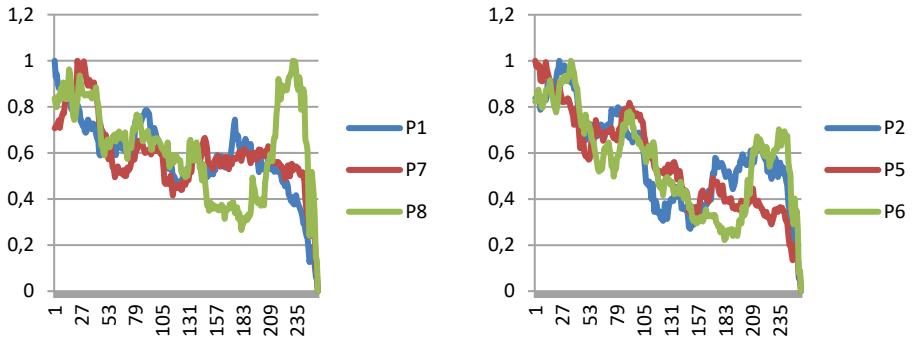


Figure 5. Clusters in the first sub-period for the Polish stock exchange

Source: own study.

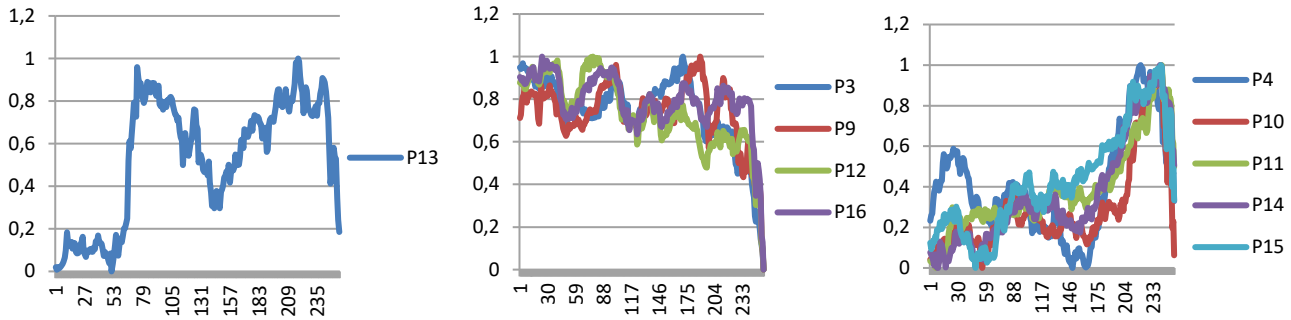


Figure 6. Clusters in the second sub-period for the Polish stock exchange

Source: own study.

For the Warsaw Stock Exchange, since more sub-indices were taken into account, more clusters appeared. The first cluster included the energy, moto and clothing industries. Apart from moto, which saw an increase before a sharp fall in value, the others were in a downward trend. Cluster two included the mining, chemical and food industries. Here, too, there was a downward trend. Cluster three included only the telecommunications sector. It differed from the others; hence it was the only one in this cluster. The fourth cluster, including the fuel

sector, pharmaceuticals, banks and the WIG index, tended to remain at a similar level with a downward trend at the end of the period. The last cluster included construction, media, games, IT and developers, which were in an upward trend in period one.

In period two, there was a complete shuffling of sectors in the various clusters. Only IT and games were still similar, as in period one. There was also one more cluster, which included the medicine industry. Such an unpredictable and sudden event, which affected the real economy of virtually the whole world with unprecedented speed, also caused significant changes in the functioning of sectors, with numerous restrictions and limitations affecting individual sectors to varying degrees. This was reflected in the quotations of listed companies, which resulted in a complete dislocation of sectors in particular clusters in the Warsaw Stock Exchange and significant movements in the Spanish stock exchanges.

The final stage of the research was a Granger causality test between indices within a cluster. It was based on the stationarity of the return series under study. If a cluster was single-element, it was not taken for further analysis. On the other hand, if the clusters contained more than two indices, the research was conducted in pairs, taking into account all possible combinations of those pairs. The results of verifying the Granger causality test can be seen in Tables 3 and 4.

Table 3. Delays at which causality occurs (Spanish stock exchange)

Period I	k	Period II	k
H1→H3	2,3,4,5	H1→H3	5
H3→H1	1	H6→H1	1,5
H6→H2	2,3,4	H7→H2	1,2,3,4,5
H2→H7	1,2,3,4,5	H5→H4	1,3,4,5
H6→H7	1,2		
H4→H5	1,2,3,4,5		
H5→H4	3,4,5		

Source: own study.

In the Spanish stock market, where the number of sectors was smaller, unidirectional relationships in both periods are more noticeable. In the first cluster, the fuel and energy sector appeared to be the cause of food changes. This occurred in both Period I and Period II. Industry and construction and technology and telecommunications were the cause of changes in the IBEX35 index in Period I. Consumer services were the cause of changes in financial services and real estate in Period I. The reverse relationship also occurred, and did so in both periods.

Table 4. Delays at which causality occurs (Polish stock exchange)

Period I	k	Period II	k
P7→P8	2,3,4	P3→P1	2
P2→P6	2	P1→P16	1
P5→P6	2,3,4,5	P16→P1	1,2
P3→P9	1,2,3,4,5	P3→P5	2
P3→P12	1,2,3,4,5	P3→P16	4,5
P3→P16	1,2,3	P16→P3	5
P12→P9	3,4,5	P13→P16	5
P16→P12	1	P14→P11	1,2
P16→P9	2,3,4,5	P12→P6	4,5
P4→P10	1,2,3,4,5	P8→P15	4,5
P11→P10	1,2,3,4,5	P15→P8	3,4,5
P10→P14	1,2,3,4,5		
P14→P10	1,2,3,4,5		
P10P15	1,2,3		
P15P10	3,4,5		
P11P14	2,3,4,5		
P11→P15	1		
P15→P11	3,4,5		
P14→P15	4,5		
P15→P14	1,2,3,4,5		

Source: own study.

In the Warsaw Stock Exchange, as the sectors were in different clusters in both periods, it is difficult to find the same relationships between pairs of sectors. There were far fewer relationships in Period II. This can be interpreted as other factors having a greater influence on the behaviour of the sectors in a period of such high uncertainty. Even similar industries such as games and IT behaved differently in the two periods. In period one, the games industry was the cause of the IT industry's changes, while in period two, the relationship was the other way around. It is important to remember that sectors are heterogeneous (Narayan and Sharma 2011, p. 3262) and are therefore likely to react differently to market shocks.

The results obtained for the Polish and Spanish stock markets are consistent with the results for the markets of other countries (Shen et al. 2020; Zaremba et al. 2020; Kizys, Tzouvanas, and Donadelli 2021) and sectors (Nguyen 2020; Hanif, Mensi, and Vo 2021; Narayan, Gong, and Ali Ahmed 2021). Hanif, Mensi, and Vo's (2021, p. 3) analysis

of the dependence structure and risk spillovers between US and Chinese listed sectors in the pre- and post-pandemic periods indicates that COVID–19 had an impact on changing the dependence structure of sectors. The differential impact of the pandemic on sectors is also confirmed by a few studies from other markets (Liu, Zhang, and Zhang 2020; Nguyen 2020; Narayan, Gong, and Ali Ahmed 2021). The results are thus in line with the mainstream, showing the asymmetry of the pandemic's impact on inter-sectoral dependencies.

Conclusions

The aim of the research was to investigate similarity and Granger causality between sectors within a stock exchange. The similarities found between sectors made it possible to indicate which sectors that are similar to each other were the cause of changes in other sectors and to verify the hypotheses. For the Spanish stock exchange, unidirectional relationships in both periods are more discernible. In the first cluster, the fuel and energy sector appeared to be the cause of food changes. The energy sector is often treated as a potential multiplier of change because of the links between oil prices and other sectors of the economy. The impact of shocks in this sector on other areas of economic activity varies depending on the sector's dependence on energy consumption (Laborda and Olmo 2021, p. 2). Industry and construction and technology and telecommunications were the cause of changes in the IBEX35 index in Period I . Consumer services drove changes in the financial and real estate sectors (confirming H_1 and H_2). The inverse relationship also occurred, and in both periods. It should be noted that the last three sectors distribute consumer income into spending, saving and investment; hence, it should be assumed that these sectors interact with each other.

In the Polish stock market, it is difficult to indicate such unidirectional dependencies. Only IT and games were still similar (confirming H_3). The likely reason for this is the overly large number of sectors represented by a relatively small number of companies, which do not reflect the actual economic and financial state of a given sector. As a consequence, this may distort mutual relations and give ambiguous results.

In the second period, there was a complete reshuffling of the sectors in each cluster for both markets, which resulted in a lower correlation between sectors (confirming the last hypothesis). Both the pandemic and the administrative restrictions that changed the rules of the markets affected the similarities and causality of sectors. To what extent these changes are permanent will be possible to assess in the long term.

References

Adnan, A.T.M., Hasan, M.M. (2021), *The emergence of COVID–19 and capital market reaction: An emerging market scenario analysis*, "Asian Academy of Management Journal of Accounting and Finance", 17 (1), pp. 35–62, https://doi.org/10.21315/aamjaf2021.17.1.2

Aharon, D.Y., Siev, S. (2021), *COVID–19, government interventions and emerging capital markets performance*, "Research in International Business and Finance", 58, 101492, https://doi.org/10.1016/j.ribaf.2021.101492

Akhtaruzzaman, M., Boubaker, S., Sensoy, A. (2021), *Financial contagion during COVID–19 crisis*, "Finance Research Letters", 38, 101604, https://doi.org/10.1016/j.frl.2020.101604

Albulescu, C.T. (2021), *COVID–19 and the United States financial markets' volatility*, "Finance Research Letters", 38, 101699, https://doi.org/10.1016/j.frl.2020.101699

Ali, M., Alam, N., Rizvi, S.A.R. (2020), *Coronavirus (COVID–19) – An epidemic or pandemic for financial markets*, "Journal of Behavioral and Experimental Finance", 27, 100341, https://doi.org/10.1016/j.jbef.2020.100341

Ashraf, B.N. (2020), *Stock markets' reaction to COVID–19: Cases or fatalities?*, "Research in International Business and Finance", 54, 101249, https://doi.org/10.1016/j.ribaf.2020.101249

Baek, S., Mohanty, S.K., Glambosky, M. (2020), *COVID–19 and stock market volatility: An industry level analysis*, "Finance Research Letters", 37, 101748, https://doi.org/10.1016/j.frl.2020.101748

Baker, S.R., Bloom, N., Davis, S.J., Kost, K., Sammon, M., Viratyosin, T. (2020), *The Unprecedented Stock Market Reaction to COVID–19*, "The Review of Asset Pricing Studies", 10 (4), pp. 742–758, https://doi.org/10.1093/rapstu/raaa008

Dickey, D.A., Fuller, W.A. (1979), *Distribution of the estimators for autoregressive time series with a unit root*, "Journal of the American Statistical Association", 74 (366a), pp. 427–431, https://doi.org/10.1080/01621459.1979.10482531

Dickey, D.A., Fuller, W.A. (1981), *Likelihood ratio statistics for autoregressive time series with a unit root*, "Econometrica: Journal of the Econometric Society", 49 (4), pp. 1057–1072, https://doi.org/10.2307/1912517

ElFayoumi, K., Hengge, M. (2021), *Capital Markets, COVID–19 and Policy Measures*, "IMF Working Paper", No. 2021 (033), https://doi.org/10.2139/ssrn.3799625

Gębka, B., Serwa, D. (2007), *Intra- and inter-regional spillovers between emerging capital markets around the world*, "Research in International Business and Finance", 21 (2), pp. 203–221, https://doi.org/10.1016/j.ribaf.2006.03.005

Granger, C.W.J. (1981), *Some properties of time series data and their use in econometric model specification*, "Journal of Econometrics", 16 (1), pp. 121–130, https://doi.org/10.1016/0304-4076(81)90079-8

GUS (2020a), *Wstępny szacunek produktu krajowego brutto w drugim kwartale 2020 r.*, Warszawa, https://stat.gov.pl/obszary-tematyczne/rachunki-narodowe/kwartalne-rachunki-narodowe/wstepny-szacunek-produktu-krajowego-brutto-w-drugim-kwartale-2020-r-,3,72.html (accessed: 30.06.2021).

GUS (2020b), *Bezrobocie rejestrowane. II kwartał 2020 r.*, Warszawa, https://stat.gov.pl/obszary-tematyczne/rynek-pracy/bezrobocie-rejestrowane/bezrobocie-rejestrowane-ii-kwartal-2020-roku,3,41.html (accessed: 30.06.2021).

Hanif, W., Mensi, W., Vo, X.V. (2021), *Impacts of COVID–19 outbreak on the spillovers between US and Chinese stock sectors*, "Finance Research Letters", 40, 101922, https://doi.org/10.1016/j.frl.2021.101922

Harjoto, M.A., Rossi, F., Lee, R., Sergi, B.S. (2020), *How do equity markets react to COVID–19? Evidence from emerging and developed countries*, "Journal of Economics and Business", 105966, https://doi.org/10.1016/j.jeconbus.2020.105966

Henríquez, J., Gonzalo-Almorox, E., García-Goñi, M., Paolucci, F. (2020), *The first months of the COVID–19 pandemic in Spain*, "Health Policy and Technology", 9 (4), pp. 560–574, https://doi.org/10.1016/j.hlpt.2020.08.013

Heyden, K.J., Heyden, T. (2021), *Market reactions to the arrival and containment of COVID–19: An event study*, "Finance Research Letters", 38, 101745, https://doi.org/10.1016/j.frl.2020.101745

Kizys, R., Tzouvanas, P., Donadelli, M. (2021), *From COVID–19 herd immunity to investor herding in international stock markets: The role of government and regulatory restrictions*, "International Review of Financial Analysis", 74, 101663, https://doi.org/10.1016/j.irfa.2021.101663

Laborda, R., Olmo, J. (2021), *Volatility spillover between economic sectors in financial crisis prediction: Evidence spanning the great financial crisis and Covid–19 pandemic*, "Research in International Business and Finance", 57, 101402, https://doi.org/10.1016/j.ribaf.2021.101402

Liu, H., Manzoor, A., Wang, C., Zhang, L., Manzoor, Z. (2020), *The COVID–19 Outbreak and Affected Countries Stock Markets Response*, "International Journal Environmental Research Public Health", 17 (8), 2800, https://doi.org/10.3390/ijerph17082800

Liu, Z., Zhang, T., Zhang, G. (2020), *Heterogeneous Stock Market Reactions to COVID–19: More Hidden Mechanisms*, https://doi.org/10.2139/ssrn.3697622

Mazur, M., Dang, M., Vega, M. (2021), *COVID–19 and the march 2020 stock market crash. Evidence from S&P1500*, "Finance Research Letters", 38, 101690, https://doi.org/10.1016/j.frl.2020.101690

MSCI (n.d.), https://www.msci.com/end-of-day-data-country (accessed: 31.06.2021).

MSCI Indexes (n.d.), https://app2.msci.com/products/indexes/performance?&size=30&scope=C&style=C&currency=15&priceLevel=0&indexId=95 (accessed: 31.06.2021).

Narayan, P.K., Sharma, S.S. (2011), *New evidence on oil price and firm returns*, "Journal of Banking & Finance", 35 (12), pp. 3253–3262, https://doi.org/10.1016/j.jbankfin.2011.05.010

Narayan, P.K., Gong, Q., Ali Ahmed, H.J. (2021), *Is there a pattern in how COVID–19 has affected Australia's stock returns?*, "Applied Economics Letters", 29 (3),pp. 179–182, https://doi.org/10.1080/13504851.2020.1861190

Nguyen, K. (2020), *A coronavirus outbreak and sector stock returns: the tale from the first ten weeks of year 2020*, https://doi.org/10.2139/ssrn.3559907

Onali, E. (2020), *COVID–19 and Stock Market Volatility*, https://doi.org/10.2139/ssrn.3571453

Pera, J. (2019), *The Effectiveness of Investing in Stock Exchange Markets in Central and Eastern European Countries with Regard to NYSE2-LSE-HKSE2. A Comparative Risk Analysis*, "Comparative Economic Research. Central and Eastern Europe", 22 (2), pp. 121–140, https://doi.org/10.2478/cer-2019-0016

Phan, D.H., Narayan, P.K. (2020), *Country Responses and the Reaction of the Stock Market to COVID–19 – a Preliminary Exposition*, "Emerging Markets Finance and Trade", 56 (10), pp. 2138–2150, https://doi.org/10.1080/1540496X.2020.1784719

Pražák, T., Stavárek, D. (2017), *The relationship between stock market development and macroeconomic fundamentals in the Visegrad group*, "Comparative Economic Research. Central and Eastern Europe", 20 (3), pp. 5–23, https://doi.org/10.1515/cer-2017-0017

Ramelli, S., Wagner, A.F. (2020), *Feverish Stock Price Reactions to COVID–19*, "Review of Corporate Finance Studies", 9 (3), pp. 622–655, https://doi.org/10.1093/rcfs/cfaa012

Shen, H., Fu, M., Pan, H., Yu, Z., Chen, Y. (2020), *The Impact of the COVID–19 Pandemic on Firm Performance*, "Emerging Markets Finance and Trade", 56 (10), pp. 2213–2230, https://doi.org/10.1080/1540496X.2020.1785863

Souza de Souza, P.V., Augusto, C. (2020), *Effects of COVID–19 Pandemic on International Capital Markets*, "International Journal of Economics and Financial", 10 (6), pp. 163–171, https://doi.org/10.32479/ijefi.10702

Syllignakis, M.N., Kouretas, G.P. (2011), *Dynamic correlation analysis of financial contagion: Evidence from the Central and Eastern European markets*, "International Review of Economics & Finance", 20 (4), pp. 717–732, https://doi.org/10.1016/j.iref.2011.01.006

Šimáková, J., Rusková, N. (2019), *The Role of Exchange Rates in the Stock Price Development of Chemical Companies in the Visegrad Four Countries*, "Comparative Economic Research. Central and Eastern Europe", 22 (3), pp. 117–129, https://doi.org/10.2478/cer-2019-0026

Wagner, A.F. (2020), *What the stock market tells us about the post-COVID–19 world*, "Nature Human Behaviour", 4 (5), 440, https://doi.org/10.1038/s41562-020-0869-y

Ward, J.H. (1963), *Hierarchical grouping to optimize an objective function*, "Journal of American Statistical Association", 58 (301), pp. 236–244, https://doi.org/10.1080/01621459.1963.10500845

World Federation of Exchanges (2021), *2020 Annual Statistics Guide*, https://www.world-exchanges.org/our-work/articles/2020-annual-statistics-guide (accessed: 30.06.2021).

World Health Organization (2020), *Coronavirus disease 2019 (COVID–19): situation report, 51*, https://apps.who.int/iris/handle/10665/331475 (accessed: 30.06.2021).

World Health Organization (n.d.), *WHO Coronavirus (COVID–19) Dashboard*, https://covid19.who.int/table (accessed: 15.08.2021).

Zaremba, A., Kizys, R., Aharon, D.Y., Demir, E. (2020), *Infected Markets: Novel Coronavirus, Government Interventions, and Stock Return Volatility around the Globe*, "Finance Research Letters", 35, 101597, https://doi.org/10.1016/j.frl.2020.101597

Zhang, D., Hu, M., Ji, Q. (2020), *Financial markets under the global pandemic of COVID–19*, "Finance Research Letters", 36, 101528, https://doi.org/10.1016/j.frl.2020.101528

Żebrowska-Suchodolska, D., Karpio, A., Kompa, K., (2021), *Covid–19 Pandemic: Stock Markets Situation in European Ex-Communist Countries*, "European Research Studies Journal", XXIV (3), pp. 1106–1128, https://doi.org/10.35808/ersj/2408

Podobieństwo i przyczynowość w sensie Grangera sektorów rynku giełdowego Polski i Hiszpanii w okresie pandemii COVID–19

Rynki kapitałowe reagują prawie natychmiast na sytuacje kryzysowe. Zależności takie mogą mieć zarówno charakter międzynarodowy, jak i lokalny. Badania skupiają się na giełdach dwóch krajów: Hiszpanii i Polski. Kraje te są często porównywane do siebie pod względem różnych kryteriów gospodarczych i społecznych. Badania dotyczą okresu od 3 marca 2019 roku do 31 marca 2021 roku. Celem badań jest identyfikacja sektorów i indeksów podobnych do siebie na poziomie lokalnym oraz wskazanie wśród par indeksów podobnych tych, które stanowią impuls dla innego sektora. Do badań wykorzystano metodę hierarchiczną analizy skupień (metoda Warda) oraz test przyczynowości Grangera. W niniejszej pracy przedstawiono nowatorskie podejście do porównań sektorowych na poziomie lokalnym.

Słowa kluczowe: koronawirus, sektory gospodarki, zmienność finansowa, podobieństwo

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.24

Determinants of International Reserves Among Organisation of Petroleum Exporting Countries (OPEC)

Oladejo Tokunbo Bada https://orcid.org/0000-0001-7823-3785
Covenant University, Department of Finance, Ota, Nigeria, e-mail: oladejo.bada@stu.cu.edu.ng

Kehinde Adekunle Adetiloye https://orcid.org/0000-0002-7171-0793
Ph.D., Associate Professor, Covenant University, Department of Finance, Ota, Nigeria,
e-mail: kehinde.adetiloye@coveantuniversity.edu.ng

Felicia Omowunmi Olokoyo https://orcid.org/0000-0003-0176-0194
Ph.D., Associate Professor, Covenant University, Department of Finance, Ota, Nigeria,
e-mail: felicia.olokoyo@covenantuniversity.edu.ng

Grace Ukporhe https://orcid.org/0000-0001-5245-8986
Covenant University, Department of Finance, Ota, Nigeria, e-mail: grace.ukporhepgs@stu.cu.edu.ng

Abstract

Member countries of the Organisation of Petroleum Exporting Countries (OPEC) are always in the news regarding the prices and supply of crude oil to the international market. One of the economic reasons for this is liquidity and the desire to accumulate international reserves by the respective countries. This paper examined the determinants of international reserves among the cartel against the backdrop of the motives for keeping reserves. With data from 2005 to 2018, the adopted variables that were tested with the system of generalised methods of moments (Sy-GMM) are inflation, exchange rates, oil prices, crude oil dependence, economic crises and others. The results and outputs show that inflation was negatively impactful externally and internally, while FDI inflows recorded negative significance. Economic crises and economic openness were positively significant, while oil prices and exchange rates were not significant determinants of international reserves accumulation. The paper recommends the maximisation of opportunities available by members during

Received: 15.11.2021. Verified: 7.04.2022. Accepted: 7.06.2022

economic crises to accumulate reserves that will enable them to diversify from dependence on crude oil exports to include other products and a higher level of openness to open the economy up for competition to make the economies stronger.

Keywords: international reserves, Organisation of Petroleum Exporting Countries, crude oil prices, exchange rates, international trade

JEL: F14, F23, F31, F41, F43

Introduction

The role that international reserves have assumed in most countries has been taken to new heights. Countries can accumulate reserves when they have a good terms of trade (ToT) position to do so, and the trade balance is favourable. Included among these are the Organisation of Petroleum Exporting Countries (OPEC) countries, which produce crude oil for sale in the international market, with their commodity having an inelastic demand. These countries are mainly developing and require capital for consumption in various amounts over the years that would help develop their countries. Central banks (CB) attempt to keep reserves to support international transactions for their economies, and international reserves act as a buffer for their economies and support their currency. Essentially, it should control possible exchange rate volatility. These reasons have always led to the accumulation and hoarding of international reserves (IR). Since medieval times, when gold and other precious metals were traditional media of exchange, IRs helped grant purchasing power to countries for transactionary purposes across countries. Commonly used to stave off shocks and volatilities in domestic currency, countries have developed a herd instinct to continuously accumulate international reserves that can back up the domestic currency and help meet other domestic developmental objectives. Recent experiences and studies indicate that emerging economy countries tend to accumulate higher reserves to meet shocks from imbalances in the Balance of Payments: varying balances from current to capital accounts over the last twenty years (Gosh, Ostry, and Tsangarides 2014). The study also agreed that this is the case for most emerging economies., especially the RIMs (Malaysia, China, Korea, etc.). Keeping a high level of reserves was intended to help align the exchange rate (ER) in many countries.

Countries have different models for accumulating and managing their IR. Most common among these is the import coverage period that most developed countries use. The most popular is the Guidotti-Greenspan Rule (Jeanne and Rancière 2006) for the one-year cover of short-term foreign capital outflows. However, OPEC countries (most are developing) have a differing purpose for stocking IR, amongst which is the buffer it serves for the economy when in distress. Steiner (2017) gave three clears reasons for the interest in the accumulation of reserves: 1) for precautionary purposes to support mercantilist ideals and mitigate output volatility (Aizenman and Ito 2012); 2) to support under-

valued exchange rates to encourage and promote exports by keeping ERs down; 3) as a strategy by most developing countries where the financial markets are underdeveloped. The central bank (CB) acts as a financial intermediary (Shin and Turner 2015) as a lender of last resort.

Accumulating reserves is not without risks and costs. Steiner (2017) acknowledged the role of IRs as a causal determinant of global inflation. For OPEC members, the accumulation of reserves seems spurred by the export of a seemingly inelastic commodity whose price, when threatened, throws members into an economic quagmire and macroeconomic instability. As a result of the developing nature of most cartel members, the need to acquire and maintain large IRs becomes essential and paramount. There is no doubt that the IR has stood these countries in good stead for their development, and as such, many of the 14 countries can be grouped as part of the emerging market economes.

OPEC members frequently need to diversify their economies, which requires resources and thus public expenditure (Alberola, Erce, and Serena 2016). The public expenditure required would need to be sterilised to control inflation. Interestingly, some OPEC members are in the throes of high inflation and low IR, having managed this resource sub-optimally. A few have diversified fundamentally. Earnings from oil form an insignificant amount of the IR accumulation, which is why the hoarders of the largest reserves are non-OPEC members. Trading crude oil requires many bilateral parities, whose openness has been rendered insignificant among trading countries. Globalisation has forced countries to open up to capital flows and other resources that their various economies may need. Lane and Milesi-Ferretti (2007) identified trade and financial openness as significant components of movements across countries in the 2010s. Saudi Arabia, arguably the largest exporter of crude oil, occupies the tenth position among the countries with the highest level of reserves globally and is first among the cartel.

With the understanding that large IRs encourage inflows of capital and, subsequently, foreign exchange into the respective countries, accumulation by OPEC should encourage a greater amount of IR in the respective countries' composite development. The paper objectifies the determinants for the accumulation of IRs by OPEC members and essentially investigates the nature of what encourages this accumulation. Following this section is a brief, relevant literature review, followed by the methodology, results from output and discussions. The final section concludes and provides recommendations.

Literature review

Conceptually, IR is a country's stock of financial resources outside its shores invested to support the domestic economy (International Monetary Fund 2009). It is variously defined as external or foreign reserves, though the popular term in the literature is in-

ternational reserves. Technical terms for IRs are international media of exchange, international liquidity and vehicle currencies (Moosa 1992). Commonly held in strong negotiable foreign currencies, liquid financial instruments and gold by the central bank (CB) of the respective country, it is used for various reasons as desired by the CB and the monetary authority as enabled by law.

Asset composition of reserves is defined by the country of interest, where the first issue is what drives the choice of currency (Aizenman, Cheung, and Qian 2019). The study identified four currencies held for reserves before the global financial crisis (GFC) of 2007: the United States Dollar, the Euro, the Yen and the Great British Pound. The GFC changed this behaviour somehow as the GFC and quantitative easing (QE) were factors that subsequently determined the holdings of various currencies as reserves. Commodity exporting countries (like OPEC) tend to diversify their holdings from the big four when their terms of trade improve.

At the same time, the valuation of the effects of the parity between USD/Euro diminished the importance of the GFC as a determinant of the currency composition of IRs. While commodities determined the choice of currency before the GFC, monetary issues became paramount after that.

Explicitly, the reserves serve various purposes, depending on the objectives set by the monetary authority or the country's government. Moosa (1992) believes IR is money at the international level, and attached three Keynesian demands for money: 1) speculative – the opportunity cost of holding reserves; 2) precautionary – to deal with Balance of Payment (BoP) imbalances or support the domestic currency in the foreign exchange market; 3) transactionary – which depend on imports as a variable. The various uses are explained by studies such as Lawrence (2006) for insurance against volatilities in currency and shocks in ER fluctuations, especially when the domestic currency is overvalued. Dooley, Folkerts-Landau, and Garber (2004) found that IRs support monetary policy and act as a buffer against excessive capital outflows. The European Central Bank (2006; 2012) believed it is mainly used for insurance against currency crises and an overvalued domestic currency, while the International Relations Committee Task Force (2006) believes that stocking up reserves allows for an increase in the country's purchasing power.

In all the primary uses and objectives of keeping IR, the support for the domestic economy is dominant. Therefore, reserves matter (Fischer 2001). One of the fundamental reasons for accumulating, stocking or hoarding IR was the need not to have a repeat experience of the contagion of the 1990s, especially from the Asia region (Reddy 2006; Aizenman 2008). The specific case study was the Asian crisis. The global financial crises of 2007–2010 indicated that many countries strengthened their IR positions to stabilise their economies, especially Poland. Čech and Jevčák (2011) reported that

most countries of Central and Eastern Europe (CEE) performed well with the metrics to measure the adequacy of the IRs, even when a vulnerable metric was adopted.

Emerging economies are at the forefront of IR accumulation, and most are in the Asia region. This is probably attributed to the need to be self-insured against the contagion of the late 1990s, when some were severely hit. Lawrence (2006) and Irefin and Yaaba (2011) state that protecting the domestic economy is significant in IR accumulation in Asian countries. The OPEC members also accumulated IR in their various capacities. Other countries that have accumulated reserves include China, Japan, and South Korea, although they are non-OPEC members. Specifically, countries that do not require such huge level of reserves have found the need to maintain large quantities, which was attributed to structural breaks in the model adopted (Lee and Luk 2018).

IR management theories have been formalised since the 1960s but became germane for economic management in the 1980s following sudden stops of capital inflows into developing countries. Jeanne and Rancière (2006) documented the different models in place, and more nomenclature is explained by Irefin and Yaaba (2011). The Buffer model of Frenkel and Jovanovic (1981) has endured, having been tested across many studies and found stable The proposal of the International Monetary Fund (2009) for IRs to meet three to four months of imports imbalances (not net current account transactions) led to the maintenance of 5% to 20% of the M2 (Marion 2005). Pineau et al. (2006) argued that countries deliberately stock reserves to unrequired levels despite these measures. In some countries, IR management is determined by the law and the objectives determined by the monetary authorities rather than by the economic and financial realities of the day.

In view of the above, it is clear that production output affects IR accumulation. The inelasticity of the product in the market enables OPEC to control its supply, often in disagreements with other major non-OPEC producers such as Russia, the United Kingdom and the United States. As a cartel, its formation brought major macroeconomic issues to the attention of many countries, including its members. Other non-OPEC crude producers formed the OPEC+ to control the market. Meanwhile, the largest non-OPEC producers remain the United States, China and Russia (the only one in Eastern Europe).

Interestingly, nearly all large producers are invariably large consumers, leaving little for export except Russia, for which it has gained a tremendous amount of IRs. Russia with an annual crude production of 540.5 million barrels, supplies most of the CEE countries. Other European producers are relatively insignificant, mainly the United Kingdom and Norway (Energy Information Administration 2021).

Oil prices and the market situation are essential to news about OPEC. Plante (2019) measured and correlated oil price volatility with cartel meetings. Newspaper reports that

shocks to the index is also correlated with Google searches on oil price volatility. However, idiosyncratic events generate excessive volatility in extreme cases, like the Kuwaiti invasion and the Iraq and Iran wars. Since they collectively control about 79% of total fossil fuel reserves, OPEC members can stock up reserves given the inelastic commodity they sell on the international market, should they desire. Despite the cartel's efforts to influence prices, there has always been a mean reversion of the prices. The network structure of the countries producing oil has changed over the years depending on the influence each obtained in production and export.

Recent studies on OPEC have focused on various issues. OPEC members have lost some ground since the other major producers discovered crude oil in some form (shale oil in the US). It has survived the headwinds of world market turbulence and cyclicality by understanding how weak cartel members should be accommodated and treated. Okullo and Reynes (2016) studied the cartel membership structure and concluded that membership heterogeneity prevents effective collusion by treating weak members with kindness, allowing the cartel to survive and persevere. Thus, OPEC decisions impact members and non-members alike, bringing a form of connectedness within both ranks (Al Rousana, Sbia, and Tas 2018).

Despite the level of connectedness between both OPEC and non-OPEC producers, the level of compliance with quotas among OPEC members is debatable for two glaring reasons. Firstly, each country's reserves depend on the quantity pushed to the market, and thus the capacity to absorb short-term shocks in total output. Secondly, the level of dependence on oil production as maintenance for macroeconomic performance among producers differs. Parnes (2019) analysed compliance among the OPEC, dividing them into three groups. The high and low complying countries exhibit relatively low compliance. Therefore, they cheat within the cartel, while mid-producing countries tend to comply more with the group's production demands.

Despite the declining importance of oil as a source of energy, Al-Fattah (2020) believes there is an insufficient supply of this commodity. This insufficiency in supply can easily be made up from major OPEC members and non-members (Saudi Arabia and Russia). The production capacities of non-OPEC countries, which currently make up 56% of total world output, are expected to go down and subsequently out of the world market as it has been declining at about 3.5% per annum. Gil-Alana, Dadgar, and Nazari (2020) deal with the interactions in the market, stratifying the three series into OPEC, non-OPEC and world producers, showing that the OPEC still maintains an edge in production and reserves. Thus, it has a comparative advantage because of its ability to reduce costs and produce more. The production of oil by OPEC has important implications for the global market, which means that it matters because it balances the market (Razek and Michieka 2019). In that study, it became clear that oil is a financial asset, and other global producers equally influence the pricing of the commodity just as OPEC does; so OPEC matters in global oil production and marketing.

Finally, the use to which the reserves of OPEC members should be for economic diversification and real production while embracing other sources renewable income to increase IRs. With globalisation, many countries have opened up, including OPEC members, encouraging inflows into their respective countries, since this increases IRs. Ibhagui (2020) studied the economic performance of capital inflows into OPEC using a disaggregated approach. He discovered that it is either significantly negative or, at best, insignificantly positive for most counties. For the three types of flows, i.e., Foreign Direct Investment (FDI), foreign portfolio investment (FPI) and foreign debt (FD), the effects of capital flows have been not beneficial. FDI indicates a short-term performance at best in most countries, while FPI shows a robust negative significance. For most countries, there is a relaxation of the restrictions on inflows and outflows of foreign capital for IRs liquidity.

Using FDI as a means of increasing the stocks of IRs can benefit OPEC members because of the liquidity effect of the foreign exchange position of the country. For instance, Saudi Arabia, arguably one of the ten countries with the highest IRs, is a leading member of OPEC. Alfalih and Bel Hadj (2020) studied the kingdom's FDI situation and reported that while the usual causal determinants are significant, FDI reacts more to oil price fluctuations than other determinants. Olayungbo (2019) studied the impact of trade and reserves in the OPEC country of Nigeria and surmised that there is a long-term relationship between IRs and oil prices, implying that oil prices Granger-cause an increase in IRs in the short term. The paper recommended diversifying away from oil to other non-resource commodity exports to increase and improve the country's IR position. Adetiloye (2015) mentioned the country's foreign exchange management as being detrimental to the growth of domestic investment, recommending a stricter capital outflows regime for the country.

Methodology

Data and sources

Various studies support the independent variables adopted for analysis in the study. The variables include total reserves minus gold, exchange rates, inflation rates, commodity prices, foreign direct investment inflows, and gross domestic product. The variables were obtained from the World Development Indicators (The World Bank n.d.). They covered the 14 OPEC countries from 2005 to 2018.

Methodology and modelling

The analytical process started with the pooled ordinary least square (OLS) regression to more advanced system generalised methods of moments (Sy-GMM) through fixed and random effects (FE and RE). Arellano and Bond (1991) popularised the use

of the GMM with advanced properties that enable it to exploit all restrictions with no serial correlation in errors and individual-specific effects. Of the two GMMs, i.e., the difference GMM and the system GMM (Sy-GMM), Sy-GMM is preferred. It has two variants, of which the two-step Sy-GMM is adopted for analysis in this study. Specifically, the differenced GMM is known not to allow country-specific effects, while the one-step Sy-GMM does not produce efficient estimators like the two-step Sy-GMM does (Bond, Hoeffler, and Temple 2001).

The modelling process begins with the pooled OLS as below

$$\ln Yit = \varnothing \ln Yit_{-1} + yz_{it} + di + \varepsilon_{it} \tag{1}$$

$$i = 1, 2\ldots.N\text{it} = 1,2\ldots.\text{T}$$

$$\ln Y_{it} = \varnothing \ln Y_{it-1} + yz_{it}^{1} + dt + \varepsilon_{it}$$

$$y_{it} = \beta_0 + x_{it}\beta_{it} + Z_{it} + \alpha_{it} + \varepsilon_{it} \tag{2}$$

For the Sy-GMM, the original equation is

$$y_{it} = \delta y_{it-1} + \beta_{xit} + \mu_i + v_{it} \tag{3}$$

and for the transformed model, it is

$$\Delta y_{it} = \Delta y_{it-1} + \Delta x_{it} + \Delta v_{it} \tag{4}$$

The model is explicitly shown below:

$$\begin{aligned} lresers_{it} &= lencrs_{it} + lexhr_{it} + lfdi\_\text{inf}_{it} + \\ &+ lGdp_{it} + lCrdpr_{it} + lopns_{it} + lNrspdc_{it} + \varepsilon \end{aligned} \tag{5}$$

where, *resers, encrs, exhr, FDI_inf, GDP, inf_R, Crdpr, opns, Nrspdc* all stand for IRs of a particular country, economic or financial crises index, exchange rate (NEER), inflation rate, gross domestic product (GDP), crude oil price, economic openness, and natural resource dependence, respectively, all in log form.

The independent variables

The first is the oil price. It is doubtful if oil prices affect holdings of IRs, encourages hoarding or dispensing of foreign exchange. An increase in the price of the commodity has a relationship with other variables. Bankole and Shuaibu (2013) showed that

a higher oil price has a positive effect on the IR in their study for Nigeria. It is unclear if this is the case for all countries. With a Vector Autoregressive (VAR) estimation process, the study confirmed the impact of prices through the coefficient as it was marginally positive.

The role of the exchange rate in IR accumulation is adopted following Aizenmann and Riera-Crichton (2008). They showed that the impact of the real practical exchange rate on IRs cushions the impact of adverse terms of trade in developing countries, which is highly needed by those countries when oil trade and prices are volatile. The depth achieved by the financial system mitigates the need for this. This is not the case for developed countries, where the depth of the financial system acts as a shock absorber on its own. Bankole and Shuaibu (2013) maintained the same trend in the argument on oil price: this is positive but marginal for Nigeria. Thus, for OPEC members, the exchange rate as a determinant is not ascertained.

FDI inflows are a strong and positive contributor to the accumulation of IRs by most countries and OPEC. As far as FDI is concerned, the retention of IR is made possible as it becomes stocks of investment, as the inflows are not volatile like the portfolio flows. The country's GDP measures the total services and goods produced in a country that reflect the effect of an increase or decrease in countries' stocks of IRs. In this case, a higher production level will increase exportable goods apart from crude.

Inflation rate, economic crises and economic openness

Since inflation increases the prices of goods and services within a country, Steiner (2017) demonstrated through panel data analysis that inflation has a negative impact on the holding of IRs as one of the significant drawbacks of IR accumulation, both at the global and individual country level. Dominguez, Hashimoto, and Ito (2012) earlier discussed the role of international crises in IR management and accumulation. The decision to acquire or dispose of foreign assets is influenced by the economic and financial performance of the specific countries.

IR is particularly sensitive to financial flows as caused by globalisation. The more open a financial system is, the more flows it should experience, which could go either way, depending on the economic conditions at the domestic level in the particular country. The experience has been remarkably more spontaneous for emerging market countries than for developed ones (Choi, Sharma, and Strömqvist 2007).

Results and output of estimates

Table 1 presents the summary statistics of the variables used in the econometric analysis of the study. The analysis shows the statistical distribution of the variables. The statistics adopted include the mean, maximum, minimum and the analysis of the symmetric distribution of the variables. The *total reserves in months of imports* (*ENCRS*) have a mean of approximately 13.5, a minimum of 0.87 and a maximum of 79.34. This implies that, on average, the OPEC member countries are economically healthy and capable of financing their imports bill for up to thirteen and a half months. The statistics show that the exchange rate (Local Currency Unit: LCU to the dollar) values differ significantly among OPEC member countries. It has a mean of 1447, a minimum of 0.269, and a maximum of 40864; while a few countries have their local currency almost on par with the dollar, the disparity seems large in others. However, on average, a unit of dollar equals about 1447 units of LCU of OPEC member countries.

Also, FDI inflow, as a percentage of GDP, significantly differs among the countries, with a mean of about 2.9, a minimum of –6.1 and a maximum of 50.6. The distribution shows that some economies have attracted a large chunk of FDI to improve their GDP, while it is negative in others. The volume of FDI attracted could have been spurred by a myriad of determinants, such as the level of economic progress and institutional development attained over time. Nevertheless, the liquidity of members has been greatly assisted by oil-exporting activities.

In the same way, the GDP volume also differs across the OPEC member states, with an average of about $200 billion, a minimum of $9 billion and a maximum of about $700 billion. The statistics also show the relative productivity of the economies of the cartel, whose economies are driven primarily by oil export proceeds. Despite this, a number of the economies have successfully diversified their export base, thus reducing their dependence on exporting oil and making their economies more productive and competitive. For some countries, it cannot be agreed that all revenues yielding efforts were from oil exports.

The reserve has a mean of $67.5 billion, a minimum of $45.5 million and a maximum of $703 billion. A standard deviation of about $103 billion also shows a large disparity among the OPEC members and accumulated international reserves. The reserve value also reflects the competitiveness and diversity of the export base of an economy. As before, oil exports might not be the sole source of reserve accumulation. A net exporting economy tends to be able to boost reserves quicker than a net importing economy. Similarly, the inflation rate is modest at 11.2% among the countries, though reaching a maximum of about 254.9% in one country. The maximum shows considerably large inflation that could be counter-productive and which erodes the purchasing power in the economies' currencies concerned.

Table 1. Descriptive statistics of major variables

Var.	ENCRS	EXHR	FDI_IN	GDP	RESRS	INFR	CRDPR	OPNS	NRSDPC
Mean	13.4858	1447.001	2.89943	2.00E+11	6.75E+10	11.175	77.441	0.86374	0.892225
Median	6.655604	75.03335	1.155547	1.36E+11	2.72E+10	4.4155	71.88	0.81769	0.922566
Maximum	79.23722	40864.33	50.63641	7.02E+11	7.32E+11	254.95	111.96	1.76145	1
Minimum	0.879804	0.268828	−6.10498	9.31E+09	45502925	−60.496	44.04	0.29785	0.451216
Std. Dev.	14.52461	5362.706	6.60413	1.83E+11	1.31E+11	33.132	23.092	0.34613	0.110877
Skewness	1.763411	5.130581	4.621005	0.878982	3.37812	6.2435	0.2599	0.50434	−1.87976
Kurtosis	6.231899	30.69263	30.62695	2.656471	14.47068	45.659	1.6015	2.70107	6.547853
Jarque-Bera	149.6971	7595.176	7390.44	27.94025	1439.94	16299	19.479	9.40762	233.8103
Probability	0	0	0	0.000001	0	0	6E−05	0.00906	0
Sum	2117.271	302423.2	605.9809	4.19E+13	1.32E+13	2212.6	16263	176.203	187.3672
Sum Sq. D.	32910.45	5.98E+09	9071.823	6.93E+24	3.32E+24	216257	111449	24.3208	2.569371
Observations	157	209	209	209	195	198	210	204	210

Source: data from the World Development Indicators and from the system.

Consequently, the statistics show that for the period considered, the price of crude fluctuated, reaching a maximum of $112, an average of $77.4 and a minimum of $44.04 per barrel. It is now generally accepted that a price less than the average stated here can be disastrous for the economy of a typical member. However, prices reached a floor of $20 in the COVID–19 lockdown, while the standard deviation of 23 shows significant fluctuations and volatility in prices over the years. In addition, the table shows the relative dependence of OPEC members on commodity exports. The statistics show that, on average, OPEC member states are heavily dependent on commodity exports with an average of 89%, which implies that primary commodity exports constitute about 89% of all merchandise exports of all OPEC member countries. The indicator has a maximum of one, indicating that 100% of primary commodity exports constituted the entire exports of some of the economies in this category, while the minimum value is 45%. This reflects that some economies in the cartel have considerably diversified their export base from primary commodities. The level of diversification did not seem significant from this point. The openness of a typical economy is 0.86, close to the median economy. With 1.76, it means that some countries are entirely open, while at 0.29, some are quite closed. The deviation for openness indicates that there is not much disparity between closed and open countries. Table 1 shows other details.

Correlation table

Table 2 shows the correlation matrix for the variables to test the possible multicollinearity among the variables. The highest coefficient of any two bivariates is –0.466, as shown by the correlation between openness and *GDP*. This simply means that a negative coefficient exists, though *r* is between these variables with negative implications and is not considered impactful. The nominal bivariate coefficient is only for the test of multicollinearity and did not indicate the possibility that a higher level of openness leads to a reduction in GDP as this coefficient would suggest. If this were the case, the relationship is not sufficiently strong to lead to that conclusion. On the other hand, the lowest possible coefficient is found between *NRSDPC* and *infr*, where the coefficient is positive but not significant. Since a superior test is being used, there is no need to test for the significance of any relationship at this level. The remaining bivariate relationships are shown in Table 2.

Table 2. Correlation Matrix – Multicollinearity test

Variable	CRDP	ENC	EXH	FDI_I	GDP	INFR	INST	NRSD	OPNS
CRDPR	1	0.111	–0.02	–0.061	–0.027	–0.10	–0.02	0.1369	0.130
ENCRS		1	–0.20	–0.050	0.279	–0.09	–0.06	–0.038	0.106
EXHR			1	0.212	–0.26	–0.11	–0.39	0.1633	–0.001

Variable	CRDP	ENC	EXH	FDI_I	GDP	INFR	INST	NRSD	OPNS
FDI_IN				1	−0.17	−0.08	−0.08	−0.221	0.365
GDP					1	0.217	0.044	−0.362	−0.466
INFR						1	−0.25	0.0626	−0.255
INST							1	−0.504	0.198
NRSDP								1	−0.189
OPNS									1

Source: system output from the data.

Multicollinearity test

Table 2 shows the test of collinear dependence among the explanatory variables in the model. The test was conducted to assess the extent of the linear relationship, which is necessary before attempting to combine the variables. Also, where there is high collinear dependence among the explanatory variables, examining the unique influence of the explanatory variables becomes problematic. It could yield a misleading parameter estimate and be unsuitable for drawing inferences and making a prediction. A careful observation of the statistics in Table 2 shows a moderate collinear relationship of −0.514.5 between natural resource dependence and institutions. This relationship is predictable, as several heavily resource-dependent economies (resource trap) are also weak institutionally. Despite this, the table shows no serious problem with multicollinearity. Hence, the variables are suitable to be combined for econometric analysis.

Determinants of interactional reserves

Table 3 shows the analysis of the determinants of international reserves. This comprises results using the pooled ordinary least squares, static panel estimation using fixed and random effect specifications, and the dynamic panel data estimation using the system generalised method of moments. The pooled OLS and static panel estimation approach serve as a baseline regression, while the dynamic panel estimation was adopted to assess the international reserve determinants for OPEC members. The rational choice of the dynamic panel has been well documented in the literature and the preceding section. This is anchored on the fact that some explanatory variables in the model failed the test of strict exogeneity. For instance, FDI, which the model treated as an exogenous variable, could also serve as an endogenous variable, thus making it susceptible to the endogeneity problem. Another reason for adopting the dynamic model is that maintaining international reserves encapsulates a network of policies that have long-run implications.

The dynamic panel estimation results in Table 3 reveal a direct relationship between the price of crude oil and international reserves, as a unit increase in crude oil price yields about a 4.2% increase in international reserves. This outcome is expected since crude oil constitute the bulk of export earnings for most OPEC member states. Thus, it is the major source of export earnings and budgetary financing for several of these economies. The proportionate response of the international reserves of OPEC member states to the price of crude reveals that the rationale for setting-up the cartel to regulate the international oil market, preventing black market operations and maintaining healthy pricing by manipulating the supply force. The crude oil price trend has been consistent with the trend in several economies with absolute dependence on oil price proceeds. The recent episodes of decline in international prices (with rising import bias) have left some of these economies in a problematic state, unable to ensure continuous budget financing (the OPEC disease) and plunging the economies into recession. For instance, Angola has experienced a severe economic depression resulting from the declining oil price before and during the COVID–19 pandemic. Meanwhile, Nigeria has had to reduce the oil price benchmark to finance its budgetary allocation from an initial $60 per barrel to $30 and later to $20 per barrel. This scenario has weakened the economic outlook, expectations and performance of the country and many other oil-exporting economies.

Regressions outputs

Table 3. Determinants of international reserves

	(ols)	(fe)	(re)	(sgmm)
VARIABLES	Lresrs	Lresrs	Lresrs	Lresrs
L.lresrs				0.416***
				(0.0715)
Lcrdpr	0.247**	0.293***	0.411***	0.0421
	(0.104)	(0.0799)	(0.0816)	(0.121)
Exhr	0.000298*	−0.00363***	0.000163	−0.00244***
	(0.000159)	(0.000818)	(0.000251)	(0.000922)
Infr	−0.00862***	−0.00342***	−0.00411***	−0.00213**
	(0.00136)	(0.00100)	(0.00119)	(0.000839)
lfdi_in	0.0128	−0.0528**	−0.0478	−0.123***
	(0.0335)	(0.0257)	(0.0302)	(0.0296)
Lencrs	1.013***	0.873***	0.988***	0.530***
	(0.0444)	(0.0695)	(0.0635)	(0.119)
Lopns	0.949***	0.551**	0.702***	1.622***

	(ols)	(fe)	(re)	(sgmm)
VARIABLES	Lresrs	Lresrs	Lresrs	Lresrs
	(0.163)	(0.224)	(0.206)	(0.262)
Lnrsdpc	0.229	0.780	−0.547	1.654**
	(0.569)	(0.842)	(0.706)	(0.679)
Lgdp	1.006***	1.777***	0.912***	0.250
	(0.0539)	(0.249)	(0.0880)	(0.157)
Constant	−4.678***	−23.85***	−3.054	8.023**
	(1.285)	(6.063)	(2.161)	(3.843)
Observations	119	119	119	50
R-squared	0.972	0.812		
Number of id		12	12	5

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: system output from the data.

On the other hand, the exchange rate exerts a negative response on international reserves, as a unit increase in the exchange rate depletes resources by 0.24 units. This implies that changes in the exchange rate negatively impact reserves. The situation is not unusual from what is obtainable among oil-exporting African economies that are commodity-dependent and equally net importers. For instance, dwindling foreign exchange reserves coupled with falling crude oil proceeds and rising import bills can pressure foreign exchange demand, weakening the local currency. In this case, a swift reaction to defend the local currency value continuously depletes the reserve. The success of such an intervention depends on the soundness of the macroeconomic policy adopted. Otherwise, to maintain a considerable reserve level, restrictive pegging is disallowed, and the foreign exchange market can freely determine the value of the local currency.

The evidence among monocultural economies has always supported the fact that a falling exchange rate depletes reserves because the government attempts to stabilise the local currency, and there is a need to expend more foreign exchange in financing the import bills. In the same manner, reserves respond adversely to changes in inflation. A unit increase in inflation depletes reserves by 0.213 units. It implies that a general price hike in the economy makes exports relatively expensive and incapable of earning foreign exchange. It suggests that inflation reduces the competitiveness of the exportable good. Whether domestically generated or transmitted from abroad, the national produce becomes relatively expensive and uncompetitive. Hence, the economy loses a comparative edge in the ownership of natural and human resources. This is not unconnected with the experience in some oil-producing African economies where an efficient cost cannot be attained in refining crude oil and transforming it into finished goods. In contrast,

the process's gains are transferred across the border, and the same finished good is repurchased at a higher value.

In addition, the indicator of reserves: months of import cover (economic crisis) varies directly with international reserves. The expectation is in line with this result, as the more significant the reserves, the more months of imports it can finance. Alternatively, the larger the reserves, the healthier the economy and its ability to absorb foreign exchange instability, which can distort budgetary financing or the sustainability of financing imports. Reserves ie. months of import cover suggest the dynamism of the export basket of an economy, which generates further foreign exchange and boosts the reserve volume. The evidence from Table 2 shows that economic stability (in terms of its reserves: months of import cover) raises the reserve volume.

Specifically, a unit increase in export dynamism leads to an approximately 53-unit accumulation in reserves. This evidence shows that dynamic economies that export manufactures and services tend to be relatively more prosperous and developed than their commodity export-dependent counterparts. This indicator of export dynamism and stability exerts the greatest influence on international reserves across all models estimated in this study. It shows the relevance of the call by development organisations and the continuous discourse for oil and other commodity-dependent economies to embrace horizontal diversification for oil and other commodity-dependent economies to embrace horizontal diversification of their export basket to escape the vicious cycle of commodity misalignment in pricing. Among the OPEC member states, Abu Dhabi, where there has been considerable diversification into tourism and hospitality, thereby reducing dependence on crude oil price earnings, leaves hope, especially for the African OPEC members, where there has been little commitment to attaining an expanded export basket.

As expected, natural resource dependence exerts a significant impact on the international reserves of OPEC member states because, in the average OPEC country, commodity exports (oil) constitute about 89.2 per cent of their entire merchandise exports. The majority of these economies are highly dependent on commodity exports for their foreign exchange earnings, fiscal expenditure and macroeconomic stability. Specifically, the result shows that every unit increase in resource exports accumulates reserves by about 65.4 units. Though the empirics sounds interesting and would suggest that a commodity-dependent economy should expand its commodity extraction and exports, it is necessary to note that excessive commodity dependence also creates a widening gap between consumer goods and food imports capable of yielding a negative substitution (net) effect. In buttressing the foregoing, the results show that GDP does not significantly influence international reserves. This is linked to the previously established fact that most OPEC member countries depend on commodity exports with little or no value addition for the bulk of their reserve earnings.

In the same manner, several of these economies are plagued with the Dutch disease. The discovery of oil led to the neglect of other prominent sectors of the economy, limiting productivity, exports volume and resisting economic opportunities. The discovery of natural resources, such as oil, precipitates a decline in other sectors and is incapable of ensuring domestic diversification to generate foreign exchange but exerts pressure on the economy by increasing consumer imports and food bills.

Table 4. Determinants of international reserves: controlling for the price of crude and exchange rate volatility

	(ols)	(fe)	(re)	(sgmm)
VARIABLES	Lresrs	Lresrs	Lresrs	Lresrs
L.lresrs				0.526***
				(0.0877)
crdpr_v	0.736*	0.283	0.736*	0.350
	(0.381)	(0.310)	(0.381)	(0.420)
exhr_v	−1.776**	1.090	−1.776**	−0.0603
	(0.769)	(0.795)	(0.769)	(0.945)
lnfr	−0.00869***	−0.00493***	−0.00869***	−0.00326***
	(0.00159)	(0.00134)	(0.00159)	(0.00102)
lfdi_in	−0.0307	−0.0572	−0.0307	−0.0803**
	(0.0476)	(0.0408)	(0.0476)	(0.0395)
Lencrs	0.962***	0.930***	0.962***	0.511***
	(0.0585)	(0.108)	(0.0585)	(0.187)
Lopns	0.898***	0.765**	0.898***	1.144**
	(0.178)	(0.324)	(0.178)	(0.511)
Lnrsdpc	2.017*	2.980**	2.017*	6.053***
	(1.057)	(1.389)	(1.057)	(1.024)
Lgdp	0.910***	1.431***	0.910***	0.298
	(0.0641)	(0.369)	(0.0641)	(0.194)
Constant	−1.173	−14.68	−1.173	2.857
	(1.545)	(9.133)	(1.545)	(3.856)
Observations	85	85	85	38
R-squared	0.958	0.687		
Number of id		9	9	4

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: output from the system.

The results show that foreign direct investment is significant but exerts a less proportionate effect on international reserves. The evidence that supports this result be discussed in two ways. First, most FDI inflows into resource-dependent economies are rent-seeking. They may not yield an impressive economic gain despite the domestic economy partly financing such initiatives using foreign earnings. The relatively weak institutions and the perception of the policy actors in most commodity-dependent economies encourage such manipulation in which the locals are deprived of economic resources with no compensation or economic benefit. A number of these scenarios have played out in African economies, where foreigners collude with government actors to grab economic resources and land to support the economy and livelihood in the foreigners' home countries. In Nigeria and other African countries, the agriculture, oil and gas, and steel sectors have witnessed unyielding direct foreign involvement. The local economy invests expensively without any corresponding economic benefits. After many years of heavy repatriation of value and transfer of economic resources to their home countries, such projects have been abandoned.

Secondly, the lower responsiveness of international reserves to changes in foreign direct investment could have resulted from the weak absorptive capacity of the locals to attract/absorb the skills and expertise of the expatriates/the technical assistance financed by the domestic government. This weakness in absorbing the necessary skills reflects the weakness in the social and physical infrastructures required to build the capacity of the national workforce. Finally, the composite governance indicator shows a significant and positive effect on international reserves, indicating that an effective governance framework is considered necessary in accumulating and maintaining a healthy reserve level.

Consequently, Table 4 shows the implication of crude oil price volatility and exchange rate volatility on the international reserves of OPEC member states. Table 3 already indicated the effect of the exchange rate and crude oil price on reserves. However, due to constant changes in these indicators and their critical role in influencing the volume of reserves for oil-rich resource economies, it also becomes pertinent to examine how their volatility influences the volume of reserves. The results show that the volatility of the crude oil price inversely impacts reserves. Specifically, 1 unit increase in the price of crude oil changes reserves by about 15 units.

Fluctuations in the crude oil price are significantly linked to reserves. In fact, the reserve receives the first impact of negative oil price volatility because crude oil price receipts are strongly linked to reserves due to the heavy concentration on oil price proceeds. Similarly, exchange rate volatility exerts a negative influence on reserves but with a lesser magnitude compared with the volatility of crude oil price. The exchange rate fluctuates, especially when it is incessant, due to the mal-alignment of foreign exchange inflow and outflow' i.e. when there are net flows. In this case, the pressure on foreign exchange to finance imports,

support overseas transactions and the repatriation of FDI gains weakens the local currency, resulting in a rising exchange rate. The rising exchange rate makes imports more expensive and further depletes the reserves due to the weak income elasticity of crude oil exports. Following the control for the volatility variables, the signs and the significance of the significant explanatory variables remain stable. The natural resource dependence, reserves in import months, and degree of openness directly affect international reserves and are important determinants of the same, while inflation rate, FDI inflows, and institutions inversely influence international reserves. For CEE countries (non-oil producers), the accumulation of IRs increased greatly after the global financial crisis. In contrast, Russia (a non-OPEC oil producer), which diversified its sources of oreign exchange-earning capacity, has maintained increasing IRs, from an average of $454.97 billion pre-COVID–19 to over $600 billion post-COVID–19.

Concluding remarks and recommendations

From the objective of the study, the long-run determinants of IR accumulation among OPEC members include inflation, economic crises, and crude oil dependence, which have differential impacts on the total reserves of the cartel members. While inflation is unfavourable for IRs externally, it is not also good on the domestic side. Equally, the exchange rate (which implies the use of the exchange rate system) is debilitating for these counties' accumulation and maintenance of IR. With this discovery, the question that must be answered is: What type of exchange rate management is used by the countries? OPEC members used variants of the floating exchange rate system. This means that the ER management is not entirely floating but managed, many under dirty floating.

On the positive side, the crude oil price, economic crises, and the openness of the economy are strong positive determinants of IRs among the members. Higher crude prices have always meant buyers of crude pay more; economic crises for most other countries have always been a blessing to OPEC members, as they tend to profit more from the ensuing instability of other countries and crises around the world. This is a significant contribution of this study. The openness of the economy to the world indicates a vital positive sign and is a new discovery as competition, though desired, has not been practised by most members. If the openness achieved by these economies could be positive at this level, then there is a need to open more. Generally, a higher level of production of goods and services will help boost the IRs for OPEC members, as indicated by the significance of GDP in the regressions.

The Sy-GMM outputs indicate that the crude oil price, exchange rates and GDP are insignificant in the estimation process. Crude oil price and GDP were positively insignificant, while the exchange rate was negatively insignificant. The outputs of these estima-

tions show that the inflation rate and FDI are negatively significant. FDI inflows were particularly negative with the estimations.

The paper concludes with the following recommendations to the cartel as a body. Firstly, economic openness should be practised as much as possible. This enables the individual countries to maintain an excellent competitive environment for their respective economy. At the same time, each of them should diversify from crude to other sustainable goods and services that can be exported. Secondly, in a crisis period among other countries, members should maximise production and exports to increase their IRs. Thirdly, policies or programmes that would make FDI inflows more stable and profitable must be explored and put in place in the long run. One common determinant for FDI in most OPEC members is the attraction to the extractive sector. Diversification should also encourage the inflows of FDI into other sectors of the economy. A contribution of the study lies in the fact that OPEC countries do not sufficiently diversify their economies to increase the production of other goods and services that can grow their IRs. Rather, they depend on the continuous export of crude, which subjects them to the vagaries of volatilities of the crude petroleum export market.

References

Adetiloye, K.A. (2015), *Business Investment and the Nigerian Investible Capital Hemorrhage in Financial Crises*, [in:] C. Das (ed.), *Handbook of Research on Globalization, Investment, and Growth-Implications of Confidence and Governance*, IGI Global, Hershey, pp. 416–436, https://doi.org/10.4018/978-1-4666-8274-0.ch020

Aizenman, J. (2008), *International Reserve Management and the Current Account*, [in:] K. Cowan, S. Edwards, R.O. Valdés (eds.), *Current Account and External Financing*, Central Bank of Chile, Santiago, pp. 435–474.

Aizenman, J., Ito, H. (2012), *Trilemma policy convergence patterns and output volatility*, "The North American Journal of Economics and Finance", 23 (3), pp. 269–285, https://doi.org/10.1016/j.najef.2012.03.002

Aizenman, J., Riera-Crichton, D. (2008), *Real Exchange Rate and International Reserves in an Era of Growing Financial and Trade Integration*, "The Review of Economics and Statistics", 90 (4), pp. 812–815, https://doi.org/10.1162/rest.90.4.812

Aizenman, J., Cheung, Y., Qian, X.W. (2019), *The currency composition of international reserves, demand for international reserves, and global safe assets*, "Journal of International Money and Finance", 102, 102120, https://doi.org/10.1016/j.jimonfin.2019.102120

Al Rousana, S., Sbia, R., Tas, B.K.O (2018), *A dynamic network analysis of the world oil market: Analysis of OPEC and non-OPEC members*, "Energy Economics", 75, pp. 28–41, https://doi.org/10.1016/j.eneco.2018.07.032

Al-Fattah, S.M. (2020), *Non-OPEC conventional oil: Production decline, supply outlook and key implications*, "Journal of Petroleum Science and Engineering", 189, 107049, https://doi.org/10.1016/j.petrol.2020.107049

Alberola, E., Erce, A., Serena, J.M. (2015), *International reserves and gross capital flows dynamics*, "Journal of International Money and Finance", 60, pp. 151–171, https://doi.org/10.1016/j.jimonfin.2015.09.003

Alfalih, A.A., Bel Hadj, T. (2020), *Foreign direct investment determinants in an oil abundant host country: Short and long run approach for Saudi Arabia*, "Resources Policy", 66, 101616, https://doi.org/10.1016/j.resourpol.2020.101616

Arellano, M., Bond, S. (1991), *Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations*, "The Review of Economic Studies", 58 (2), pp. 277–297, https://doi.org/10.2307/2297968

Bankole, A.S., Shuaibu, M.I. (2013), *International Reserve and Oil Price Movement: Evidence from Nigeria*, "Ibadan Journal of the Social Sciences", 11 (2), pp. 70–85.

Bond, S.S., Hoeffler, A., Temple, J. (2001), *GMM Estimation of Empirical Growth Models*, "Economics Papers", W21 (1), Economics Group, Nuffield College: University of Oxford.

Choi, W.G., Sharma, S., Strömqvist, M. (2007), *Capital Flows, Financial Integration, and International Reserve Holdings: The Recent Experience of Emerging Markets and Advanced Economies*, "IMF Working Paper", WP/07/151, https://doi.org/10.5089/9781451867152.001

Čech, Z., Jevčák, A. (2011), *International reserves in the CEE8 – lessons from the financial crisis*, "ECFIN Country Focus", 8 (2), pp. 1–8.

Dominguez, K.M.E., Hashimoto, Y., Ito, T. (2012), *International reserves and the global financial crisis*, "Journal of International Economics", 88 (2), pp. 388–406, https://doi.org/10.1016/j.jinteco.2012.03.003

Dooley, M.P., Folkerts-Landau, D., Garber, P. (2004), *An Essay on the Revived Bretton Woods System*, "NBER Working Paper National", No. 9971, National Bureau of Economic Research, Cambridge, https://doi.org/10.3386/w9971

Energy Information Administration (2021), *Annual energy Outlook 2021 with projections to 2050*, https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf (accessed: 2.06.2022).

European Central Bank (2006), *The Accumulation of Foreign Reserves*, "Occasional Paper Series", No. 43, https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp43.pdf (accessed: 17.03.2021).

European Central Bank (2012), *The external environment of the euro area*, "Economic and Monetary Developments. ECB Monthly Bulletin", June, https://www.ecb.europa.eu/pub/pdf/mobu/mb201310en.pdf (accessed: 21.03.2022).

Fischer, S. (2001), *IMF/World Bank International Reserves: Policy Issues Forum – Opening Remarks by IMF First Deputy Managing Director Stanley Fischer*, International Monetary Fund, http://www.imf.org/external/np/speeches/2001/042801.htm (accessed: 3.06.2022).

Frenkel, J.A., Jovanovic, B. (1981), *Optimal International Reserves: A Stochastic Framework*, "The Economic Journal", 91 (362), pp. 507–514, https://doi.org/10.2307/2232599

Gil-Alanaab, L.A., Dadgar, Y., Nazari, R. (2020), *An analysis of the OPEC and non-OPEC position in the World Oil Market: A fractionally integrated approach*, "Physica A: Statistical Mechanics and its Applications", 541 123705, https://doi.org/10.1016/j.physa.2019.123705

Gosh, A.R., Ostry, J.D., Tsangarides, C.T. (2014), *Accounting for emerging market countries' international reserves: Are Pacific Rim countries different?*, "Journal of International Money and Finance", 49 (A), pp. 52–82, https://doi.org/10.1016/j.jimonfin.2014.05.006

Ibhagui, O.W. (2020), *The Economic Performance Effects of Capital Flows in OPEC Member Countries*, "The Quarterly Review of Economics and Finance", 75, pp. 67–83, https://doi.org/10.1016/j.qref.2019.05.015

International Monetary Fund (2009), *International Monetary Fund. Annual Report*, http://www.imf.org/external/pubs/ft/ar/2009/eng/pdf/a1.pdf (accessed: 2.06.2022).

International Relations Committee Task Force (2006), *The Accumulation of Foreign Reserves*, "European Central Bank Occasional Paper", No. 43, February.

Irefin, D., Yaaba, B.N. (2011), *Determinants of foreign reserves in Nigeria: An autoregressive distributed lag approach*, "CBN Journal of Applied Statistics", 02 (2), The Central Bank of Nigeria, Abuja, pp. 63–82.

Jeanne, O., Rancière, R. (2006), *The Optimal Level of International Reserves for Emerging Market Countries: Formulas and Applications*, "IMF Working Paper", WP/06/229, https://doi.org/10.5089/9781451864892.001

Lane, P.R., Milesi-Ferretti, G.M. (2007), *The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004*, "Journal of International Economics", 73 (2), pp. 223–250, https://doi.org/10.1016/j.jinteco.2007.02.003

Lawrence, H.S. (2006), *Reflections on Global Account imbalances and Emerging Markets Reserves Accumulation*, Paper presented at J.K. Jha Memorial Lecture, March.

Lee, S.S., Luk, P. (2018), *The Asian Financial Crisis and international reserve accumulation: A robust control approach*, "Journal of Economic Dynamics and Control", 90, pp. 284–309, https://doi.org/10.1016/j.jedc.2018.03.010

Moosa, I.A. (1992), *The demand for international reserves by OPEC countries: some empirical estimates*, "OPEC Review", 16 (4), pp. 441–453, https://doi.org/10.1111/j.1468-0076.1992.tb00443.x

Okullo, S.J., Reynes, F. (2016), *Imperfect cartelisation in OPEC*, "Energy Economics", 60, pp. 333–344, https://doi.org/10.1016/j.eneco.2016.10.010

Olayungbo, D.O. (2019), *Effects of Global Oil Price on Exchange Rate, Trade Balance, and Reserves in Nigeria: A Frequency Domain Causality Approach*, "Journal of Risk and Financial Management", 12 (1), p. 43, https://doi.org/10.3390/jrfm12010043

Parnes, D. (2019), *Heterogeneous noncompliance with OPEC's oil production cuts*, "Energy Economics", 78, pp. 289–300, https://doi.org/10.1016/j.eneco.2018.11.023

Pineau, G., Dorrucci, E., Comelli, F., Lagerblom, A. (2006), *The Accumulation of Foreign Reserves*, "European Central Bank Occasional Paper", No. 43, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=807417 (accessed: 3.06.2022).

Plante, M. (2019), *OPEC in the news*, "Energy Economics", 80, pp. 163–172, https://doi.org/10.1016/j.eneco.2018.12.025

Razek, N.H.A., Michieka, N.M. (2019), *OPEC and non-OPEC production, global demand, and the financialisation of oil*, "Research in International Business and Finance", 50, pp. 201–225, https://doi.org/10.1016/j.ribaf.2019.05.009

Reddy, Y.V. (2006), *Foreign exchange reserves: new realities and options*, "BIS Review", 87, pp. 1–6, https://www.bis.org/review/r060921c.pdf (accessed: 20.05.2021).

Shin, H.S., Turner, P. (2015), *What does the new face of international financial intermediation mean for emerging market economies?*, "Financial Stability Review", 19, pp. 25–36.

Steiner, A. (2017), *Does the accumulation of international reserves spur inflation? A reappraisal*, "The North American Journal of Economics and Finance", 41, pp. 112–132, https://doi.org/10.1016/j.najef.2017.03.007

Summers, L.H. (2007), *Reflections on Global Account Imbalances and Emerging Markets Reserve Accumulation*, https://ideas.repec.org/p/ess/wpaper/id1042.html (accessed: 20.05.2021).

The World Bank (n.d.), *World Development Indicators*, https://databank.worldbank.org/source/world-development-indicators (accessed: 19.06.2020).

Williamns, M.V. (2005), *Foreign exchange reserves – how much is enough*, https://www.bis.org/review/r060123c.pdf (accessed: 11.03.2021).

Determinanty rezerw międzynarodowych w ramach Organizacji Krajów Eksportujących Ropę Naftową (OPEC)

Państwa członkowskie Organizacji Krajów Eksportujących Ropę Naftową (OPEC) są nieustannie przedmiotem zainteresowania mediów w obszarze cen i wielkości dostaw ropy naftowej na rynek międzynarodowy. Jedną z ekonomicznych przyczyn tego zainteresowania jest kwestia płynności i chęci gromadzenia rezerw międzynarodowych przez poszczególne kraje. W niniejszej pracy przeanalizowano determinanty tworzenia rezerw międzynarodowych w ramach organizacji na tle motywów utrzymywania rezerw. zmienne przyjęte na podstawie danych z lat 2005–2018 zostały przetestowane przy pomocy systemu uogólnionych metod momentów (Sy-GMM). Zmiennymi tymi były: inflacja, kursy walutowe, ceny ropy naftowej, stopień zależności od ropy naftowej, kryzysy gospodarcze i inne. Wyniki analizy pokazują, że inflacja miała ujemny wpływ zewnętrzny i wewnętrzny, podczas gdy napływ BIZ był istotnie ujemy. Kryzysy gospodarcze i otwartość gospodarcza miały statystycznie istotny, dodatni wpływ na akumulację rezerw międzynarodowych, natomiast ceny ropy i kursy walutowe nie były istotnymi determinantami akumulacji rezerw międzynarodowych. Artykuł rekomenduje maksymalizację wykorzystania możliwości, jakimi dysponują członkowie organizacji w czasie kryzysów gospodarczych, w celu gromadzenia rezerw, co umożliwi im uniezależnienie się od eksportu ropy naftowej i uwzględnienie w ich eksporcie także innych produktów oraz zwiększenie otwartości gospodarki na konkurencję, co powinno wzmocnić gospodarkę.

Słowa kluczowe: rezerwy międzynarodowe, Organizacja Krajów Eksportujących Ropę Naftową, ceny ropy naftowej, kursy wymiany, handel międzynarodowy

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.25

Generalized Trust, Helpfulness, Fairness and Growth in European Countries
A Revised Analysis

Jan Jacek Sztaudynger https://orcid.org/0000-0002-2622-7997
Ph.D., Full Professor at the University of Lodz, Faculty of Economics and Sociology
Department of Econometrics, Lodz, Poland
e-mail: jan.jacek.sztaudynger@uni.lodz.pl

Ewa Ambroziak https://orcid.org/0000-0003-1402-8381
Ph.D., mBank, Lodz, Poland

Paweł Starosta https://orcid.org/0000-0002-6231-4510
Ph.D., Full Professor at the University of Lodz, Faculty of Economics and Sociology
Department of Rural and Urban Sociology, Lodz, Poland
e-mail: pawel.starosta@uni.lodz.pl

Abstract

This research is an attempt to assess the impact of trust, helpfulness, and fairness on economic growth in Europe. The first part of the paper highlights the concept of social capital and the related concept of trust, while the second part gives an overview of selected research hitherto conducted on the subject. The third part presents an econometric growth model based on a modified Cobb-Douglas production function. The model we propose includes three interrelated variables: generalized trust, helpfulness, and fairness, which can be combined into an aggregated variable, called 'cooperation capital'. The pooled sample covers the years 2006–2018 and includes 22 European countries. European Social Survey data provides a chance to examine the previously inaccessible measurement of the impact of bridging social capital increase on economic growth. The results suggest that approximately 1/8 of economic growth (measured by the GDP growth rate) may be ascribed to the effect of an increase in cooperation capital. In addition, 86% of this

Received: 6.09.2021. Verified: 3.03.2022. Accepted: 18.05.2022

effect occurs with a 1–4 year lag. The three-component cooperation capital explains economic growth better than generalized trust exclusively. The estimated model suggests that an increase in helpfulness among people has the largest impact on economic growth. As the outcomes of this research also clearly show, fairness and trust are key factors for economic growth in Europe.

Keywords: bridging social capital, trust, helpfulness, fairness, economic growth, Europe

JEL: A13, C31, C33, O47, P24, Z13

Introduction

In social sciences, the importance of the relationship between social capital and the economy is widely recognized. The significance of social capital to the economy is generally interpreted in terms of the impact of social cooperation and institutional factors on economic phenomena. One of the main conditions for a more effective economy, and simultaneously an important component of bridging social capital, is generalized trust.

In this paper, we treat trust as an essential component of the capacity for social cooperation (Axelrod 1984). However, the effectiveness of collaboration is also based on the fair value of rewards received in the exchange process, the internalization of social norms (Blau 1964) and, to some extent, individuals' biological predisposition (Fehr 2009). These norms include credibility through fairness, which is expressed in the mutual conviction of both partners that they will observe the rules of fair play and will not deviate from either the mutually recognized principles or the general desire to cooperate. Along the same line, Coleman (1994), Cook and Cooper (2003), and Herreros (2004) underline fairness and a general desire to help others as principal factors in laying the foundations of trust. They have been incorporated into our present study as complementary factors to social capital and cooperation.

Credibility is a characteristic that relates to the partners involved in an interaction and represents their wishes and capabilities to respect the 'rules of the game' (norms) in the social milieu. As noted by Herreros (2004, p. 8), "trust reflects one's expectations concerning the credibility of other social partners". A general inclination to help others means that helping each other can thus be treated as a type of cooperative orientation (Cook and Cooper 2003), rooted in various socialization processes, which can either facilitate or weaken a general atmosphere of trust. The review of the surveys and experiments conducted by Cook and Cooper convincingly demonstrates the positive relationship between partners' credibility and orientation toward cooperation and willingness to engage in some form of collaboration (Cook and Cooper 2003).

The literature on the correlation between social trust and growth begins with Putnam's 1993 study in which he suggested that the substantial differences in economic perfor-

mance between northern and southern Italy could be explained by differences in social trust (see also Bjørnskov 2017).

At the end of the 20th and the beginning of the 21st century, there were attempts to assess the relationship between trust and long-run economic growth by means of econometric models. The first models by Knack and Keefer (1997), Whiteley (2000), and Zak and Knack (2001) combined data from international survey studies with macroeconomic data on GDP, fixed capital investments, and employment.

In these models, cross-sectional data (an average of 20–30 years) from the final three decades of the 20th century and a single measurement (related to one year) of trust were combined according to the values from social surveys. They made it possible to explain the differences in average economic growth for particular countries by means of varying trust levels. Hence, these models make it possible to analyze long-term differences in GDP growth.

In this article, we try to develop a thesis regarding the impact of trust on economic growth. As shown in Table 1, we analyze the level or increase in social capital variables and lags thereof. It seems that such an approach was not employed in either the early or recent literature.

Table 1. Comparison of initial econometric research with our present research

	Initial	Present
Bridging social capital	Trust (mainly generalized)	Cooperation capital: Generalized trust Helpfulness Fairness
Social capital measurement	One for each country	Several for 2002–2018 for each country
Data	Approx. twenty years average, cross-section	2002–2018 Pooled
Possible definition of social capital variables	Level	Level or increase
Possible analyses	Long term	Long term or short term
Time lags	Not possible	Up to 3 years

Source: authors' own considerations.

Pooled European Social Survey (ESS) data from 2002–2018[1] allow us to examine the impact of changes in trust on short-term fluctuations of economic growth; something that was previously impossible due to the lack of relevant data.

1 This is not panel data because samples are newly selected, and the set of countries varied over time.

The study was conducted for 22 European countries. It involved three related components: generalized trust (most people can be trusted), helpfulness (people mostly try to be helpful), and a sense of fairness (most people try to be fair). The combined variable containing all three components will be called **cooperation capital**. With respect to social interaction, we assume that helpfulness and the conviction about the trustworthiness of other individuals are generally the basis for trust and fairness (Coleman 1994).

Our definition of cooperation capital is related to the theory of rational choice **as well as** to the theory of attitudes. We focus on three components: trust toward others, willingness to help others, and adopting an attitude of fair play. These attitudes constitute the foundation for building a **social network, bridging social capital,** and constraining individuals from acting toward others solely based on egoistic motivations. Cooperation capital can be considered a significant part of bridging social capital. By limiting egoism, resources are created with a necessary level of intensity to engage in social interaction (Hechter 1988).

We consider the following general hypothesis:

Cooperation capital has both long-term and short-term positive impacts on economic growth.[2]

Based on the above hypothesis, we can formulate three sub-hypotheses:

- The three-component cooperation capital explains economic growth better than the most commonly used measure – generalized trust.
- Taking into account lags in the weights of generalized trust, willingness to help, and sense of fairness estimated in the model of economic growth allows one to better specify the role of cooperation in economic growth compared to a variable with equal weighting.
- An increase in helpfulness has the greatest importance for economic growth (due to the essential role of help in cooperation and economic activities), while trust and fairness have a smaller but still significant impact.

This article describes the meaning of generalized trust and gives examples of three initial econometric models of trust's impact on the economy. In the first section, we discuss the concept and meaning of generalized trust as well as cooperative capital. The second section focuses on reviewing the literature on the impact of trust on economic growth. The methodological part characterizes the operationalization of the main concepts and database. Next, we present our own econometric model of the impact of co-

2 From a theoretical perspective, we cannot find any basis for a determination on whether the level or the increase in cooperation capital influences economic growth.

operation capital (generalized trust, willingness to help, sense of fairness) on economic growth based on the ESS survey, while the last section is dedicated to the results of the model estimations.

Theoretical background

The concept and meaning of generalized trust

Psychologists and sociologists, as well as economists, note the importance of trust in social life. Psychologists treat trust as one of the cornerstones of interpersonal relationships, which allows for cooperation and, consequently, the maintenance of social and economic interactions. Sociologists see trust as one of the main sources of social integration beyond dyadic relationships, enhancing the durability of social order (Simmel 1997).

Economists consider trust to be an important non-economic factor for economic development. Marshall, recognized as the founder of neoclassical economics, noted early on that trust "permeates all life, like the air we breathe" (Marshall 1920, p. 165). However, Marshall's reflections, as well as Polanyi's (2001) subsequent suggestions, which highlight the importance of non-economic factors in economic development, have been omitted in mainstream neo-liberal analysis, which has been dominant since the mid-1970s.

With regard to the utilitarian concepts of neo-liberal analyses, it is worth mentioning the debate concerning the model of the under-socialized man (Granovetter 1985). It is mainly oriented toward achieving personal material benefits, choosing from the array of available alternatives the solution that leads to the maximization of individual benefits, and placing personal interest above the interests of the social group.

Views on the role of non-economic factors in economic development changed slightly following the publication of Schultz's article "Investment in Human Capital" (Schultz 1961), focusing on the importance of skills and education in the multiplication of wealth. Later on, the theory of institutional economics (North 1990) emphasized the significance of different types of social institutions, particularly the rules of law for economic efficiency.

The concept of social capital was reintroduced into academic discussion by Bourdieu (1986). It was then popularized in the 1980s and 1990s by Coleman (1988; 1994), Putnam (1993; 2000) and Fukuyama (1995), who provided further stimulus for analyzing the relationship between the degree of societal organization – characterized by a network of organizations, a set of norms, and in particular, the level of social trust – and economic development. As an integral component – and in some cases, even a synonym – of social capital, trust has become a subject of analysis to explain economic growth.

The essence of trust is the assumed relationship of reciprocity and expectation, reflected in the interaction parties respecting each other's interests. In this case, mutual expectations are a kind of platform for mutual understanding and sharing semantic meanings communicated by the interaction parties.

It can therefore be concluded that trust is A's positive attitude toward B, arising in situation X, resulting from A's knowledge or belief that B will not work to A's disadvantage. This approach is consistent with the position of Misztal, who stated that "to trust is to believe that the result of somebody's intended action will be appropriate from your point of view" (Misztal 1998, p. 24), as well as that of Gambetta (2010, p. 277), who writes that "trust (or, symmetrically, distrust) is a particular level of subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action […] and in a context in which it affects his own action." Mutual help "and our expressions of gratitude are social rewards that tend to make doing favors enjoyable, particularly if we express our appreciation and indebtedness publicly […] Besides, one good deed deserves another. […] The fact that furnishing benefits to others tends to produce these social rewards is, of course, a major reason why people often go to great trouble to help their associates" (Blau 1964, p. 16).

Therefore, trust is a consequence of ongoing or implied social interaction. It is an attitude in which the constitutive role is played by information about the subject or object of trust, together with the limited control of the agent who is trusting of the action and their assessment of the situation.

Information is the basis for describing and understanding the trusting agent's situation. The attitude of trust can result from verified knowledge (personal and/or expert) and established social stereotypes, as well as beliefs built on them. Information can also be the subject of trust in the case of confidentiality, i.e., keeping obligations and secrets, or even in the case of acts of treachery (see Simmel 1908). The ability to control is the result of the power resources available in particular social relations. They are the basis for the formation of credibility. The credibility of entities may, therefore, result from the application of sanctions, both through the use of external coercive measures and through possessed authority and social recognition. It may also be the result of direct experience, as suggested by proponents of the theory of self-contained benefits (Hardin 2006) and socialization processes (Watier and Markova 2006).

The assessment of a situation is based on shared norms and values. It is worth noting (Knight 2001) that the category of 'sharing' can relate to both knowledge of the content of norms and to an attitude of approval, ambivalence, or rejection thereof.

These arguments do not, however, lead us to reduce trust purely to knowledge. For the same reason, we do not treat it as an attitude based solely on rational calculation, or as an action. According to the general theory of attitude, we assume that trust is more a dispo-

sition to take an action rather than an action itself. We agree with the argumentation of Ahn and Ostrom (2008, p. 80) that "[t]rust itself is a kind of belief but not an action per se". Trust or belief, therefore, may, and often does, stimulate an action, but it is not a precondition for its undertaking.

In the literature, one may find proposals to distinguish different forms of trust: horizontal, vertical and generalized (Fukuyama 1995). In the analyses of the relationship between trust and economic development, authors most commonly treat the generalized form of trust as being synonymous with trust as such.

Its specificity lies in the fact that it is not generated on the basis of personal experience or exchange processes but on a belief in the existence of a positive human nature (Uslaner 2008), shaped by socialization processes (Simmel 1908) and/or the social processes of identification (Braithwaite 1998).

Generalized trust is an orientation that we adopt toward entities, outside of the field of direct experience. It is more an attitude toward the social setting, one that expresses our need to have bonds beyond attaining an individual interest. In other words, generalized trust "refers to the confidence in the credibility of others" (Macek and Markova 2006, p. 176).

The attitude toward generalized 'others' is a good premise upon which to assess the extent of a culture of trust or a culture of cynicism in a society (Sztompka 2007). If trust is shown *a priori*, it is more likely to lead to cooperation and is certain to reduce social tensions. It also facilitates overcoming prejudice and intolerance. However, too much of this optimism, not based on social experience, may lead to naivety and being easily manipulated. A good example of the consequences of excessive trust is society's misplaced confidence in quasi-banks and their various activities or in institutions that provide instant, on-the-spot loans. In an era of growing risks in the countries of Central and Eastern Europe, generalized trust, or the lack thereof, sometimes becomes, in the absence of access to information, a substitute for cognitive competence.

The impact of trust on economic growth in the literature

Since the late 1990s, social capital has been considered a variable of the econometric growth model. Existing empirical research results lead to the conclusion that there is a positive relationship between the level of generalized trust in a given society and economic growth measured by GDP per capita growth. Knack and Keefer (1997) were the first to find a strong correlation between trust and the long-run growth rate. Their research utilized data taken from the 1981 and 1991 World Value Surveys (WVS) for 29 countries from different continents operating within market economies, and it led to some interesting conclusions. First, they stated that "a ten-percentage-point rise in [the trust] variable is associated with an increase in growth of four-fifths of a percentage point" (Knack

and Keefer 1997, p. 1260). Second, they admit that the impact of trust on GDP growth is stronger in poorer countries than in wealthier ones. This is explained by the importance of non-formal and non-legal transactions made through informal agreements and the weakness of financial institutions in such countries. They also noted that a seven-point increase in the trust variable increases the share of investment in GDP by one percentage point.

The relationship between economic development dynamics, measured by GDP per capita, and the level of trust was also researched by Whiteley (2000). Starting with Barro and Sala-i-Martin's (1995) neoclassical model, he directly introduced the level of the trust variable into the analysis. In his work, the concept of trust assumes two forms: generalized and particularized trust. The indicator for the former is based on answers to the classic question, "Can most people be trusted?" The indicator for the latter is based on answers to questions about trusting members of one's own family and trusting fellow nationals (Whiteley 2000, p. 453). Based on an analysis of the main components, he concludes that what is most important for economic development is trust toward one's compatriots, followed by trust toward one's family, with trust toward people in general being the least important.

Whiteley's study of the relationship between trust and economic growth was based on data from the European Social Survey (ESS) in 34 countries in 1992. Furthermore, based on estimates, he concluded that social capital measured by the trust index is more important to economic growth than human capital, which is included in the classical growth models alongside investment rate, population growth, and the initial level of GDP.

Along the same lines as Whiteley (2000), Zak and Knack (2001) also studied the effect of trust on the growth of GDP per capita in 41 countries, averaged over the period 1970–1992. They estimated that an increase of 10 percentage points in trust would increase the annual growth rate of income per capita from 1.9% to 2.4% (i.e., by approx. 0.5 pp). This means an approximately one-quarter increase in the average dynamics of economic growth in the countries surveyed.

Econometric studies on the impact of trust on economic growth were thus initiated by Knack and Keefer (1997), Whiteley (2000) and Zak and Knack (2001). They confirmed the impact level of generalized trust on economic growth (see also Ambroziak, Starosta, and Sztaudynger 2016).

Having investigated a later period and a bigger sample size than the previous studies, Berggren, Elinder, and Jordahl (2008) found that, on average, the trust coefficient is half

as large as that indicated in previous findings. This also confirms Zak and Knack's results – that a growth in trust by 10pp facilitates GDP growth by as much as one quarter.[3]

Tabellini (2010), pioneering the use of composite measure questions, utilized answers to four WVS items: trust, respect for others, confidence in individual self-determination and obedience. He shows that the principal component variable[4] constructed from the four indicators of individual values and beliefs introduced above is strongly correlated with economic development in regions of Europe.

Gorodnichenko and Roland (2011) analyzed Schwartz Values Survey variables. Among them, embeddedness is significant, with a negative effect on long-run growth. Affective autonomy, intellectual autonomy, and egalitarianism are jointly positively significant in models of long-run economic growth. The survey variables influence growth through innovation.

While macro-level research on the national scale confirms the importance of the impact of trust on GDP per capita dynamics, the results of research conducted on the regional level are not as consistent regarding the significance of the relationship between these two variables. Beugelsdijk and van Schaik (2005), who analyzed 54 European regions based on the European Value Survey database for 1990, found a very high differentiation in the level of trust in European regions, from 5.5% in Sardinia in southern Italy to 64.6% in the eastern Netherlands. However, they state that the extent, or level, of residents' membership in a variety of social associations and organizations, explains economic growth in regions, in terms of GDP per capita, to a greater degree than trust.

Treating trust as a factor that explains economic growth can be justified by four arguments related to the ; investment activity, human capital, quality of institutions, and financial intermediation (Boulila, Bousrih, and Trabelsi 2008).

The essence of the first argument lies in reducing transaction costs and the reduced propensity to invest when there is a misleading level of trust. As Whiteley notes, "[…] when transaction costs are low, actors will be able to negotiate solutions to collective action problems more efficiently than could be achieved by outside regulations" (Whiteley 2000, p. 451).[5] The greater the trust, the greater the likelihood of cooperative action by members of a society. The translation of trust and cooperation into economic benefits usually occurs in two ways. First, as Warren (2008, p. 136) writes, "A relationship of trust ena-

3 Zak and Knack (2001) confirmed the hypothesis that there is a reverse causal direction in the low-trust/poverty trap. Poor societies are characterized by a low level of trust, which, in turn, slows economic growth and makes it difficult to escape poverty.

4 In our opinion, the principal component method eliminates the causal character of analysis.

5 See also Gur and Bjørnskov (2017). In a set of cross-country regressions, they note that delegation is a low-cost option when management decisions can be implemented without monitoring. Delegation is, however, risky and more likely to be profitable in higher-trust environments. High-trust environments will be characterized by a less formal hierarchy (Bjørnskov 2017).

bles the truster to benefit from the resources of the trustee and vice versa." Thus, trust extends access to others' resources, thereby increasing the chances of achieving additional benefits. Second, it encourages the establishment of all sorts of companies, initiatives and projects by merging small financial capital into larger financial institutions, capable of more complex tasks and competing more effectively in the market.

The second argument refers to the impact of trust and social capital on the growth of human capital and thus on a higher level of economic development Bjørnskov (2009). However, the phonomenon of "squaring the circle between effects of competition and cooperation in the educational system as well as allowing firms in countries with high social trust to demand a more educational workforce" shoud also be underlined (Bjørnskov 2012, p. 1347).

The third argument refers to the relationship between trust and institutions that provide economic growth. The greater the trust, the greater the tendency to legitimize the existing social inequalities, and the lesser the inclination to initiate conflicts, which weaken the effectiveness of the existing socio-economic system. As Knack and Keefer emphasized, "government officials in societies with higher trust may be perceived as more trustworthy and their policy pronouncements as thus being more credible" (Knack and Keefer 1997, p. 1253). Moreover, this greater trust leaves greater freedom of action to the state bodies responsible for economic policy, even if some decisions are not beneficial to society in the short term. Thus, greater trust facilitates policies aimed at long-term objectives. Economic growth – building human potential, as well as human and physical capital – is inherently a long-term phenomenon. This is why economic policy requires long-term objectives, which are facilitated by trust. A positive correlation between institutions and social trust has also been found in China. Cui stressed that a "higher level of social trust is conducive to economic growth. A one standard deviation increase in trust is associated with the increase in growth of 0.225 units of standard deviation, which is 0.638 percentage points. […] the effect of social trust depends on the quality of the institution, and this effect decreases with institutional strength" (Cui 2017, p. 1256).

The fourth argument refers to the relationship between financial market development and trust. Guizo et al. (2000) found trust to have a strong influence on financial development. Their study from Italy discovered that "in regions with high level of trust, individuals have more access to credits, more participation in the stock market and less resort to informal sources of finance" (Boulila, Bousrih, and Trabelsi 2008, p. 406). Meanwhile, Calderon, Chong, and Galindo (2001) found evidence of a significant association between a higher level of trust and financial deepening ratios.

The multitude of measures of social capital has encouraged researchers to search for the best instrument for explaining economic growth. Beugelsdijk and van Schaik (2005) found that economic growth is better explained by citizens' participation in various social associations and organizations than by trust. This is an argument for entering

both variables into the model simultaneously, or for a combined variable. Several variables, which represent trust in family members, compatriots, and people in general, were accounted for in the model employed by Whiteley in the form of a combined variable. We can thus infer that there is a more widespread conviction as to the need to analyze the impact of several variables representing social capital on economic growth. We will explore this further below.

The main **research problem** is encapsulated in the following question: To what extent does **cooperation capital**, including helpfulness, fairness, and generalized trust, have an impact on economic growth?

If the answer to the above question is positive, we can formulate three more detailed research questions:

1. Which component – trust, helpfulness or fairness – plays the most important role in economic growth? In other words, what weights should be assigned to the three components?
2. How does this impact break down over time? In other words, what time lags of trust, helpfulness or fairness should be used?
3. Is economic growth determined by the level of or the increase in cooperation capital? Is this a short-term or long-term determination?

Data and method

The study included 22 countries: Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Switzerland, Sweden, and the United Kingdom. The analyzed period covers the years 2002–2018. Due to the three-year lags, our model was estimated for the period 2007–2018 and 212 observations.[6] The macro data come from the Eurostat database. The survey pooled data were taken from the European Social Survey.[7] Because the variables of the cooperation capital were reported in even years, it was necessary to interpolate observations for the odd years (an arithmetic average of the surrounding years was applied).

6 The Referee drew our attention to the weights recommended for ESS data (European Social Survey 2014). We will apply these weights at the next stage of research.

7 "One possibility in developing more persuasive evidence of social capital effects is a broader use of survey data" (Durlauf and Fafchamps 2005).

The cooperation **capital** was measured by the respondents' choice:

1. *People mostly look out for themselves* (*0*) –> *People mostly try to be helpful* (*10*) – (**helpfulness**).
2. *Most people try to take advantage of me* (*0*) –> *Most people try to be fair* (*10*) – (**fairness**).
3. *You can't be too careful* (*0*) –> *Most people can be trusted* (*10*) – (**generalized trust**).

These questions were formulated for the first time by Rosenberg in 1956 (Paxton 1999, p. 105). The foundations on which respondents' relationships with fellow members of the community and region rest and are created characterize these choices. Fairness and helpfulness are treated here not only in altruistic terms but also in terms of investments, for which may pay back at a later date.

These three choices were recorded using the same 11-point scale (0–10), with 10 points meaning that the respondent fully agrees with the opinion that most people can be trusted, that most people act fairly, and that most people are helpful to others.

The correlation coefficients between levels of trust,[8] helpfulness and fairness are so high, and the variables are multicollinear (correlation coefficients above 0.9) that it is not possible to distinguish their impact on GDP growth. In addition, they are negatively correlated with GDP growth. We conclude that GDP growth should not be linked with the level of trust, helpfulness, or fairness.[9]

Comparing correlation coefficients for levels and increases, we can note that the coefficients between increases of the variables (with lags) are lower. The correlation coefficient increases of helpfulness, and two other components of cooperation capital (particularly compared with GDP growth coefficients) are still relatively high.

A panel EGLS (cross-section weights) method was used to estimate the model for all the analyzed countries.[10]

8 There are several models with the level of trust variable related to GDP growth, i.e., Knack and Keefer (1997), Whiteley (2000), and Zak and Knack (2001).

9 See also Ambroziak, Starosta, and Sztaudynger (2016).

10 The main aims of the ESS are to chart stability and change in social structure, conditions, and attitudes. It assumes that newly selected, cross-sectional samples are comparable. Based on this justification, we used panel estimation methods. Additionally, we assumed that the impact of social capital on economic growth is equal (the same) over both time and the 22 analysed countries. We partly reject the constant over time assumption.

The model and hypothesis of cooperation capital's impact on economic growth in European countries

To study the effects of the three measures of cooperation capital – helpfulness, fairness and trust – on economic growth, the neoclassical, constant returns to scale, augmented Cobb-Douglas production function was applied:

$$GDP_t = A_t L_t^{1-\beta} K_t^{\beta},$$

where:

GDP_t – product (GDP) in constant prices, in year t,

K_t – physical capital in constant prices,

L_t – labor,

t – time,

A_t – Total Factor Productivity.

We will use the dynamic version of the CD production function:

$$\overset{o}{GDP}_t = \overset{o}{A}_t + (1-\beta)\overset{o}{L}_t + \beta \overset{o}{K}_t.$$

After approximating the rate of physical capital by investment output ratio[11], we obtain the following function:

$$\overset{o}{GDP}_t = \overset{o}{A}_t + \alpha_1 \overset{o}{L}_t + \alpha_2 (investment / GDP)_t,$$

where:

$\overset{o}{GDP}_t$ – GDP growth rate,

$\overset{o}{L}_t$ – labor growth rate,

$\overset{o}{A}_t$ – total factor productivity growth rate.

We assumed that $\overset{o}{A}_t$ depends on three variables representing cooperation capital CooperationC (level or increase) and constant α_0:

11 This is a common practice mainly due to considerable difficulties in calculating the statistical value of fixed assets at constant prices.

$$\overset{o}{A}_t = \alpha_0 + f\left(CooperationC_t\right)$$

and get the following general growth model:

$$\overset{o}{GDP}_t = \alpha_0 + f\left(CooperationC_t\right) + \alpha_1 \overset{o}{L}_t + \alpha_2 (invest / GDP)_t . \quad (1)$$

There is no convergence variable in the model. In the world economy, we can observe a growing disproportion, growing divergence. Hence, the functioning of the real economy suggests that the assumptions of a long-term equilibrium and convergence are not appropriate. It can only be viewed as a club convergence. In some models of Romer and Lucas, convergence does not appear, or at least its incorporation in the model is dependent on a shortage of physical or human capital.

The current models analyzed cross-sectional data from the last three decades of the 20th century and single, one-time measurements of trust level. They make it possible to explain the long-term differences in the average rate of economic growth by means of different generalized trust levels.

The available pooled data from the European Social Survey from 2002 to 2018 provide a previously inaccessible opportunity to explore how the changes in trust (as well as changes in fairness and helpfulness) over time translate into short-term fluctuations in economic growth.

We use model (1), in which the GDP growth rate is dependent on the employment rate and the investment output ratio. An average annual rate of inflation was also added to the set of explanatory variables.[12] We also added a zero-one variable for the "crisis" years (2008 and 2009).

Based on existing models, including the ones described above, we tried to confirm the positive impact of the level of cooperation capital indicators on economic growth, which resulted in complete failure (wrong signs or insignificant structural parameters). Therefore, we did not confirm that, at the beginning of the 21st century, countries with a higher level of cooperation capital attained "permanently" higher economic growth.[13] According to the main research questions, we provide the general hypothesis:

Economic growth is positively affected by an increase in cooperation capital (generalized trust, helpfulness, fairness). It is a short-term impact[14].

12 See, for example, research on the negative impact of inflation on economic growth, e.g., Sidrauski (1967), Sarel (1996), and Barro (2013).

13 Different levels of social capital in such a case would have a divergent effect.

14 Adopting the first hypothesis would lead to the question of whether the difference in the social capital impact on economic growth in the 1990s and the beginning of the 21st century does not mean that

Based on the above hypothesis, we can formulate three sub-hypotheses:

1. The three-component cooperation capital explains economic growth better than the traditional one-element indicator of generalized trust. Employing all three variables better reflects the integrity of others, the mutual moral obligation, and thus the complex cooperation phenomenon (Axelrod 1984; Paxton 1999) than one component of trust.
2. Based on a two-stage estimation, the weights of the cooperation capital components can be determined, taking into account the lags. It means that weights of trust, willingness to help, and a sense of fairness, are not arbitrary (as is common practice) but estimated in the growth model. The variable determined in this way allows one to better specify the role of cooperation in economic growth compared to the variable with equal weights.
3. An increase in helpfulness has the greatest importance for economic growth (due to the essential role of help in cooperation and economic activities), while trust and fairness have a smaller but significant impact. Helpfulness may then be a necessary but insufficient condition for building trust and fairness. We assumed that the effects of trust, helpfulness, and fairness could be different and show, in the empirical section, that they are indeed different. There is no reason that such different phenomena should have equal effects. The other argument is that trust, fairness, and helpfulness are not simultaneous in time.
4. Help usually comes first, followed by our belief that somebody is fair. Finally, trust is built. Helpfulness is the first factor and the one that is crucial from the economic point of view. Everything in the economy happens between people. It is impossible to cooperate without help, and it is impossible to build a good relationship with somebody if he does not respond to the help given.

According to the general hypothesis, there are increases in the variables that constitute cooperation capital (helpfulness, fairness, trust) in the model. The model is as follows:

$$\overset{o}{GDP}_{i,t} = \alpha_0 + \alpha_1 \overset{o(+)}{L}_{i,t} + \alpha_2 (\overset{(+)}{investment} / GDP)_{i,t} +$$
$$\alpha_3 \overset{(-)}{\text{inf}lation}_{i,t} + \alpha_4 \Delta \overset{(+)}{helpfu\text{ln}ess}_{i,t} + \alpha_5 \Delta \overset{(+)}{fairness}_{i,t} +$$
$$\alpha_6 \Delta \overset{(+)}{trust}_{i,t} + \alpha_7 \overset{(-)}{crisis\_2008} + \alpha_8 \overset{(-)}{crisis\_2009} + \xi_{i,t}$$

previously an impact of the level of social capital determined economic growth while currently there is an impact of the increase of social capital.

where:

$\overset{o}{GDP}_{i,t}$ – GDP growth (for the country i, year t), constant prices, in %,

$\overset{o}{L}_{i,t}$ – number of employed, growth in %,

$investment/GDP_{i,t}$ – investment/GDP ratio, in %,

$inflation_{it}$ – CPI growth rate, in %,

$\Delta helpfulness_{it}$ – increase in average *helpfulness*,

$\Delta fairness_{it}$ – increase in average *fairness*,

$\Delta trust_{it}$ – increase in average *trust*,

crisis_2008 – dummy variable, 1 in 2008, 0 in other years,

crisis_2009 – dummy variable, 1 in 2009, 0 in other years,

i – subscript denoting country $i = 1, \ldots, 22$.

Expected parameter signs are given in parentheses above the variables.

The results of the model estimation

A panel EGLS (cross-section weights) method was used to estimate the model.[15] As mentioned earlier, the parameters of variables representing the level of cooperation capital were insignificant, often with a minus sign. The estimation results confirmed the hypothesis about the impact of increases in cooperation capital on economic growth:

Table 2. The basic model of GDP growth and increases in helpfulness, fairness and generalized trust, panel EGLS (Cross-section weights), 2007–2018, 212 observations

Variable	Basic model	
	Coefficient	Std. error
constant	**0.40**	0.50
$employed, growth_t$	**0.54*****	0.05
$(investment/gdp)_t$	**0.06*****	0.02
$inflation_{t-1}$	**–0.23*****	0.07
$(\Delta helpfulness_t + \Delta helpfulness_{t-1} + \Delta helpfulness_{t-2} + \Delta helpfulness_{t-3})/4$	**6.00*****	1.96

15 The basic model presented in Table 4 was also estimated using the fixed effect and random effects methods. Significantly worse results were obtained.

Variable	Basic model	
	Coefficient	Std. error
$\Delta fairness_{t-2}$	**2.63****	1.10
$(\Delta\ trust_{t-3} + \Delta\ trust_{t-4})/2$	**2.51****	1.12
crisis_2008	**–1.78*****	0.29
crisis_2009	**–3.96*****	0.35
IRland_15	**21.3*****	2.58
ESTONIA_2008_2009	**–5.91*****	1.58
R2 weighted	0.831	
Adjusted R2 weighted	0.823	
R2 unweighted	0.771	
S_e weighted	1.55	
JB	0.97	
***DW* weighted**	1.65	
F-statistic	99.0	

R^2 – goodness of fit, JB – Jarque–Ber test, *DW* – Durbin–Watson statistic, S_e – average residual error.
The coefficient is statistically different from 0 at the *** .01, ** .05, and * .10 levels.
Source: authors' own calculations.

The choices of delays are based on empirical model estimations. "Economic theory rarely provides a basis for specifying the lag lengths in empirical macro-models" (Stigum 2003, p. 388; see also Nerlove 1972; Holden 2005). The delays were chosen taking into account the F-statistic, t-statistic and adjusted R^2 values.

The explanation of delays is relatively intuitive: trust requires time. It is much faster to make sure that someone is helpful to me or to people in general. Usually, the next step is to believe in someone's fair incentives. Trust is built on the recognition of these two. Because of this time sequence, it is possible that an increase in helpfulness will affect economic growth first. The second argument is that the help is relatively directly linked to economic activity, which is not the case with trust. So, the influence of helpfulness is fast, which is not the case for the impact that indirect trust has on economic growth.

Let us explain the construction of the variable: $\Delta helpfulness_t + \Delta helpfulness_{t-1} + \Delta helpfulness_{t-2} + \Delta helpfulness_{t-3}$, for example. At the beginning, we introduce these variables to the model separately. As the numerical values of the estimated parameters were similar, we assumed that they were equal, and we summed up the Δhelpfulness variables. In addition, it helps to cope with the fact that the ESS survey is only available every other year.

All coefficients have the expected sign and are significant (at a significance level of 5% or lower).

The standard approach is three variables combined into one variable as a simple sum:

$$\Delta helpfulness + \Delta fairness_t + \Delta\ trust.$$

"This variable can be taken to denote the general moral basis of a society, a set of unwritten rules and norms that govern everyday life. Thus, we can argue here that … [this variable] indicates individuals' expectations that in general, others, unknown to him/her, will be helpful and fair in their everyday interactions" (Daskalopoulou 2019, p. 283). Unfortunately, in our model, the simple sum of variables (no lags) has a negative sign.

For comparison, we ran a model with three variables combined into one, with weights taken from the basic model:

$$\begin{aligned}\Delta Cooperation\ C = 6.00[(&\Delta helpfulness_t + \Delta helpfulness_{t-1} + \\ &\Delta helpfulness_{t-2} + \Delta helpfulness_{t-3})/4] + 2.63 \\ &\Delta fairness_{t-2} + 2.51(\Delta trust_{t-3} + \Delta trust_{t-4})/2.\end{aligned} \tag{2}$$

This variable is significant at the 0.0001 level.

The results confirm the hypothesis about the positive impact of increases in the components of cooperation capital on economic growth. For example, the parameter of variable Δ*helpfulness* indicates that the GDP growth rate is influenced by an increase in helpfulness from the current and three previous years – an increase of 0.1 points leads to a cumulative increase in economic growth by approx. 0.60 percentage points (ceteris paribus);

The influence of helpfulness is more than twice as strong as that of trust or fairness.

Among the 15 countries (Table 3), the average GDP growth between 2007 and 2018 was 1.8%. About 1/8 of it can be attributed to cooperation capital.

The most important positive role of cooperation capital growth was seen (CooperationC absolute share GDP growth from 1/4 to 1/3) in Finland, Hungary, the Netherlands, Portugal, and Slovenia.

Table 3. The increase in the cooperation capital effect and the average annual GDP growth for 2007–2018

No.	Country	Average annual %			CooperationC absolute share (2)/(1)
		GDP growth (1)	CooperationC effect equation (2)	GDP growth without CooperationC (3)	
1	Belgium	1.4	0.3	1.1	1/5
2	Finland	0.8	0.3	0.5	1/3
3	France	1.0	0.2	0.8	1/5
4	Germany	1.4	0.4	1.0	3/10
5	Hungary	1.4	0.3	1.1	1/4
6	Ireland	4.4	0.0	4.5	within statistical error
7	Netherlands	1.3	0.3	1.0	1/4
8	Norway	1.3	0.1	1.2	1/10
9	Poland	3.9	0.4	3.4	1/10
10	Portugal	0.5	0.1	0.3	1/4
11	Slovenia	1.5	0.4	1.1	1/4
12	Spain	0.8	0.1	0.7	1/10
13	Sweden	1.8	0.1	1.7	1/20
14	Switzerland	1.8	0.2	1.6	1/10
15	United Kingdom	1.3	0.2	1.1	1/8

Source: authors' own calculations based on the basic model presented in Table 2.[16]

In general, models with cooperation (social) capital variables have a much better fit than models without this variable.

Because of the relatively high[17] correlation between the components of cooperation capital, we built one combined variable with them. After replacing three increases in cooperation capital with the increase in combined cooperation capital (2) in the basic model, we obtained very similar estimates of the parameters, their significance, and the R^2 coefficients.

A difficult problem with creating combined variables is the arbitrary selection of weights. What weights should we give to the three measurements of social capital in our study, i.e., fairness, helpfulness, and trust? The simplest solution is to give each of them equal

16 If there is no increase in the cooperation capital in a country, the effect will be "zero".

17 Comparing the 0.4 correlation coefficient with 0.15, for example.

weight, with three lags "suggested" by the basic model.[18] This yields significant estimates. However, we obtained much better results when taking weights from the basic model (adjusted R^2 0.830 and 0.784, respectively).

Table 4. The increase in the cooperation capital effect and the average annual GDP growth in the sub-periods of 2007–2018

No.	Country	Period	Average annual %			CooperationC absolute share (2)/(1)
			GDP growth (1)	CooperationC effect equation (2)	GDP growth without CooperationC (3)	
1	Bulgaria	2011–2012	1.4	0.3	1.0	1/4
2	Cyprus	2011–2012	–1.5	–1.8	0.2	xxx
3	Czech Republic	2013–2018	2.9	0.4	2.4	3/20
4	Denmark	2007–2014	0.2	0.0	0.2	within statistical error
5	Estonia	2009–2018	1.8	0.5	1.4	1/4
6	Slovak Republic	2009–2012	1.3	–0.1	1.4	within statistical error

Source: as in Table 3.

The three components of cooperation capital (involving generalized trust, fairness, and helpfulness) explain economic growth better than the traditional, single generalized trust.

Conclusions

In the research, we investigated and expanded both the theoretical discussion of generalized trust and empirical analyses of the potential impact of the three components of bridging social capital on economic growth. We developed a commonly recognized thesis on the positive impact of generalized trust on economic growth (see Knack and Keefer 1997; Zak and Knack 2001). In addition to trust (most people can be trusted), we used two related components of social capital, helpfulness and fairness.

The model was estimated using a sample from 22 European countries between 2007 and 2018 (212 observations). In general, we confirmed our main hypothesis that economic growth is positively affected by an increase in cooperation capital (trust, willingness to help, and fairness). This is a new finding because, so far, the analysis of the role of trust in growth in the economic literature has usually not been connect-

18 In the case of weights determined arbitrarily, the lags are usually not used.

ed with the role of helpfulness and fairness. Additionally, the variables of social capital level (mainly the level of trust) were used. The long-term influence of cooperation capital level on economic growth was not confirmed in our analysis. Instead, we found short-term positive relations between economic growth and increases in trust, willingness to help, and fairness. In the surveyed countries, approximately one-eighth of their growth can be attributed to the growth in cooperation capital. This impact varied from 1/20 to 1/3 of the total value of economic growth.

In some countries, this influence is negligible.

We also support the first sub-hypothesis: The three-component cooperation capital explains economic growth much better than the one-component generalized trust. Most likely, this concept better reflects the mutual moral obligation, which is important for economic cooperation and effectiveness.

We also validate the second sub-hypothesis. Based on the econometric model estimation, the weights of the above components of cooperation capital (taking lags into account) can be determined. The lag cooperation capital variables, to the best of our knowledge, were not used, mainly due to the lack of statistical data and the long-term character of most of the investigated relationships.

The cooperation capital variable with the weights estimated in the basic model (Table 2) allows one to specify more precisely the role of cooperation in economic growth compared to the cooperation capital variable with equal weights. The standard model with equal weight without lags is much worse. An increase in cooperation capital affects economic growth in a current year only to a small degree; over 80% of the effect occurs with a lag of 1–4 years.

If we choose a cooperation capital variable with unequal weights, it will be possible to test sub-hypothesis 3. The basic model shows that the most important economic growth factor of cooperation capital is the increase in the willingness to help others, which can be explained by the critical importance of cooperation in economic activities. Approximately twice smaller but significant effects are associated with trust and fairness. Therefore, we confimed sub-hypothesis 3.

This article discusses three issues: the definition and importance of trust, a review of the models of the impact of generalized trust on the economy, and our model of economic growth with the increase in trust, willingness to help, and fairness variables, while considering lags.

During the global crisis of 2008 and 2009, called a crisis of trust, there was a GDP slowdown in the analyzed countries by approx. 1.8% and 4%, respectively. This constitutes an essential prerequisite for the continuation of the initiated analysis.

Our findings point to the conclusion that the most important potential areas of investigation are, firstly, the influence of the global crisis on the relationship between cooperation capital and economic growth. Secondly, when the optimal level of trust, willingness to help, and fairness are exceeded, the phenomenon of cooperation abuse intensifies so much that the cumulative effect on the economy will be negative.[19]

In summary, our analysis claims that helpfulness is a leading and more significant factor in explaining economic growth dynamics than generalized trust and fairness. This means that the intensification of fairness and trust is more likely when based on helpfulness.

The main policy implication of our research is the significance of the positive role of cooperation capital for social and economic development. The important, pragmatic task of government and local authorities should be to support trust, help and fairness, not only because of their moral values but also their impact on the economy.

References

Ahn, T.K., Ostrom, E. (2008), *Social capital and collective action*, [in:] D. Castiglione, J.W. Van Deth, G. Wolleb (eds.), *The Handbook of Social Capital*, Oxford University Press, Oxford, pp. 70–100.

Ambroziak, E., Starosta, P. Sztaudynger, J.J. (2016), *Zaufanie, skłonność do pomocy i uczciwość a wzrost gospodarczy w Europie*, "Ekonomista", 6, pp. 647–673.

Axelrod, R. (1984), *The evolution of co-operation*, Basic Books, New York.

Barro, R.J. (2013), *Education and economic growth*, "Annals of Economics and Finance", 14, pp. 301–328.

Barro, R.J., Sala-i-Martin, X. (1995), *Economic growth*, McGraw-Hill, New York.

Berggren, N., Elinder, M., Jordahl, H. (2008), *Trust and growth: a shaky relationship*, "Empirical Economies", 35, pp. 251–274, https://doi.org/10.1007/s00181-007-0158-x

Beugelsdijk, S., Schaik, T. van (2005), *Social capital and growth in European regions: an empirical test*, "European Journal of Political Economy", 21 (2), pp. 301–324, https://doi.org/10.1016/j.ejpoleco.2004.07.004

Bjørnskov, Ch. (2009), *Social trust and the of schooling growth*, "Economics of Education Review", 28 (2), pp. 249–257, https://doi.org/10.1016/j.econedurev.2006.09.013

Bjørnskov, Ch. (2012), *How Does Social Trust Affect Economic Growth?*, "Southern Economic Journal", 78 (4), pp. 1346–1368, https://doi.org/10.4284/0038-4038-78.4.1346

19 Due to the cooperation capital variable, it can be studied by introducing only one variable to the model – the cooperation capital variable squared. The first attempt was not satisfactory (see also Butler, Giuliano, and Guiso 2016).

Bjørnskov, Ch. (2017), *Social Trust and Economic Growth*, [in:] E.M. Uslaner (ed.), *The Oxford Handbook of Social and Political Trust*, Oxford University Press, Oxford, pp. 535–555, https://doi.org/10.1093/oxfordhb/9780190274801.013.24

Blau, P.M. (1964), *Exchange and power in social life*, John Wiley & Sons, Inc., New York.

Boulila, G., Bousrih, L., Trabelsi, M. (2008), *Social capital and economic growth: empirical investigations on the transmission channels*, "International Economic Journal", 22 (3), pp. 399–417, https://doi.org/10.1080/10168730802287994

Bourdieu, P. (1986), *The forms of capital*, [in:] C. Richardson (ed.), *Handbook of theory and research for Sociology of Education*, Greenwood Press, Westport, pp. 241–258.

Braithwaite, V. (1998), *Communal and Exchange Trust Norms; Their Value Base and Relevance to Institutional Trust*, [in:] V. Braithwaite, M. Levi (eds.), *Trust and Governance*, Russell Sage Foundation, New York, pp. 46–74.

Butler, J.V., Giuliano, P., Guiso, L. (2016), *The Right Amount of Trust*, "Journal of the European Economic Association", 14 (5), pp. 1155–1180, https://doi.org/10.1111/jeea.12178

Calderon, C., Chong, A., Galindo, A. (2001), *Structure of and development of financial institutions and links with trust: cross-country evidence*, "Inter-American Development Bank, Research Department, Working Papers", No. 444.

Coleman, J.S. (1988), *Social Capital in Creation of Human Capital*, "American Journal of Sociology", 94, pp. 95–120, https://doi.org/10.1086/228943

Coleman, J.S. (1994), *Foundations of social theory*, The Belkanap Press of Harvard University Press, Cambridge.

Cook, K.S., Cooper, R.M. (2003), *Experimental studies of cooperation, trust and social exchange*, [in:] E. Ostrom, J. Walker (eds.), *Trust and reciprocity*, Russell Sage Foundation, New York, pp. 209–244.

Cui, W. (2017), *Social Trust, Institution, and Economic Growth: Evidence from China*, "Emerging Markets Finance and Trade", 53 (6), pp. 1243–1261, https://doi.org/10.1080/1540496X.2016.1264299

Daskalopoulou, I. (2019), *Individual-Level Evidence on the Causal Relationship Between Social Trust and Institutional Trust*, "Social Indicators Research", 144, pp. 275–298, https://doi.org/10.1007/s11205-018-2035-8

Durlauf, S.N., Fafchamps, M. (2005), *Social Capital*, [in:] P. Aghion, S.N. Durlauf (eds.), *Handbook of Economic Growth. Vol. 1B*, Elsevier, Amsterdam, pp. 1639–1699, https://doi.org/10.1016/S1574-0684(05)01026-9

European Social Survey (2014), *Weighting European Social Survey Data*, https://www.europeansocialsurvey.org/docs/methodology/ESS_weighting_data_1.pdf (accessed: 15.05.2021).

Fehr, E. (2009), *On the Economics and Biology of Trust*, "Journal of the European Economic Association", 7 (2–3), pp. 235–266, https://doi.org/10.1162/JEEA.2009.7.2-3.235

Fukuyama, F. (1995), *Trust: The Social Virtues and The Creation of Prosperity*, Free Press Paperbacks, New York.

Gambetta, D. (2010), *Can we Trust Trust?*, [in:] E. Ostrom, T.K. Ahn (eds.), *Foundations of social capital*, Edward Elgar, Cheltenham, pp. 274–290.

Gorodnichenko, Y., Roland, G. (2011), *Which Dimensions of Culture Matter for Long-Run Growth?*, "American Economic Review", 101 (3), pp. 492–498, https://doi.org/10.1257/aer.101.3.492

Granovetter, M. (1985), *Economic action and social structure: The problem of embeddedness*, "American Journal of Sociology", 91 (1), pp. 481–510.

Guizo, L., Sapienza, P., Zinagales, L. (2000), *The role of social capital in financial development*, "NBER Working Papers", No. 7563, National Bureau of Economic Research, Cambridge, https://doi.org/10.3386/w7563

Gur, N., Bjørnskov, Ch. (2017), *Trust and delegation: Theory and evidence*, "Journal of Comparative Economics", 45 (3), pp. 644–657, https://doi.org/10.1016/j.jce.2016.02.002

Hardin, R. (2006), *Trust*, Polity Press, Cambridge.

Hechter, M. (1988), *Principles of Group Solidarity*, University of California Press, Berkeley.

Herreros, F. (2004), *The problem of forming social capital: Why trust?*, Palgrave, New York.

Holden, K. (2005), *Macroeconomic Forecasting*, [in:] D. Bleaney, M. Steward (eds.), *A Guide to Modern Economics Greenaway*, Taylor & Francis e-Library, London–New York, pp. 466–481.

Knack, S., Keefer, P. (1997), *Does social capital have an economic payoff? A cross-country investigation*, "Quarterly Journal of Economics", 112 (4), pp. 1251–1288.

Knight, J. (2001), *Social Norms and the Rule of Law; Fostering Trust in a Socially Diverse Society*, [in:] K.S. Cook (ed.), *Trust in Society*, Russell Sage Foundation, New York, pp. 354–373.

Macek, P., Markova, I. (2006), *Trust and distrust in old and new democracies*, [in:] I. Markova (ed.), *Trust and democratic transition in post-communist Europe*, Oxford University Press, Oxford, pp. 173–194.

Marshall, A. (1920), *Industry and trade*, Macmillan, London.

Misztal, B. (1998), *Trust in modern societies*, Polity Press, Cambridge.

Nerlove, M. (1972), *Lags in Economic Behavior*, "Econometrica", 40 (2), pp. 221–251, https://www.jstor.org/stable/1909403 (accessed: 23.05.2020).

North, D.H. (1990), *Institutions. Institutional change and economic performance*, Cambridge University Press, Cambridge.

Paxton, P. (1999), *Is Social Capital Declining in the United States? A Multiple Indicator Assessment*, "American Journal of Sociology", 105 (1), pp. 88–127, https://doi.org/10.1086/210268

Polanyi, K. (2001), *The great transformation*, Beacon Press, Boston.

Putnam, R.D. (1993), *Making democracy work: Civic traditions in modern Italy*, Princeton University Press, Princeton.

Putnam, R.D. (2000), *Bowling alone: the collapse and revival of American community*, Simon & Schuster, New York, https://doi.org/10.1145/358916.361990

Sarel, M. (1996), *Nonlinear Effects of Inflation on Economic Growth*, "IMF Staff Papers", No. 43, pp. 199–215.

Schultz, T.W. (1961), *Investment in Human Capital*, "American Economic Review", 51 (1), pp. 1–17.

Sidrauski, M. (1967), *Inflation and Economic Growth*, "Journal of Political Economy", 75, pp. 796–810, https://doi.org/10.1086/259360

Simmel, G. (1908), *Sociology*, Duncker & Humblot, Leipzig.

Simmel, G. (1997), *Filozofia pieniądza*, Fundacja Humaniora, Poznań.

Stigum, B.P. (2003), *Econometrics and the Philosophy of Economics: Theory-Data Confrontations* in *Economics*, Princeton University Press, Princeton.

Sztompka, P. (2007), *Zaufanie. Podstawa społeczeństwa*, Wydawnictwo Znak, Kraków.

Tabellini, G. (2010), *Culture and Institutions. Economic Development in the Regions of Europe*, "Journal of the European Economic Association", 8 (4), pp. 677–716, https://doi.org/10.1111/j.1542-4774.2010.tb00537.x

Uslaner, E.M. (2008), *Trust as a moral value*, [in:] D. Castiglione, J.W. Van Deth, G. Wolleb (eds.), *The handbook of social capital*, Oxford University Press, Oxford, pp. 101–121.

Warren, M.E. (2008), *The nature and logic of bad social capital*, [in:] D. Castiglione, J.W. Van Deth, G. Wolleb (eds.), *The handbook of social capital*, Oxford University Press, Oxford, pp. 122–149.

Watier, P., Markova, I. (2006), *Trust as a psychological feeling; Socialization and totalitarianism*, [in:] I. Markova (ed.), *Trust and democratic transition in Post-Communist Europe*, Oxford University Press, Oxford, pp. 25–46.

Whiteley, P.F. (2000), *Economic Growth and Social Capital*, "Political Studies", 48 (3), pp. 433–466, https://doi.org/10.1111/1467-9248.00269

Zak, P.J., Knack, S. (2001), *Trust and Growth*, "The Economic Journal", March, pp. 295–321, https://doi.org/10.1111/1468-0297.00609

Zgeneralizowane zaufanie, skłonność do udzielania pomocy, poczucie uczciwości innych a wzrost ekonomiczny w Europie. Zmodyfikowane ujęcie

Celem artykułu jest próba oszacowania wpływu postaw zaufania, pomocniczości i uczciwości na wzrost gospodarczy w krajach Europy. W pierwszej części tekstu skupiono uwagę na prezentacji koncepcji kapitału społecznego i na związanym z nim pojęciu zaufania, natomiast w kolejnej części dokonano selektywnego przeglądu literatury dotyczącej wpływu zaufania na rozwój ekonomiczny. Część trzecia zawiera prezentację ekonometrycznego modelu wzrostu gospodarczego, bazującego na zmodyfikowanej funkcji produkcji Cobba-Douglasa. Zaproponowany model zawiera trzy powiązane ze sobą zmienne: zgeneralizowane zaufanie, skłonność do udzielania pomocy (pomocniczość) oraz deklarowaną postawę stopnia uczciwości innych ludzi, które wyrażone są w postaci zmiennej zagregowanej, nazwanej przez autorów kapitałem współpracy. Próba badawcza, będąca podstawą analiz empirycznych, odnosi się do kolejnych rund badań przeprowadzonych w latach 2006–2018 w ramach Europejskiego Sondażu Społecznego w 22 krajach Europy. Dane zawarte w Europejskim Sondażu Społecznym, wykraczające poza wąsko rozumiane

zjawisko zaufania, dają pewną szansę na weryfikację niezbyt dotychczas dokładnego pomiaru wpływu kapitału współpracy i pomostowego na kształtowanie się poziomu wzrostu ekonomicznego. Uzyskane rezultaty analiz wskazują, iż w przybliżeniu 1/8 wzrostu (mierzonego wielkością stopy wzrostu GDP) może być traktowana jako efekt wzrostu zgeneralizowanego zaufania, pomocniczości i uczciwości. Ponadto odnotowano, iż 86% tego wpływu ujawnia się z opóźnieniem od roku do 4 lat. Przyjęte do analizy trzy zmienne cząstkowe lepiej wyjaśniają zmienność wzrostu gospodarczego niż wyłącznie poziom zaufania, który stanowił jedyną kategorię wyjaśniającą w większości dotychczasowych analiz. Wyestymowany przez autorów model sugeruje, iż spośród trzech analizowanych zmiennych cząstkowych największy wpływ na zmienność ekonomicznego wzrostu ma skłonność do wzajemnego udzielania sobie pomocy przez ludzi. Nie podważa to jednak faktu, że również zaufanie i uczciwość to istotne czynniki wpływające na wzrost gospodarczy w badanych krajach Europy.

Słowa kluczowe: społeczny kapitał pomostowy, zgeneralizowane zaufanie, pomocniczość, uczciwość, wzrost ekonomiczny, Europa

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 3, 2022
https://doi.org/10.18778/1508-2008.25.26

Demographic Changes in the Countries of the Western Balkans – A Comparative Analysis with the European Union

Agata Szymańska https://orcid.org/0000-0001-5184-931X
Ph.D., University of Lodz, Institute of Economics, Lodz, Poland, e-mail: agata.szymanska@uni.lodz.pl

Abstract

The study analyses the demographic changes in five countries of the Western Balkans – Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia – which are associated with and are potential candidates for European Union (EU) member states. Due to a lack of data, Kosovo was excluded. The research was based on selected measures, both static and dynamic. The analysis was conducted against the background of the indicators presented for the EU, with the longest time sample covering the years 1960–2020. The study presents the scope of demographic changes and the advancement of the population ageing of these countries using selected static measures and showing their dynamics. The methods used are based on data analysis and cluster analysis. The results point to the advancement of demographic changes and ageing in the region. The comparison of calculated measures indicates that the demographic structure in the region has shifted towards "old", with the share of people aged 65 and over higher than 14% in 2020. The most advanced stages concern Bosnia and Herzegovina, where the transformation from a "young" demographic structure to an "old" was very dynamic and deep.

Keywords: demographic ageing, Western Balkans, demographic changes, ageing index, population aged 65 and over, cluster analysis

JEL: J10, J11

Received: 2.11.2021. Verified: 2.03.2022. Accepted: 18.05.2022

Introduction

In recent years, almost all countries have experienced numerous demographic changes, including an increase in life expectancy and extended longevity. These changes affect population ageing and cause numerous socio-economic challenges for the countries experiencing them. In the European Union (EU), population ageing is advanced. While this phenomenon is analysed and assessed in detail by the European Commission for current member states, potential candidates are somewhat overlooked. In view of the Western Balkans' future membership in EU structures, although uncertain or distant, the lack of analysis to identify the demographic situation of the Balkan region regarding current EU trends may be detrimental to EU policies, especially the socio-demographic policy. The uniqueness of the Western Balkans and the determinants of demographic changes (military conflicts, ethnic conflicts, neglects in population and social policy) may be a significant challenge for the EU. Hence, it is necessary to compare and evaluate the progress in demographic changes and population ageing in the region. The comparison of the processes will make an important contribution to the literature of the subject, and this paper aims to fill the gap.

The term Western Balkans applies to six countries in Southern and Eastern Europe covered by the EU enlargement policy: Albania, Bosnia and Herzegovina, Montenegro, Kosovo, North Macedonia, and Serbia. The region has remained unstable since the wars of the 1990s, and in some cases, there are sustained conflicts or tensions between states. The problems in bilateral state relations are considered one of the critical points in the enlargement of the EU with Balkan accession (Petrovic and Wilson 2021).

The six Western Balkan countries are now at different stages of negotiations with the EU. North Macedonia applied for membership in 2004, followed by Montenegro in 2008 (accession talks began in 2012) and Albania in 2009 (but despite meeting all the EU's requirements, membership talks have not started yet). Serbia submitted its application for EU membership in 2009 (accession talks started in 2014 but were held up due to the worsening political relations with Kosovo). Meanwhile, Bosnia applied in 2016 and now is considered a potential candidate, as is Kosovo (in April 2016, the association agreement entered into force). Summing up, Bosnia and Herzegovina and Kosovo have the status of potential candidates, Albania and North Macedonia have the status of candidate countries, and accession talks have started in Serbia and Montenegro.

The empirical analysis of population ageing uses numerous measures to determine the advancement of the demographic process. Population ageing is understood as a process in which there is a noticeable increase in the number of elderly people (as a rule, people aged 65 and over) and an increase in the share of these people in the total population, with a simultaneous decrease in the number and share of people aged 0–14 years

(Holzer 2003; GUS 2014). In practice, numerous indicators are used to evaluate and describe ageing (Abramowska-Kmon 2011; Spijker 2015), including the demographic index, which is based on the share of older people (65 and over) in the total population, i.e. expressed as the following ratio $\frac{population_{65+}}{total\ population}$.

Rosset (1959) uses a similar indicator (the numerator includes people aged 60+) and proposes interpreting it as follows. Generally, society can be treated as demographically "young" if the share of 60+ is lower than 8%. If it is between 8% and 10%, then the society is in the early transition phase between "young" and "old". He considers a share between 10% and 12% to be the late transition phase, and when it is higher than 12%, it is demographic ageing. However, within demographic ageing, he distinguishes four additional phases: 12%–14%, i.e. initial, 14%–16% – moderate, 16%–18% – advanced, and 18% and higher – highly advanced.

Abramowska-Kmon (2011) points out the UN's definition, which is based on the share of people aged 65 and over in the total population. According to the UN, the population can be considered: young (the share of 65+ is less than 4%), mature (from 4% to 7%) and old (over 7%).

The literature offers many additional measures. When the "old" population is defined as the population aged 65+, then other popular indices and their formulas are: ageing index ($\frac{population_{65+}}{population_{0-14}}$), i.e. the number of people aged 65 and over per youth under 15; age dependency ratio ($\frac{population_{65+} + population_{0-14}}{population_{15-64}}$), i.e. a measure of the sum of people aged 0–14 and people aged 65 and over, compared with the total population aged 15 to 64. The indicator gives insight into the number of people of non-working age compared with the number of working-age people; young-age dependency ratio ($\frac{population_{0-14}}{population_{15-64}}$) is the ratio of the number of young people (i.e. aged 0–14) compared to the number of people of working age (i.e. 15–64 years old); old-age dependency ratio ($\frac{population_{65+}}{population_{15-64}}$) is the ratio of the number of elderly people, generally economically inactive, i.e. aged 65 and over, compared to the number of working-age people (i.e. 15–64 years old).

Regardless of the measure used, ageing impacts the economy and society in different ways, including pension systems, healthcare, the labour market, policy preferences, the welfare state and many other aspects (see, e.g. Iparraguirre 2019; Vlandas, McArthur, and Ganslmeier 2021; Razin and Schwemmer 2022).

Considering the above, the study presents the results of analysis concerning the demographic changes in the Western Balkan countries and compares them with the EU. They will allow us to assess how advanced the demographic changes of the Western Balkan are in relation to the EU, taking into account the status of these countries as associated countries and potential candidates for the EU. In particular, the study identifies trends and changes in the demographic structure of these countries and determines how advanced population ageing is.

The particular interest in the region results from these countries' potential accession to the EU. Thus, the study determines which of the analysed countries are the most similar to the EU regarding the indicators used to analyse the demographic changes and measures of advancement of ageing. It also assesses the extent to which these countries are similar to each other. A multidimensional method, cluster analysis, was applied. As a result, the methods used in the empirical parts of the study are based on the data analysis and the cluster analysis.

The study's value added is the complexity of the analysis of ageing in the Western Balkans and its comparison with the EU trend. The article fills a gap in the literature, related to the analysis of the ageing in the Western Balkans, all the more that the five Western Balkan countries are associated and potential candidates for EU membership.

A number of analyses are undertaken in this paper using static and dynamic indicators. The longest time sample includes data for the years 1960–2020. The main data sources are the World Bank's World Development Indicators (WDI) database and the United Nations Population Division (UN) data.

Demographic changes in the Balkan countries – General data analysis

This empirical section analyses the demographic processes in the Balkan region and compares the results among the five countries and with the EU average.

First, the population growth rate is analysed. Data availability allows us to analyse the time sample covering the period from 1960 to 2020. The population growth rates declined in all countries, but, generally, the decline in 2020 compared to 1960 for each analysed country was higher than the decline in the growth rate of the World's population. The generally declining trend fluctuated strongly in a few periods, which should be analysed within the history of the Balkan region. In particular, the breakup of Yugoslavia and numerous military and ethnic conflicts during the early 1990s related to this breakup should be mentioned, including the war in Croatia (1991–1995, mainly 1991–1993) or the war in Bosnia and Herzegovina (1992–1995). The conse-

quences are reflected in Figure 1 as strong negative growth rates (mainly caused by the deaths and the increased number of refugees or internally displaced).

Until the beginning of the 1990s, Albania had the highest population growth rate, but then there was a dramatic drop. In 1989, the population growth rate was 2.7%, in 1990, it was 1.8%, and in 1991, there was a decrease of –0.6% compared to 1990. The results denote a great change in population growth rate by 3.3 p.p. in 1991 compared to 1989. The sharp changes in Albabian population were associated, among others, with the dissolution of Yugoslavia, the end of communism in Europe, a civil war in the first half of 1997, and the Albanian army's involvement in the war in Kosovo (1998–1999).

In Bosnia and Herzegovina, the population growth rate in 1993 was –3.7%. From 1989 onwards, Bosnia's population decreased drastically – by approximately 772,000 between 1989 and 1997, i.e. from 4.508 million in 1989 to 3.736 million in 1997 (and from 4.508 million to 3.281 million between 1990 and 2020, i.e. by 1.23 million). This decline was related to the dissolution of Yugoslavia. In 1992 Bosnia and Herzegovina became independent. However, the launch of an independent state led to civil unrest among the different ethnic groups, resulting in the ethnic Bosnian War (1992–1995).

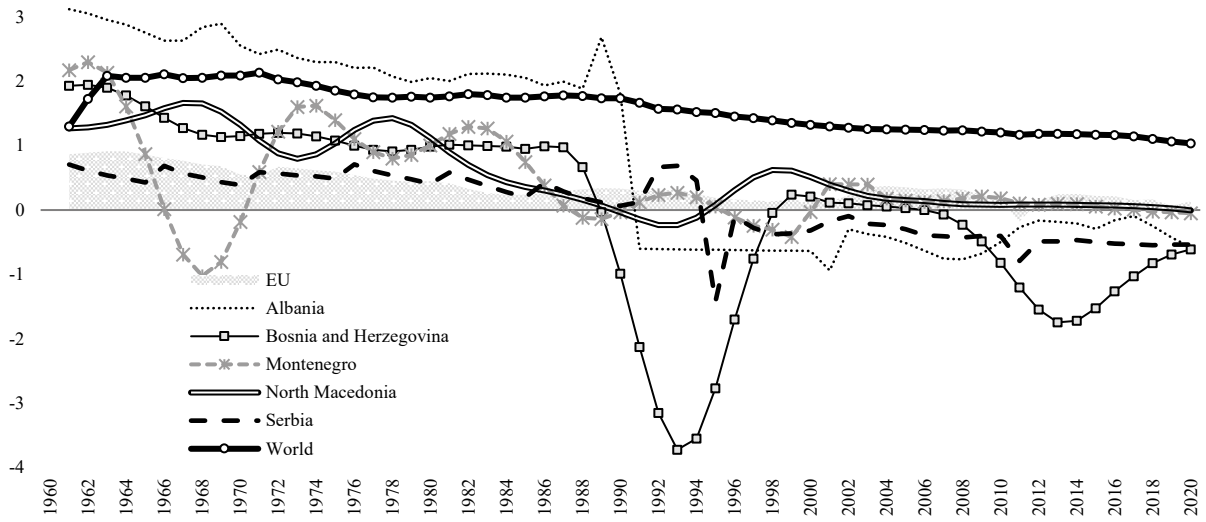


Figure 1. The growth rate of the total population in the five Balkan countries against the World and the European Union in the years 1960–2020

Source: author's own work based on World Bank (n.d.).

The next serious decline was observed at the beginning of the first decade of the 21st century. In 2013, Bosnia had the first civil census after the Bosnian War. The computed population growth rate in 2013 was negative (–1.745%), and that result was the second-highest registered decrease over the period 1960–2020, with the (already mentioned) highest negative growth rate in 1993 (–3.723%).

By contrast, since 2000, there has been quite a stable trend in the population growth rate in North Macedonia and Montenegro. Meanwhile, in Albania, there has been a small increase in the population growth rate since 2010.

An interesting observation is that since the beginning of the 2000s, the growth rate in the analysed countries was lower not only than the World's but also than the growth rate calculated for the EU. Generally, after 1995, the population growth rate in Albania and Serbia was negative. By contrast, in Bosnia and Herzegovina, it was positive between 1999 and 2006, in Montenegro, it was positive between 2001 and 2017, and in North Macedonia, it was generally positive, except for 2020, when the growth rate was –0.0037%. The change in the growth rate between 1961 and 2020 for all countries was negative, ranging from –3.7 percentage points (p.p.) in Albania (i.e. a decline from 3.12% in 1961 to –0.58% in 2020) to –1.24 p.p. in Serbia (i.e. from 0.71% in 1961 to –0.53% in 2020). By contrast, for the global population, the reduction was –0.26 p.p. (from 1.3% in 1961 to 1.04 in 2020), and for the EU, it declined by –0.74 p.p. (from 0.87% in 1961 to 0.13 in 2020).

Potential longevity is measured by the expected life. The appropriate indicators are presented in Table 1. Generally, the life expectancy at birth in the analysed countries was around 76–78 years in 2019. The highest was in Albania (78.6), and the lowest in Serbia (75.7). At the same time, the average EU citizen born in 2019 was expected to live longer (81.1). The longest expected life for women was in Albania (80.2) and in Bosnia (79.9). Between 1960 and 2019, the highest increase in life expectancy was in Bosnia. For women, it increased by 18 years, and for men by 16.2 years. The average increase in the total population was 16.2 years. At the same time, the average life expectancy of the World's population increased by 20.1 years, while for the EU, it was 12.1 years.

Table 1. Life expectancy at birth for male, female and total population, and the change in expected longevity from 1960 to 2019

		1960	1970	1980	1990	2000	2010	2019	Change 1960–2019
Albania	female	63.2	68.4	72.1	75.0	77.0	79.3	80.2	17.0
	male	61.3	65.5	68.5	69.1	71.2	74.1	77.0	15.7
	total	62.3	66.9	70.2	71.8	74.0	76.6	78.6	16.3
Bosnia and Herzegovina	female	61.9	68.2	73.0	74.3	76.9	78.5	79.9	18.0
	male	58.7	64.0	67.6	67.4	71.7	73.5	74.9	16.2
	total	60.4	66.2	70.4	70.9	74.4	76.0	77.4	17.0

		1960	1970	1980	1990	2000	2010	2019	Change 1960–2019
Montenegro	female	65.0	72.4	76.3	77.7	76.0	77.5	79.3	14.3
	male	62.5	67.3	69.6	71.3	70.5	72.8	74.4	11.9
	total	63.8	69.9	73.1	74.6	73.2	75.2	76.9	13.1
North Macedonia	female	61.1	67.4	70.5	73.2	75.8	76.7	77.8	16.7
	male	60.2	65.3	66.9	69.2	70.8	72.7	73.8	13.6
	total	60.6	66.3	68.6	71.2	73.3	74.7	75.8	15.2
Serbia	female	n.a.	n.a.	n.a.	n.a.	74.4	77.0	78.4	x
	male	n.a.	n.a.	n.a.	n.a.	68.9	71.8	73.1	x
	total	n.a.	n.a.	n.a.	n.a.	71.6	74.3	75.7	x
World	female	54.6	60.7	65.1	67.8	69.9	72.8	75.0	20.4
	male	50.7	56.6	60.8	63.3	65.4	68.4	70.6	19.9
	total	52.6	58.6	62.8	65.4	67.5	70.6	72.7	20.1
European Union	female	71.7	74.0	76.3	78.4	80.5	82.8	83.8	12.1
	male	66.5	67.9	69.4	71.2	73.8	76.7	78.4	11.9
	total	69.0	70.9	72.8	74.7	77.1	79.6	81.1	12.1

Source: author's own work based on World Bank (n.d.); n.a. denotes data not available.

The differences between the indicators for women and men living in the Balkan region were not high. For example, in 1960, in North Macedonia, the gap was 0.9 years, while in 2019, it was forecast to be four years. The largest gap in 2019 was expected for Serbia (5.3 years), while for the EU, it was 5.4 years.

The background for the analysis of demographic changes is shown in Table 2. Since the beginning of 2000, the region has been sharply affected by demographic processes. In Bosnia and Herzegovina and in Serbia, there have been low birth rates and high death rates.

Table 2. Fertility rate, birth rate and death rate in Balkan countries against the background of the World and the EU

	Albania	Bosnia and Herzegovina	Montenegro	North Macedonia	Serbia	World	EU
Fertility rate, total (births per woman)							
1960	6.49	3.80	3.60	3.84	n.a.	4.98	2.57
1970	4.91	2.93	2.74	3.16	n.a.	4.78	2.35
1980	3.62	2.12	2.24	2.49	n.a.	3.71	1.87

	Albania	Bosnia and Herzegovina	Montenegro	North Macedonia	Serbia	World	EU
1990	2.98	1.77	2.08	2.21	n.a.	3.25	1.63
2000	2.16	1.50	1.88	1.72	1.48	2.70	1.44
2010	1.66	1.32	1.76	1.47	1.40	2.52	1.57
2019	1.60	1.25	1.75	1.49	1.52	2.40	1.52
Birth rate, crude (per 1,000 people)							
1960	40.92	31.50	29.55	29.67	n.a.	31.75	18.74
1970	31.84	23.63	21.52	25.22	n.a.	32.38	16.39
1980	26.98	18.47	18.62	21.16	n.a.	27.42	13.97
1990	24.87	14.84	16.49	17.72	n.a.	25.88	12.16
2000	16.44	10.98	13.69	13.00	9.80	21.68	10.46
2010	12.00	9.26	12.51	11.11	9.40	19.81	10.45
2019	11.62	7.94	11.67	10.65	9.30	17.90	9.29
Death rate, crude (per 1,000 people)							
1960	11.33	9.66	9.90	10.58	n.a.	17.71	10.05
1970	8.00	6.95	7.35	7.45	n.a.	11.99	10.37
1980	6.29	6.28	6.74	7.19	n.a.	10.27	10.46
1990	5.99	7.71	7.16	7.55	n.a.	9.23	10.32
2000	5.91	8.29	9.75	8.30	13.80	8.59	9.95
2010	6.84	9.75	10.21	9.51	14.20	7.89	9.84
2019	8.08	10.88	10.75	10.14	14.60	7.52	10.39

Source: author's own work based on World Bank (n.d.); n.a. denotes data not available.

The Balkan region experienced a change in the death rate trend between 1980 and 2000, while the average death rate for the EU was quite stable. The dynamics of the data emphasise the faster decline in the fertility rate and birth rate in the region compared to the EU average. Comparing the last three decades with 1960 emphasizes the highest declines in fertility rate and birth rate in Bosnia and Herzegovina and in Albania. For example, in Albania, between 1960 and 2019, the fertility rate decreased by 75% and in Bosnia by 67%. Similarly, the birth rate in Albania in 2019 was lower by 72% compared to 1960, and in Bosnia by 75%. The low fertility rates emphasize the advancement of the region's natural depopulation and a very low sub-replacement rate.

The observed demographic process negatively affects the socio-economic conditions of the region, especially the labour market. The ratio of the non-working age population to the working-age population is reflected by the age-dependency ratio (see Figure 2).

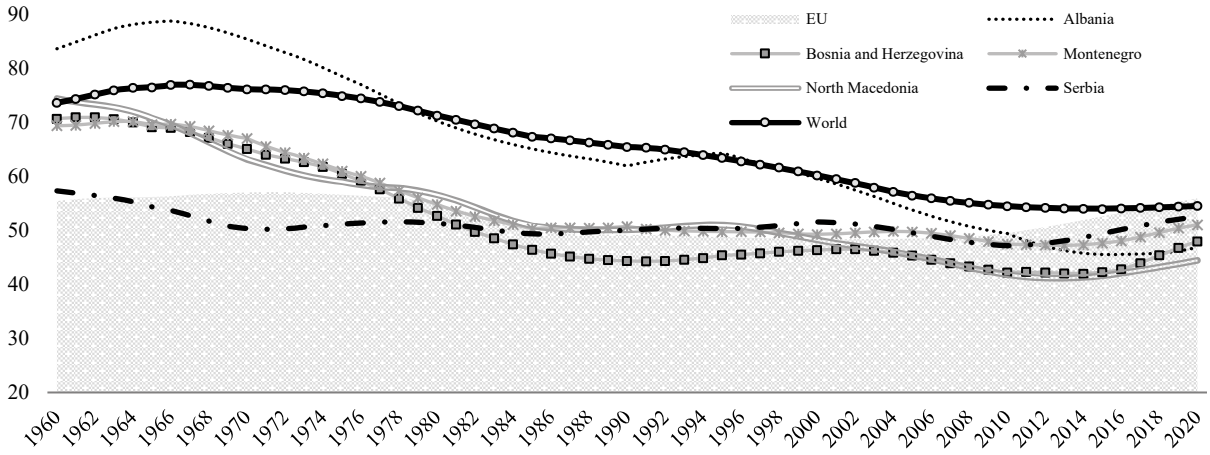


Figure 2. Age dependency ratios over 1960–2020 in Western Balkan countries against the World and the EU

Source: author's own work based on World Bank (n.d.).

The political situation and the conflicts of the 1990s shaped the formation of the age dependency ratio. Nevertheless, with the exception of Albania, the countries of the region showed a decreasing trend of the indicator, although the trend reversed at the beginning of the 2010s. For example, in Albania in 2020, on average, for every two people of working age, there was about one person of non-working age. The highest ratio of the sum of people aged 0–14 and 65+ to people of working age was in Serbia (52.5%) and Montenegro (51.1%), and the lowest was in North Macedonia (44.5%). However, at the end of the 2010s, the age-dependency ratios of the Balkan countries were lower than the EU average and lower than the world average (see Figure 2).

Additional information is given by the international migrant stock indicator – a measure of the number of people born in a country other than where they live, including refugees (UN SD 2017, p. 9). The estimates are derived from the data on people who reside in one country but were born in another. The indicators for selected years are presented in Table 3. It is worth looking at the data due to the potential effects of international migrant stock on the internal labour market.

The indicators differ greatly among the Western Balkan countries. For example, in 2019, the international migrant stock in Montenegro was 11.30% but only 1.08% in Bosnia. Albania also had a low value of the indicator, where the number of people born in another country was only 1.71%. The relatively high indicators for the EU might be a result of the free labour market for EU citizens and the ease of movement.

Table 3. International migrant stock as a percentage of the total population, selected years

	1990	1995	2000	2005	2010	2015	2019
Albania	2.01	2.29	2.45	2.10	1.79	1.80	1.71
Bosnia and Herzegovina	1.25	1.81	2.21	1.26	1.05	1.12	1.08
Montenegro	n.a.	n.a.	n.a.	n.a.	12.58	11.44	11.30
North Macedonia	4.77	5.51	6.18	6.20	6.26	6.29	6.30
Serbia	0.98	8.29	9.68	8.71	9.19	9.10	9.35
EU*	12.86	13.16	13.48	13.96	14.96	15.43	15.86

* calculated as a simple average
Source: author's own work based on United Nations data; n.a. denotes data not available.

Advancement of population ageing in the Western Balkan countries – Data analysis

Generally, the dynamics of ageing between 1960 and 2020 in the Balkan region can be analysed by a different set of indicators – both static and dynamic. Figure 3 presents the dynamics of the population aged 65 and over. The number of old people increased in Bosnia and Herzegovina by 5.3 times, whereas the global average increased by 4.8 times and in the EU by 2.7 times. Generally, the data indicate three periods of growth, with a decline in the 1980s and a decline at the beginning of 2010. The trend is generally applicable to all countries except for Albania. Figure 3 shows the disparity in dynamics between Bosnia and Herzegovina and the rest of the Balkan countries and the EU average.

Moreover, due to historical aspects, the analysis of the dynamic of the total "old" population should be extended by analysing the indicators that show the share of the old population in the total population, among others. Figure 4 shows the percentage changes of indicators for the share of the population aged 65 and over in the total population and the indicators for the share of the population aged 0–14 in the total population between 1960 and 2020.

The highest increase in the share of older people was in Bosnia and Herzegovina (by more than 420%), parallel with the highest decrease in the share of people at age 0–14 (i.e. a decrease of more than 62%). Despite this, in 2020, the lowest share of old age people was in North Macedonia and Albania, and the highest was in Serbia. In 2020, the indicator for Serbia was on a similar level to the EU average. Moreover, the percentage increase of the share of old people in Balkan countries over the last 70 years was not lower than 156% (from approximately 156% in Montenegro to more than 420% in Bosnia). Mean-

while, the percentage decline in the indicator measuring the share of young people was between 48.2% in Montenegro to nearly 62% in Bosnia and Herzegovina.

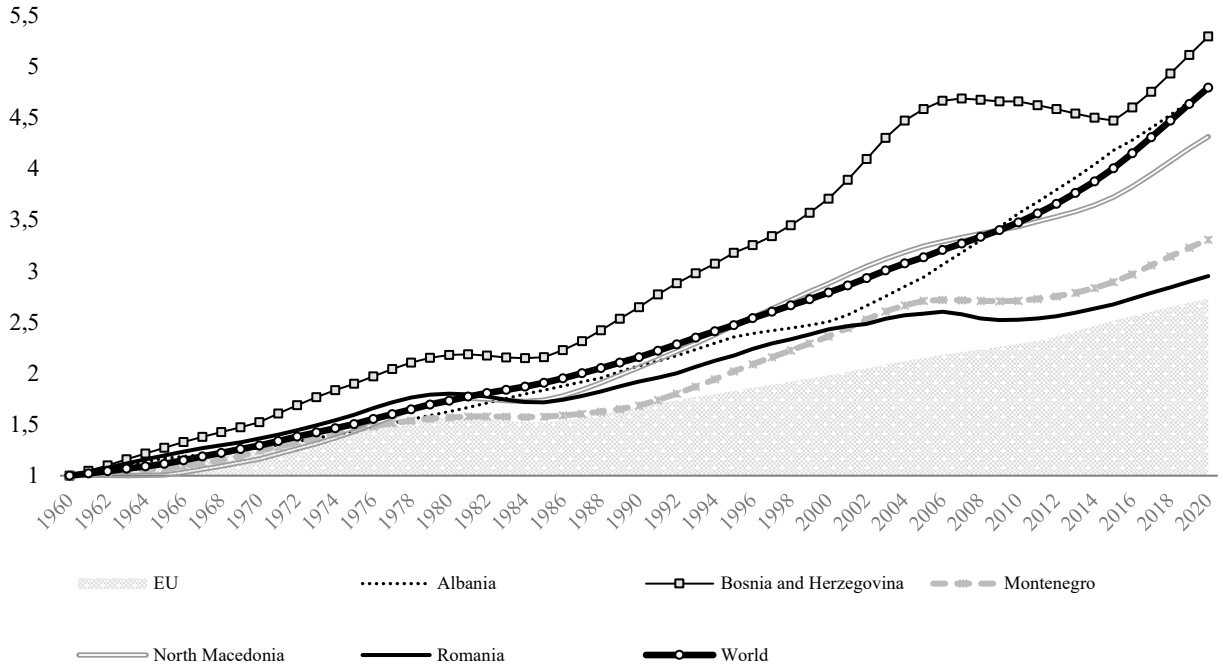


Figure 3. People aged 65 and over; the index for 1960 = 1

Source: author's own work based on World Bank (n.d.).

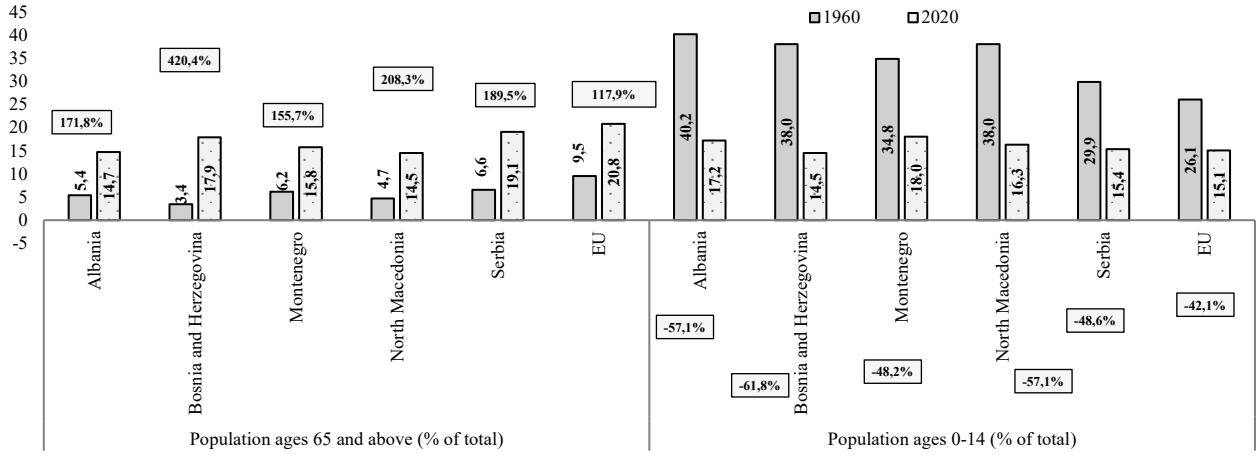


Figure 4. Share of population aged 0–14 in the total population and the share of people aged 65 and over in the total population in 1960 and 2020, and the percentage change between 1960 and 2020

Source: author's own work based on World Bank (n.d.).

The details regarding the dynamics of the two indicators are presented in Figure 5. The left panel illustrates the dynamics of the share of young people in the total popula-

tion, and the right shows the share of old people. The assumption for each index is that the value for 1960 is 1.

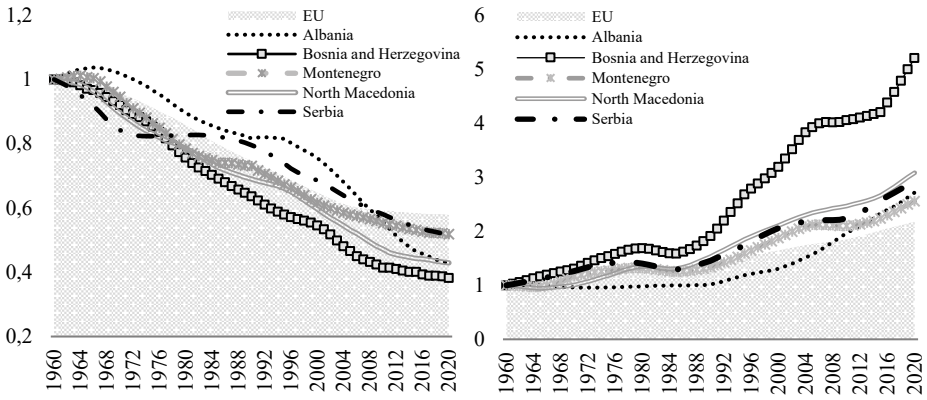


Figure 5. The dynamics of the share of the young population (left panel) and the old population (right panel) in the total population, 1960–2020; the index for 1960 = 1

Source: author's own work based on World Bank (n.d.).

The decrease in the share of the population aged 0–14 in Albania (between 1960 and 2010), Montenegro (period 1968–1990) and Serbia (1983–2008) was lower than in the EU (expressed by the highest indicator of the dynamics). In the other countries, or in the other periods, the change in the proportion was more dynamic, with the highest in Bosnia and Herzegovina. Figure 5 shows the advanced and dynamic increase in the share of people aged 65 and over in the total population, mainly since the mid-1980s. Starting in the 1990s, the Balkan countries, except for Albania, experienced higher dynamics than the EU average.

The analysis above can be supplemented with information about the old-age dependency ratio indicator, i.e. the ratio of the share of elderly (as a general, the population aged 65+) in the working-age population. Detailed data are presented in Table 4.

Table 4. The old-age dependency ratio and its dynamics in selected years, 1960–2020

Old-age dependency ratio, (% of working-age population)						
	Albania	Bosnia and Herzegovina	Montenegro	North Macedonia	Serbia	European Union
1960	9.94	5.88	10.45	8.19	10.36	14.80
1961	9.97	6.05	10.43	8.08	10.53	15.08
1970	9.64	7.43	12.03	7.71	12.52	17.84
1980	9.02	8.85	12.59	9.92	13.94	20.23
1990	8.90	9.51	12.43	10.82	14.38	20.13
2000	11.27	16.07	17.27	14.67	20.52	23.29

Old-age dependency ratio, (% of working-age population)						
	Albania	Bosnia and Herzegovina	Montenegro	North Macedonia	Serbia	European Union
2010	15.91	19.86	19.13	16.45	21.70	26.38
2020	21.61	26.52	23.83	20.92	29.06	32.40
Dynamics of the old-age dependency ratio; 1960 = 1						
1960	1.00	1.00	1.00	1.00	1.00	1.00
1961	1.00	1.03	1.00	0.99	1.02	1.02
1970	0.97	1.26	1.15	0.94	1.21	1.21
1980	0.91	1.51	1.20	1.21	1.35	1.37
1990	0.90	1.62	1.19	1.32	1.39	1.36
2000	1.13	2.73	1.65	1.79	1.98	1.57
2010	1.60	3.38	1.83	2.01	2.09	1.78
2020	2.17	4.51	2.28	2.55	2.81	2.19

Source: author's own work based on World Bank (n.d.).

Between 1990 and 2000, after a short period of a decline in the indicator (except for Serbia), there was a visible increase. In 2020, in Serbia, for almost every ten people of working age, there were three people aged 65 and over. In Albania, Montenegro and North Macedonia, for every ten working-age people, there were two "old" people. After 2000, the dynamics were fast in Bosnia. The acceleration is visible for all countries between 2000 and 2020.

Finally, the indices for ageing were calculated for the period from 1960 to 2020 for each country and for the EU as a whole, and the results for breaks of every thirty years are presented in Figure 6. The index shows the ratio of the population aged 65+ to the population aged 0–14.

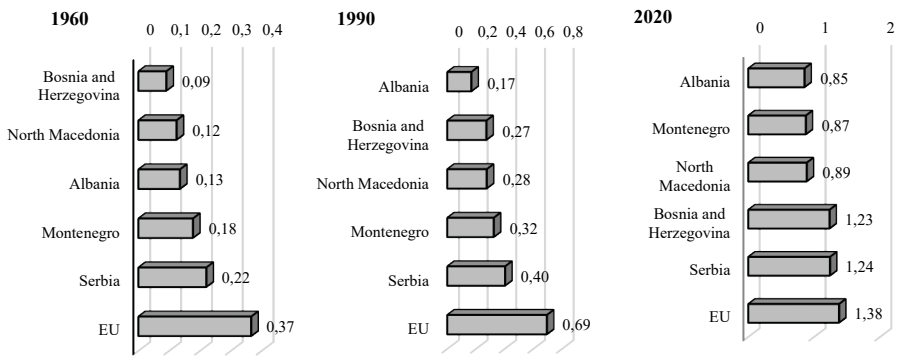


Figure 6. Ageing indices in 1960, 1990, 2020

Source: author's own work based on World Bank (n.d.).

The data show a significant increase in the index between 1960 and 2020, but the Balkan countries were below the EU average. In general, the highest indices were in Serbia except for 2006–2011, when they were slightly higher in Bosnia. Interestingly, between 1960 and 1969, the lowest computed indices were in Bosnia. Over the analysed period, it shifted its position from a generally "young" population to an ageing population. This indicates a deep change in the demographic structure of that country's population against the background of the region. From 1970 to 2020, Albania had the lowest ratio of people aged 65 and over to those aged 0–14. Between 1960 and 2020, the indicator increased by more than 3.7 times in the EU, by more than 13.6 in Bosnia, but only by 4.9 in Montenegro and 5.6 in Serbia. Figure 7 shows the indicators of dynamics of the calculated indices, presented for every ten years between 1970 and 2020 under the assumption that the value for the year 1960 equals 1.

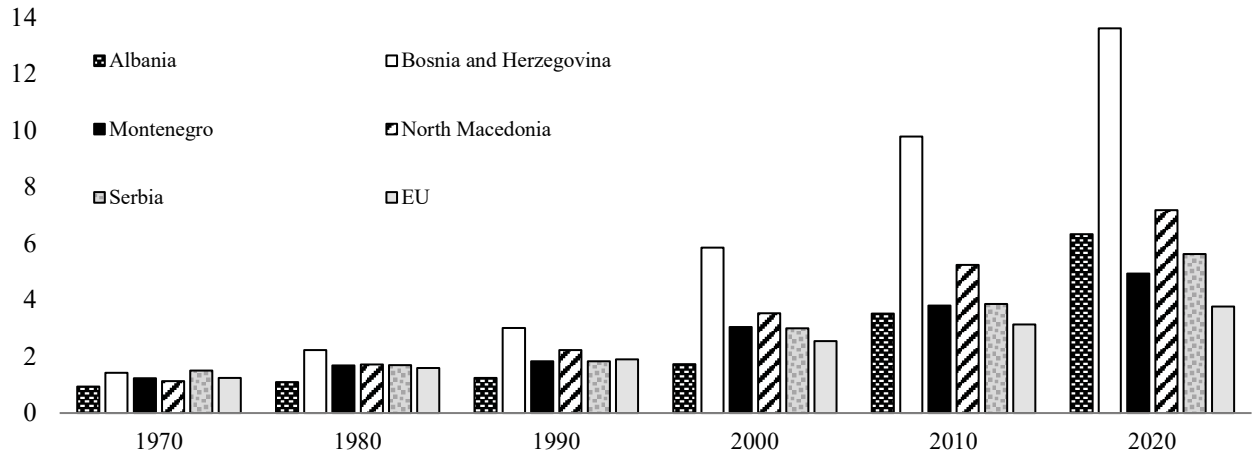


Figure 7. Changes in the ageing indices in the Balkan region against the EU, 1970–2020; the index for 1960 = 1

Source: author's own work based on World Bank (n.d.).

As Figure 7 shows, the Bosnian population was characterised by the largest dynamics of the indicator. The value of the ageing indices increased in Bosnia from 0.09 in 1960 to 1.23 in 2020, denoting a more than 13.61 times increase. The country with the second-highest dynamics was North Macedonia, where the ratio of people aged 65 and over to the population not older than 15 increased from 0.18 to 0.87 over that period. This is shown in Figure 7 by an increase of more than 7.18 times, while in the EU, it was 3.77 times.

Empirical comparison – The cluster analysis

In this part of the study, the results of using the hierarchical method of grouping objects – the cluster analysis – are shown. The algorithm makes it possible to analyse the similarity between objects (countries) from the point of view of the set of chosen variables. Cluster analysis is based on the distance between objects (see Bernstein, Garbin, and Teng 1988; Bailey 1994). In general, the greater the distance between objects, the lower the level of similarity. The most popular metric applied in cluster analysis is the Euclidean metric (Kaufman and Rousseeuw 2005; Everitt et al. 2011), which is represented by the formula:

$$d_{ij} = \sqrt{\sum_{i=1}^{p} (x_{ik} - x_{jk})^2}$$

where x_{ik} and x_{jk} are the k-*th* variable value of the p-dimensional observations for individuals *i* and *j*, respectively (Everitt et al. 2011).

In the applied cluster analysis, Ward's method (1963) is employed to measure the proximity between groups of individuals. In this method, the change in distance between clusters is defined as an increase in the sum of squares within the clusters (Romesburg 2004; Kaufman and Rousseeuw 2005). The advantage of Ward's method is that it is generally used with (squared) Euclidean distances (Sarstedt and Mooi 2014). Cluster analysis based on Ward's method is considered effective, although it tends to create small-sized clusters (Stanisz 2007).

In this study, the initial set of variables includes:

X_1 – population aged 0–14 (% of total population);

X_2 – population aged 65 and over (% of total population);

X_3 – ageing index;

X_4 – age dependency ratio (% of working-age population);

X_5 – fertility rate, total (births per woman);

X_6 – birth rate, crude (per 1,000 people);

X_7 – death rate, crude (per 1,000 people);

X_8 – old-age dependency ratio (% of working-age population);

X_9 – international migrant stock (% of the total population).

Due to missing data for the death rate, birth rate, fertility rate and international migrant stock in 2020, the last observation concerns the year 2019. Additionally,

the lack of data for Serbia for the period 1960–1994 and for the international migrant stock for Montenegro means that the final time sample is limited. The lack of data leads to difficulties comparing long-trend demographic changes over the available short time span. As a result, the cluster analysis is employed only for 2019. The data used come from WDI and the UN.

The condition of each of the countries and the EU, expressed by the set of chosen variables $X_1 - X_9$, is presented only for 2019. Selected descriptive statistics for that year are presented in Table 1A in the Appendix. The list of potential indicators is analysed from the point of view of their informative features. It is important that the set of variables used should be characterized by not high correlation (see Table 2A in the Appendix for a correlation matrix). The data should also be characterized by an appropriate level of variability (see Zeliaś 2004). Thus, the decision was made to reduce the list of variables.

As a result, the final list of indicators used includes:

- 1st set:

X_6 – birth rate, crude (per 1,000 people);

X_7 – death rate, crude (per 1,000 people);

X_8 – age dependency ratio, old (% of working-age population);

X_9 – international migrant stock (% of the total population).

- Or 2nd set:

X_3 – ageing index;

X_5 – fertility rate, total (births per woman);

X_7 – death rate, crude (per 1,000 people);

X_9 – international migrant stock (% of the total population).

The use of two lists of indicators makes it possible to compare whether the change in a set of demographic variables affects the similarity of the countries to the EU. Consequently, it checks the robustness.

The headline indicator, the index for the share of the population aged 65 and over in the total population, was excluded from further analysis due to high collinearity with another set of variables. Finally, before the cluster analysis, the variables were standardised. Based on the standardised variables, the distances between objects were calculated. The computed values allow for an initial assessment of the (dis)similarity of the analysed countries (see, e.g. Zeliaś 2004) to the EU average from the point of view of chosen variables. The results from the clustering algorithm are presented in Table 5.

Table 5. Matrices of Euclidean distances between objects in 2019 in cluster analysis

	Albania	Bosnia and Herzegovina	Montenegro	North Macedonia	Serbia	EU
2019 – variables in 1st set						
Albania	0.00	2.98	2.16	1.42	4.08	3.96
Bosnia and Herzegovina	2.98	0.00	3.12	2.35	2.56	3.10
Montenegro	2.16	3.12	0.00	1.31	2.71	2.62
North Macedonia	1.42	2.35	1.31	0.00	2.98	3.18
Serbia	4.08	2.56	2.71	2.98	0.00	2.40
EU	3.96	3.10	2.62	3.18	2.40	0.00
2019 – variables in 2nd set						
Albania	0.00	2.95	2.30	1.44	3.79	3.61
Bosnia and Herzegovina	2.95	0.00	3.82	2.22	2.82	3.18
Montenegro	2.30	3.82	0.00	1.85	2.81	2.73
North Macedonia	1.44	2.22	1.85	0.00	2.66	2.74
Serbia	3.79	2.82	2.81	2.66	0.00	2.38
EU	3.61	3.18	2.73	2.74	2.38	0.00

Source: author's own work.

The algorithm used as a linking method within the cluster analysis gives the output as a dendrogram. The dendrograms for the cluster analysis for both sets of variables are presented in Figure 8. Using cluster analysis, it is possible to divide objects into the smallest groups of similar objects.

The results of the cluster analysis were interpreted in two ways: 1) do the Balkan countries differ from the EU average, and 2) how similar are these countries to each other.

The assessment of the similarity of the five analysed Balkan countries to the EU average shows that Serbia is the most similar, regardless of the set of demographic variables. In 2nd set, Serbia is still the most similar to the EU, but its similarity is slightly higher than in 1st set, as shown by the shorter distance between these two objects. In 1st set, Albania differs significantly from the EU and the other Balkan countries, but in 2nd set, its distance to the EU is shorter.

The results also allow us to divide the countries into clusters. Considering the distances and linkages, the proposition is to divide the dendrograms into two clusters in both sets of variables. In each case, the structure of clusters is as follows: (1) the EU, Serbia, Bosnia and Herzegovina, (2) North Macedonia, Montenegro and Albania.

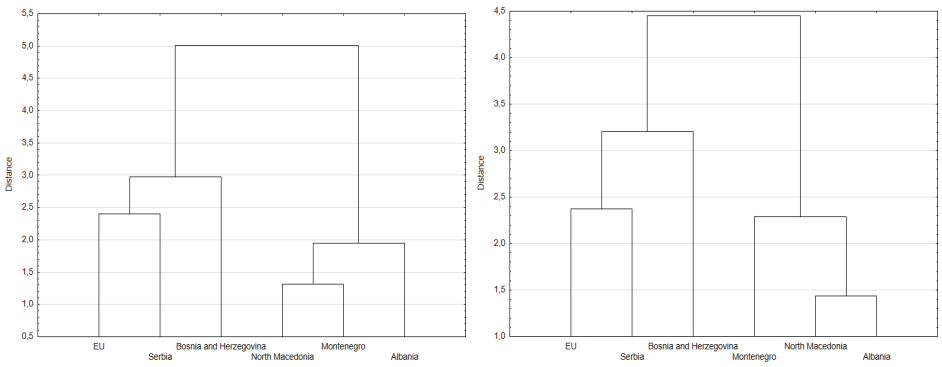


Figure 8. Results of cluster analysis for 2019 and two sets of demographic variables (1st set – left panel, 2nd set – right panel)

Source: author's own work.

Detailed analysis of the value of the variables among objects inside the two clusters reveals that in 1st set, the countries incorporated into the first cluster had the lowest birth rates in 2019 but one of the highest death rates. It also had the highest old-age dependency ratios, i.e. it includes objects with quite an old demographic structure. By contrast, the second cluster had the lowest death rate and a relatively low old-age dependency ratio.

For 2nd set, the division into two "blocks" meant that cluster (1) was formed by objects with the lowest fertility rates and relatively high ageing index, i.e. objects with an ageing structure of society. The opposite was true for cluster (2), which had the highest fertility rate in 2019, and the lowest ageing index.

Conclusions

The study aimed to identify and present the most important demographic changes in the countries of the Western Balkans. These changes were also considered against the background of the EU due to the status of these countries associated and potential candidates for EU membership.

The main conclusions of the study may be formulated as follows. The countries are at an advanced stage of demographic changes. While the analysis of static indicators shows that the average size of demographic changes in the EU is stronger than in the Western Balkans, the measures of dynamics indicate a more advanced pace in the Western Balkans, especially in Serbia or Bosnia. Both countries were also the most similar countries to the EU in terms of selected static demographic indicators in 2019, regardless of the set of variables used.

In this study, the advancement of old age is shown by, among others, an index of the share of people aged 65 and over in the total population, which in 2020 was

above 14% in these countries. Adopting the UN definition, these countries should therefore be considered to have an "old" demographic structure. The fertility rate in these countries was low, generally below 2, especially in Bosnia (1.25 in 2019), while in the EU, it was 1.52. This affects natural depopulation and problems replacing generations. The ageing index also shows that the population structures in Western Balkans are ageing. In 2020, in Serbia and Bosnia, the ratios of people aged 65 and over to people aged under 15 were higher than 1.

The demographic processes were strongly associated with the region's history, especially many ethnic or civil conflicts, including military conflicts, the dissolution of Yugoslavia, and periods of intense emigration and very low immigration to the Balkan region. Additionally, the migration policy in these countries was not clear or well-regulated. It affects problems with data availability and the quality of the demographic data. The ageing of the Balkan population also depends on factors including an increase in life expectancy (between 1960 and 2020, the increase was higher than in the EU) and a constantly declining birth rate.

As outlined by the scientific goal of the study, the research shows the advancement of demographic processes in the Western Balkans. The processes were compared to the EU average. Based on the selected demographic indicators, the results imply that in 2019, the EU was most similar to Serbia and most different to Albania. The results of the similarity analysis show that the five countries were a heterogeneous group. The cluster analysis for 2019 shows that the distance between the group that comprises Serbia and Bosnia and the group with Montenegro, Albania and North Macedonia was quite large, indicating dissimilarity.

The comparison of calculated measures indicates that the demographic structure in the Western Balkans has become "old", with an increasing share of people aged 65 and over in recent decades. The analysis clearly demonstrates the advancement of ageing in Bosnia. Considering the processes between 1960 and 2020, it can be indicated that Bosnia experienced the most advanced changes in population ageing. Meanwhile, the reproductive capacity of its population in 2019 was the lowest. The empirical evidence of the research is an important step towards better understanding how population ageing might affect government policies. The consequences of the changes, without any or with insufficient support from the government or the EU, may be serious for the country and the region.

In the Western Balkans, as in the EU, the balance between retired people (old-age population) and those of working age has been worsening, leading to a shrinking labour supply (base of taxpayers) and causing problems with financing pensions of the increasing number of elderly. Another implication is related to the conclusion that ageing, parallel to economic effects, also involves many social consequences and affects other areas of public space (e.g. longer life requires medical care and creates demand for other public services). However, the preparation and readiness of the region to accede to the EU

may influence some areas of public policies in these countries, mainly aimed at pro-natal issues or migration policy, potentially mitigating severe demographic changes.

This research was supported by the National Science Centre in Poland (grant number 2017/27/N/HS4/01878).

References

Abramowska-Kmon, A. (2011), *O nowych miarach zaawansowania procesu starzenia się ludności*, "Studia Demograficzne", 1 (159), pp. 3–22.

Bailey, K.D. (1994), *Typologies and taxonomies: An introduction to classification techniques*, "Sage University Paper Series on Quantitative Applications in the Social Sciences", Vol. 07–102, Sage, Thousand Oaks.

Bernstein, I., Garbin, C., Teng, G. (1988), *Applied Multivariate Analysis*, Springer, New York, https://doi.org/10.1007/978-1-4613-8740-4

Everitt, B.S., Landau, S., Morven, L., Stahl, D. (2011), *Cluster Analysis*, John Wiley & Sons, Ltd., Hoboken, https://doi.org/10.1002/9780470977811

GUS (2014), *Sytuacja demograficzna osób starszych i konsekwencje starzenia się ludności Polski w świetle prognozy na lata 2014–2050*, Departament Badań Demograficznych i Rynku Pracy, Warszawa.

Holzer, J.Z. (2003), *Demografia*, Polskie Wydawnictwo Ekonomiczne, Warszawa.

Iparraguirre, J.L. (2019), *Economics and ageing: Volume III : Long-term care and finance*, Springer Nature, Switzerland, Palgrave Macmillan, Cham, https://doi.org/10.1007/978-3-030-29019-1

Kaufman, L., Rousseeuw, P.J. (2005), *Finding groups in data: An introduction to cluster analysis*, John Wiley & Sons, Inc., Hoboken.

Petrovic, M., Wilson, G. (2021), *Bilateral relations in the Western Balkans as a challenge for EU accession*, "Journal of Contemporary European Studies", 29 (2), pp. 201–218, https://doi.org/10.1080/14782804.2020.1865884

Razin, A., Schwemmer, A. (2022), *Ageing and Welfare State Policy: A Macroeconomic Perspective*, "Journal of Government and Economics", 5, 100030, https://doi.org/10.1016/j.jge.2022.100030

Romesburg, C. (2004), *Cluster analysis for researchers*, Lulu Press, Research Triangle, North Carolina.

Rosset, E. (1959), *Proces starzenia się ludności. Studium demograficzne*, Polskie Wydawnictwa Gospodarcze, Warszawa.

Sarstedt, M., Mooi, E. (2014), *A concise guide to market research: The process, data, and methods using IBM SPSS Statistics*, Springer, Berlin–Heidelberg.

Spijker, J. (2015), *Alternative indicators of population ageing: An inventory*, "Vienna Institute of Demography Working Paper", No. 4.

Stanisz, A. (2007), *Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Tom 3 – Analizy wielowymiarowe*, StatSoft, Kraków.

United Nations data (n.d.), *International Migrant Stock data*, https://www.un.org/en/development/desa/population/migration/data/estimates2/estimates19.asp (accessed: 22.11.2021).

UN SD (2017), *Handbook on measuring international migration through population censuses*, Department of Economic and Social Affairs, Background document, Statistical Commission, Forty-eighth session 7–10 March, Item 4(a) of the provisional agenda, Demographic Statistics, United Nations, New York.

Vlandas, T., McArthur, D., Ganslmeier, M. (2021), *Ageing and the economy: A literature review of political and policy mechanisms*, "Political Research Exchange", 3 (1), 1932532, https://doi.org/10.1080/2474736X.2021.1932532

Ward, J.H. (1963), *Hierarchical grouping to optimize an objective function*, "Journal of the American Statistical Association", 58 (301), pp. 236–244, https://doi.org/10.1080/01621459.1963.10500845

World Bank (n.d.), *World Development Indicators database*, https://databank.worldbank.org/source/world-development-indicators (accessed: 22.11.2021).

Zeliaś, A. (ed.) (2004), *Poziom życia w Polsce i krajach Unii Europejskiej*, Polskie Wydawnictwo Ekonomiczne, Warszawa.

Zmiany demograficzne w krajach Bałkanów Zachodnich – analiza porównawcza z Unią Europejską

Celem podjętego badania jest przedstawienie wyników analizy dotyczącej zmian demograficznych w pięciu krajach Bałkanów Zachodnich, będących tzw. krajami stowarzyszonymi i potencjalnymi kandydatami do członkostwa w Unii Europejskiej. Badania oparto na wybranych miernikach zmian demograficznych, zarówno statycznych, jak i dynamicznych. Analizy te zaprezentowano na tle wskaźników dla Unii Europejskiej, przy czym najdłuższa próba czasowa obejmowała lata 1960–2020. Ze względu na brak większości danych dla Kosowa, w badaniu uwzględniono pięć z sześciu krajów regionu: Albanię, Bośnię i Hercegowinę, Czarnogórę, Macedonię Północną oraz Serbię. W opracowaniu przedstawiono zakres zmian demograficznych i stopień zaawansowania starzenia się ludności tych krajów, posługując się wybranymi miarami statycznymi i ukazując ich dynamikę. Uzyskane wyniki podkreślają zaawansowanie zmian demograficznych i starzenia się ludności w regionie. Porównanie mierników wskazuje na szybką transformację struktury demograficznej w regionie w kierunku „starzejącej się" ze wskaźnikiem udziału osób w wieku 65 i więcej w populacji ogółem przekraczającym 14% w 2020 roku. Najbardziej zaawansowane procesy dotyczyły Bośni i Hercegowiny, gdzie transformacja od „młodej" struktury demograficznej do „starej" była bardzo dynamiczna i głęboka.

Słowa kluczowe: demograficzne starzenie się, Bałkany Zachodnie, zmiany demograficzne, indeks starości demograficznej, ludność w wieku 65 lat i więcej, analiza skupień

Appendix

Table 1A. Selected descriptive statistics

	Obs.	Average	Median	Min	Max	Range	Variance	St. dev.	Coef. of variation
X_1	6	16.22	15.97	14.69	18.15	3.46	1.82	1.35	8.33
X_2	6	16.68	16.30	14.09	20.46	6.37	6.67	2.58	15.48
X_3	6	1.04	1.01	0.82	1.35	0.54	0.05	0.23	21.95
X_4	6	49.14	48.65	43.84	55.36	11.52	18.32	4.28	8.71
X_5	6	1.52	1.52	1.25	1.75	0.49	0.03	0.16	10.58
X_6	6	10.08	9.98	7.94	11.67	3.73	2.21	1.49	14.75
X_7	6	10.81	10.57	8.08	14.60	6.52	4.49	2.12	19.60
X_8	6	24.95	24.21	20.26	31.77	11.51	20.40	4.52	18.10
X_9	6	7.60	7.82	1.08	15.86	14.78	32.79	5.73	75.35

Source: author's own work based on World Bank (n.d.) and United Nations data (n.d.).

Table 2A. Correlation matrix

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.000								
X_2	−0.698	1.000							
X_3	−0.853	0.969	1.000						
X_4	−0.246	0.866	0.715	1.000					
X_5	0.854	−0.256	−0.485	0.253	1.000				
X_6	0.961	−0.681	−0.829	−0.244	0.862	1.000			
X_7	−0.396	0.542	0.516	0.445	−0.130	−0.473	1.000		
X_8	−0.640	0.997	0.946	0.902	−0.179	−0.620	0.530	1.000	
X_9	−0.006	0.604	0.437	0.823	0.474	0.050	0.321	0.655	1.000

Source: author's own work based on World Bank (n.d.) and United Nations data (n.d.).