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e-mail: ksiegarnia@uni.lodz.pl
tel. +48 42 635 55 77

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Comparing COVID–19 Budgeting Responses: New Budgeting Principles that Resulted from the Pandemic

Tlektes Espolov https://orcid.org/0000-0002-4669-4437
Doctor of Economic Sciences, Kazakh National Agrarian University, Department of Management and Organization of Agribusiness, Almaty, Republic of Kazakhstan, e-mail: t.espolov79@rambler.ru

Aidos Espolov https://orcid.org/0000-0001-6577-809X
Doctor of Economics, Kazakh National Agrarian University, Department of Management and Organization of Agribusiness, Almaty, Republic of Kazakhstan, e-mail: espolovaid@rambler.ru

Dariga Aitkozhina https://orcid.org/0000-0002-5115-2667
Ph.D., University named after D.A. Kunaeva, Department of Jurisprudence, Almaty, Republic of Kazakhstan e-mail: aitkozhina-dar@rambler.ru

Kanat Tireuov https://orcid.org/0000-0002-5230-7114
Doctor of Economics, Kazakh National Agrarian University, Department of Management and Organization of Agribusiness, Almaty, Republic of Kazakhstan, e-mail: kanat-tireuov@rambler.ru

Sailaukhan Raiymbekov https://orcid.org/0000-0001-5055-1386
Doctor of Economics, Kazakh National Agrarian University, Department of Management and Organization of Agribusiness, Almaty, Republic of Kazakhstan, e-mail: sairaiymbekov@rambler.ru

Zhenisbek Suleimenov https://orcid.org/0000-0002-4022-8566
Doctor of Economics, Kazakh National Agrarian University, Department of Management and Organization of Agribusiness, Almaty, Republic of Kazakhstan, e-mail: zhensuleimenov@rambler.ru

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Abstract

This study provides a comparative analysis of the budget limits of the Commonwealth of Independent States members, focusing on fiscal responses to the COVID crisis and options for improving the structure. The methodology comprised a statistical approach based on assessments of macroeconomic indicators for 2020–2021, as well as world rankings and several measurement systems. The following new budgeting principles were formulated as a result of the comparative analysis of public administration. The proposed principles focus on monitoring, assessing, and forecast data of long-term sustainability management and other fiscal risks. The proposed budgeting principles could provide a country with the new opportunities needed to expand its potential during further economic advancement in global politics. The central result of this work is a renewed approach to budget management using data on the actual economic situation and adaptability to changes. The proposed budget management scheme lays the foundation for the future development of a country's potential and aligns with the priority goals of the CIS member states in terms of democracy. The value of this research lies in presenting and summarizing the analysis of the budget management system and the detailing of budgetary policies to identify and reflect the political priorities of countries. This helps formulate recommendations and suggestions for improving the budgetary process, achieving a balanced distribution of resources, and attaining strategic development goals. The practical application of the findings will allow budget policy specialists, economists, and statisticians to become familiar with the changes in the institutional landscape amid COVID–19 and assess the situation in their region through the prism of administrative sovereignties.

Keywords: administrative sovereignty, budget oversight, digital transformation, economic policy, public administration

JEL: E60, H61, H83

Introduction

The global outbreak of COVID–19 coincided with the implementation of the 2020 budgets by the majority of nations. Since then, the short-term priority of numerous countries has been to implement immediate anti-crisis measures through emergency budget instruments such as supplementary budgets, virements, contingency reserve funds, and emergency decrees (Wendling et al. 2020). Today, most governments find themselves in COVID–19 crisis mode, characterized by great uncertainty, as the duration of the crisis remains unknown and unpredictable (Argento, Kaarbøe, and Vakkuri 2020). It has different interpretations for economic sectors, requiring an innovative approach from the government, convergence support, sustainability, and transformation. Plaček et al. (2020) identified the main determinants of public administration effectiveness, which is understood (Moloney 2021) to focus on developing sovereign governance that relies on specific notions of the administrative state as a policy implementer. The main determinants of public administration include (Plaček et al. 2020; Drew and Miyazaki 2022):

- decision-making unit or production system, an element of which is local self-government;
- information is a key condition for effective decision-making, which is guided by the principle of the value of utility and the probability of the chosen option;
- public services of a certain quality and quantity delivered to citizens;
- the bureaucratic behavior of politicians, which results in spending all available resources by the end of the budget year, regardless of the criterion of effectiveness and efficiency of budget allocation.

According to Alsharari (2019), budgeting in the traditional format has lost its relevance in recent years and does not meet the needs of modern society, like the administrative sovereignty of a state (Muth 2019), whose boundaries can shift under deconcentrated global governance, especially when there is uncertainty. Conducting a comprehensive literature review offered an avenue to explore matters about public administration, specifically budgeting within the global governance framework, to develop prospective reform priorities for budget preparation. This encompassed not only the context of the COVID–19 pandemic but also the potential impact of other external shocks.

Empirical research by Argento, Kaarbøe, and Vakkuri (2020) and Grossi, Mauro, and Vakkuri (2018) is especially noteworthy in this aspect. They considered different public financial management tools, including those focused on budgets and their preparation, and defined a budget itself as a plan that can be used to direct and control government activities. Other researchers view the budget as a fiscal resource that should be mobilized to provide socially useful infrastructure, services, and safety nets (Andrew et al. 2020). In this context, public budgeting has been described as a mechanism to prioritize certain values of democracy, like raising confidence among the population and building trust. In keeping with the priority goals of a democratic society, budgetary activities face the following aspects (Argento, Kaarbøe, and Vakkuri 2020):

1. The ambiguity of reality – this refers to the definitional role of budgeting and answers the question, "What is the problem, and how should we understand it?" (For example, how should we construct a document that describes the reality of the COVID–19 situation);
2. The ambiguity of causality – this refers to the relationship between the problem and economic growth. Within this framework, socio-economic indicators are combined with different directions of budget policy, which is a complex task requiring interpretation at each stage of the budget-forming process (hence, the questions "What are the most important factors related to the situation with COVID–19?" and "How

can we correlate the situation with COVID–19 in monetized budget items?" should be answered);

3. The ambiguity of intentionality – this refers to the interpretation of the situation and determining the budgetary implications (for example, seeking evidence to ensure that policymakers make the right choices).

Sicilia and Steccolini (2017) highlighted the political, fiscal, economic, re-distributive, managerial, and accountability goals of budgeting. Each possesses a particular value to the perception of subjects, processes, and the rationality of the government's budget system. The budget-setting procedure is discussed in detail by Hasanova and Korzovatykh (2016), who proposed a four-stage structure: goal setting, planning, execution control, and deciding on revealed deviations.

Several other researchers (Gruber and Sommers 2020; Siripurapu and Masters 2021) focused on the importance of indicators that led to budget cuts during the COVID crisis: a decrease in tax revenues, an increase in spending on social security programs (unemployment insurance and the Medicaid program for medical services), and an increase in staff costs during the restrictive measures. Frieden (2020) argued that every government faces difficult decisions about appropriate measures in terms of the effectiveness of the budgetary framework, namely, which restrictions to impose and when to loosen them, where the money will be spent and how it will be raised, and which national interests can be constrained in favor of international cooperation. According to Frieden, these decisions must consider public health recommendations, economic considerations, and political constraints.

Academics have noted that economically large countries (e.g., the US, Germany, Russia, and Kazakhstan) support their national economies more than developing states (HSE 2020). In the study on the American system of fiscal federalism within the local, state, and federal government levels, Clemens and Veuger (2020) found that US policy choices are based on specific legislation that includes local and regional budgets, as well as anti-crisis laws (the Coronavirus Aid, Relief, and Economic Security (CARES) Act; the American Recovery and Reinvestment Act). Based on created budgets, state and local authorities manage and finance a wide range of public services, covering education, health care, public safety, utilities, and income support, which requires a budget to be balanced.

In the event of a decline in state and local support, for example, during a financial crisis, anti-crisis laws come to force with the subsequent provision of care for the population. In general, Clemens and Veuger (2020) proposed (1) transforming the US institutional landscape by converting federal transfers into grants that adjust counter-cyclically and (2) linking federal transfers to unemployment rates to blunt the ne-

cessity of active fiscal policy, which can have significant advantages during the economic recession.

The budgetary system of the countries of the European Union (EU) includes information on the productivity of the national economy and a reporting structure. It operates on the principle of sound financial management (economy, efficiency, and effectiveness) (Downes, Moretti, and Nico 2017). In the context of the pandemic, the governments of EU member states, in particular, Germany, Italy, and France, supported the population by providing state guarantees or using other instruments of monetary regulation and, to a lesser extent, providing direct support from the budget.

In turn, the central feature of the budget policy of the countries of the Commonwealth of Independent States (CIS) is the pro-cyclical nature of spending. In other words, budget expenditures grow when prices of natural resources rise, and vice versa (Accounts Chamber of the Russian Federation 2020). Equally important is that this approach is reinforced by the dependence of domestic economic conditions on the fluctuations of natural resource costs. By introducing a mechanism that plans budgetary outlays using a conservative base price for natural resources, the dependence on CIS raw materials has been weakened, making internal conditions more stable and predictable (Accounts Chamber of the Russian Federation 2020).

The CIS was established in 1991, uniting Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan, and Ukraine on the principle of sovereign equality. Currently, Azerbaijan and Armenia, Kyrgyzstan and Tajikistan, and Russia and Ukraine are in a state of unresolved conflict within the association (Analytical Review 2022; Executive Committee of the Commonwealth of Independent States 2022). In the context of the pandemic, Russia and Kazakhstan are classified as the most prosperous CIS states. Given that their main liquid assets were accumulated before the crisis, the negative impact of the pandemic is less pronounced there. In Russia, the National Wealth Fund serves as a protective reserve for the national budget, while in Kazakhstan, this function is fulfilled by the National Fund of the Republic of Kazakhstan.

In 2020, Kazakhstan's full anti-crisis package amounted to 5.9 trillion tenges; however, only a third of those funds led to an increase in budget expenditures. To counter the adverse outcomes of the pandemic, the government applied an emergency budgetary instrument implying the redistribution of expenses to provide more anti-crisis measures aimed at direct population support. In general, virtually all countries in the world faced significant constraints on their public finances during the pandemic, increased public financing needs, and increased fiscal risks (Wendling et al. 2020) amidst the most severe economic and employment crisis in recent years (Gigineishvili et al. 2023; Kittelmann et al. 2006). Under these circumstances, Wendling et al. (2020) highlighted the need for soft and flexible budget plans, An-

drew et al. (2020) stated the importance of management based on a country's current budgetary and economic situation, and Waheduzzaman and Khandaker (2022) mentioned the digitalization of public administration through electronic means of participation.

The empirical studies reviewed use the structure of the institutional landscape to justify the processes that underlie the principles of traditional budgeting while capturing the changes that have occurred under COVID–19.

The practical significance of this study lies in its provision of a tool that makes it possible to evaluate public administration effectiveness within the context of budgeting principles, explicitly focusing on enhancing budget systems to foster a favorable impact on both the economy and society. The ultimate goal of this work is a comparative analysis of the budget limits of the CIS members, focusing on fiscal responses to the COVID crisis and options for improving the structure.

To this end, the following research objectives will be addressed:

1. The role and implications of budget management will be analyzed, considering the CIS member states' response to COVID–19;
2. New budgeting principles used to prepare a budget for future pandemic-hit periods will be defined.

The relevance of this study lies in its aim to compare budget management within the framework of a state's administrative sovereignty to strengthen the management system in conditions of uncertainty. Based on the findings, enhancing the budget structure would incorporate consistent management of the budget, presenting the forecast as a means to adjust to changes, and relying on the monitoring and evaluation of up-to-date macroeconomic data concerning the state of the economy.

Materials and methods

This paper scrutinizes public administration regarding budgeting, and makes recommendations for new budgeting principles for a pandemic. It is based on the methodological concepts provided by Beazley, Downes, and Nicol (2019), Argento, Kaarbøe, and Vakkuri (2020), Clemens and Veuger (2020), Gigineishvili et al. (2023), as well as the statistical data of the Interstate Statistical Committee of the CIS Stat and several international organizations (OECD 2019; Krafchik 2020; World Bank 2021; World Health Organization 2021).

The study was conducted in three stages. The *first stage* analyzed the available case studies on public budget and its management (Beazley, Downes, and Nicol 2019; Ar-

gento, Kaarbøe, and Vakkuri 2020), then visualized the current state of budget management in the CIS.. The data analysis of the current budget management condition includes Open Budget Index (OBI) indicators and the indicators of two measurement systems (Krafchik 2020).

The OBI covers 117 countries and assesses the compliance of public finance management with international standards in terms of the timeliness and volume of publicly available budget information, the degree of real opportunities for public participation in the budget process, and the role of official oversight institutions. Interpretations of the scores are given in Table 1.

Table 1. Score interpretations

OBI score	Score interpretations
81–100	Extensive transparency of budget management
61–80	Substantial transparency of budget management
41–60	Limited transparency of budget management
21–40	Minimal transparency of budget management
0–20	Scant or no transparency in budget management

Source: authors' elaboration.

The two measurement systems were as follows (Table 2).

Table 2. The measurement systems

Measurement system 1		Measurement system 2
The scores of oversight by the legislature and the supreme audit institution	Score interpretations	Oversight by independent financial institutions
61–100 points	sufficient oversight	possible answers – Yes/No
41–60 points	limited oversight	
0–40 points	poor oversight	

Source: authors' elaboration.

The result of this stage was arranged in a table that visually displays the budget management of public finances of CIS member states regarding the response to the COVID crisis.

The *second stage* used a statistical approach to compare the main socioeconomic indicators for the CIS member states (World Health Organization 2021) with a focus on their fiscal measures in response to COVID–19 (Alsharari 2019; OECD 2019). The result

showed a financial justification of the effectiveness of budget management, and it was arranged into a chronological table, which allows us to present a budget response to the crisis caused by the COVID pandemic.

The *third stage* developed a series of cyclic steps for preparing the budget for future exogenous shocks based on the current experience in budget management, focusing on the specifics of the state's administrative sovereignty. The result of this stage was a conceptual scheme of the recommended option for improving the budget structure, which includes new budgeting principles.

The research limitations are connected with the fact that budget management was examined for only seven of the eleven CIS member states due to the lack of statistical data, which may affect the accuracy of the conclusions of this study.

Results

The literature review showed that budgeting is a key element of policy development and accountability in any country. A well-laid budget is a public administration tool that guarantees sufficient financial resources for planned expenditures. The budget structure includes various types of specialized budgets within different types of policies (economic, social, cultural, and national). Using visual conditional formatting with histogram data, the table below shows the CIS member states' approaches to public administration through the budget. All the presented budget management systems have sufficient supervision, an identical mechanism for budget execution, and the absence of independent assessments provided by extra-budgetary financial institutions.

Table 3. Budget management in CIS countries

CIS countries	Open Budget Index	Oversight by legislature and the supreme audit institutions	Oversight by independent financial institutions (Yes/No)
Azerbaijan	35	68	No
Kazakhstan	58	67	No
Kyrgyzstan	63	78	No
Moldova	57	67	No
Russia	74	85	No
Tajikistan	17	63	No
Ukraine	63	87	No

Source: authors' elaboration based on data retrieved from Krafchik (2020) and OECD (2019).

Table 3 shows that Russia, Kyrgyzstan, and Ukraine have the most transparent budget management systems (their OBI scores range from 63 to 74). Limited transparency was observed in Moldova (57 points) and Kazakhstan (58 points). The budget management systems of Azerbaijan and Tajikistan were characterized by minimal and scant levels of transparency (38 and 17 points, respectively). It can be argued that the budget management of public finances among the analyzed states differs in terms of transparency. Thus, the budget management systems of Kazakhstan, Moldova, Azerbaijan, and Tajikistan are built on the principle of limited transparency. In contrast, the systems of Russia, Ukraine, and Kyrgyzstan are characterized by substantial transparency of budget information that is open to the public. After analyzing the budgeting for the studied countries in response to COVID–19, the financial consequences of the management were compared, focusing on the implementation of fiscal measures (Table 4).

As evidenced in Table 4, from an economic point of view, effective budget management was observed in Tajikistan – the country's constant-price GDP equaled 104.5%, the share of government spending in GDP comprised 29.0%, and the unemployment rate was 2.1%, which is relatively low. The economies of the other CIS member states were in decline, especially in Moldova and Kyrgyzstan (the GDP was 93% and 91.4%, respectively). Public health and economic support policies introduced by the governments had a serious impact on the standard of living and employment of the economically active population. The highest unemployment rate was recorded in Russia (3.7%), while the lowest was in Kazakhstan (1.5%). On the other hand, Kazakhstan had the smallest share of government spending in GDP (21.7%), which means that the state does its best to smooth out exogenous shocks at the expense of the fiscal policy tools.

The National Fund of the Republic of Kazakhstan currently assumes the role of a guarantor for ensuring consistent budgetary support, thereby offering the necessary adaptability to overcome economic crises. As regards governance effectiveness, none of the budget management systems work well. This indicator was positive only for Russia and Kazakhstan, which indicates that they managed to modernize the principles of state budget management.

In 2021, there was still a trend of responding to the consequences of COVID–19. Countries had experienced either a slight decrease or an improvement in economic indicators (Table 5). The obtained data allow us to conclude that the budgets of the reviewed CIS states project a comprehensive plan to support the economy, focusing on the digitalization of administrative processes in response to the COVID–19 pandemic through restraining fiscal policy. Through the general budget management mechanism, the governments of the analyzed countries tend to redistribute or mobilize financial resources within the framework of the priority goals of profile policies to ensure social security. Thus, the COVID crisis forced those countries to har-

monize management through the budget in the context of digitalization, including a reserve support fund and a focus on results from the perspective of global policy. Simultaneously, the aforementioned global policy necessitates the evaluation of forecasted impacts from external shocks, diligent monitoring of the macroeconomic situation and associated indicators within the country, meticulous management of the state budget in line with State Strategic Development, and individual assessments of non-budgetary financial institutions (see Figure 1).

Table 4. Results of budget management in terms of fiscal policy instruments, 2020

All countries have high resource potential; their economic growth depends on revenues from the extractive industries	Constant-price GDP as % of the previous year	CIS countries: governance effectiveness/ fiscal policy instrument	Share of government spending in GDP	Number of unemployed registered in state employment agencies as a % of the economically active population	Fiscal responses to mitigate the negative socio-economic consequences of the COVID crisis
	95.7	Azerbaijan: –0.10 / deterrent	31.7	N/A	– Closure of businesses and quarantine restrictions; – Prohibition of mass gatherings/events; – Closure of borders to foreign citizens; – Restriction of movement between regions; – Implementation of mandatory mask-wearing protocols; – Limitation of operation for public venues; – Reduced inbound and outbound travel, a decline in tourism; – Daily reports on the spread of the virus; – Vaccination of the population.
	97.4	Kazakhstan: 0.12 / deterrent	21.7	1.5	
	91.4	Kyrgyzstan: –0.68 / deterrent	30.5	3.0	
	93.0	Moldova: –0.38 / deterrent	39.8	2.7	
	97.0	Russia: 0.15 / deterrent	38.9	3.7	
	104.5	Tajikistan: –1.05 / deterrent	29.0	2.1	
	99.3	Ukraine: –0.30 / deterrent	33.4	N/A	
	97.0	Total for the CIS	34.2	1.8	

Source: authors' elaboration based on data retrieved from OECD (2019), CIS Stat, and the World Health Organization (2021).

Table 5. Results of budget management in terms of fiscal policy instruments, 2021

All countries have high resource potential; their economic growth depends on revenues from the extractive industries	Constant-price GDP as % of the previous year	CIS countries: governance effectiveness/ fiscal policy instrument	Share of government spending in GDP	Number of unemployed registered in state employment agencies as a % of the economically active population	Fiscal responses to mitigate the negative socio-economic consequences of the COVID crisis
	97.4	Azerbaijan: –0.25 / deterrent	33.8	N/A	– introduction of quarantine; – vaccination of the population; – social protection of vulnerable population groups; – financial and stabilization packages at the expense of the state and support funds; – digitalization of the economy.
	91.4	Kazakhstan: –0.50 / deterrent	25.4	1.8	
	93.0	Kyrgyzstan: –0.80 / deterrent	32.1	3.5	
	97.0	Moldova: –0.60 / deterrent	36.2	2.9	
	104.5	Russia: –0.50 / deterrent	37.5	4.2	
	99.3	Tajikistan: –1.10 / deterrent	28.8	1.9	
	97.0	Ukraine: –0.90 / deterrent	40.1	N/A	
	95.7	Total for the CIS	32.9	2.5	

Source: authors' elaboration based on data retrieved from OECD (2019), CIS Stat, and the World Health Organization (2021).

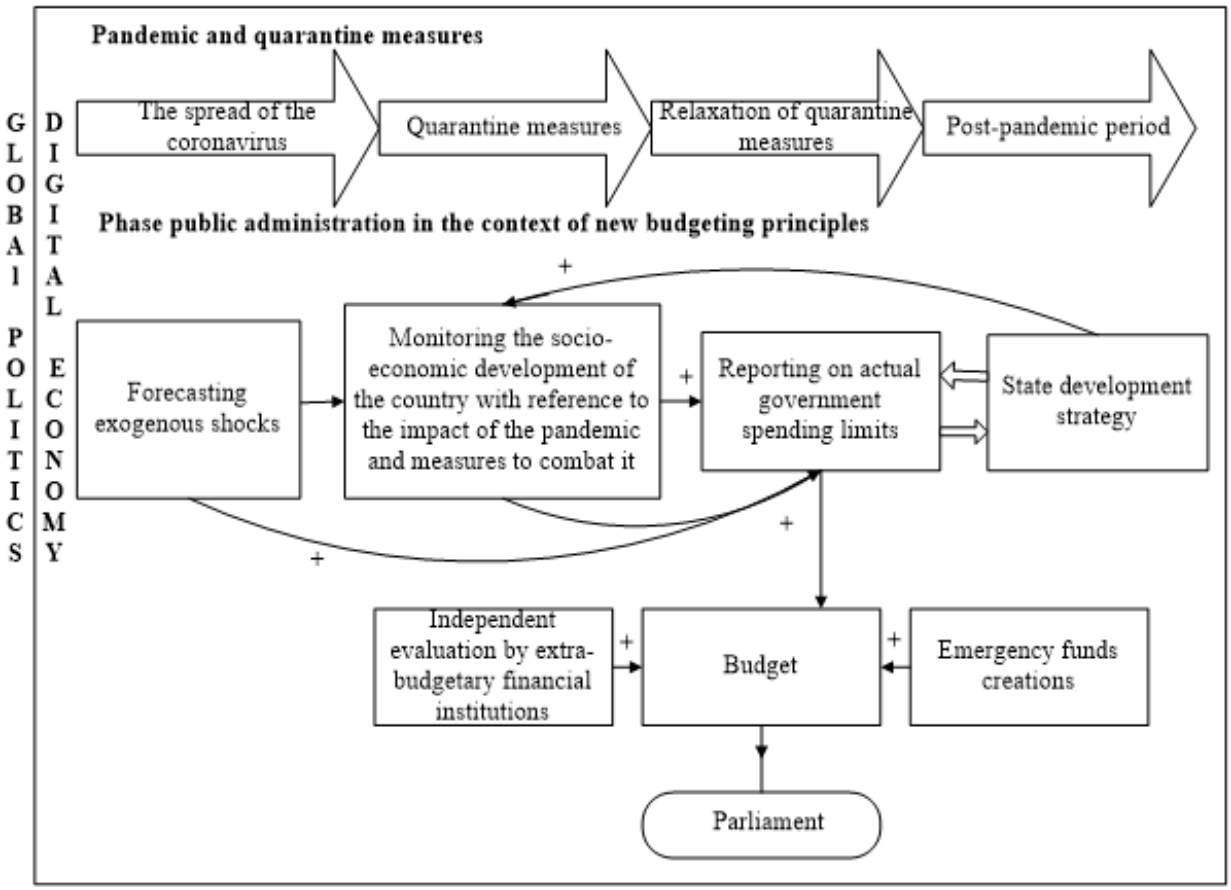

Figure 1. Budget forming in the context of new pandemic-driven budgeting principles

Source: authors' elaboration.

In addition to the conclusions above, the following key suggestions arising from the scheme presented in Figure 1 are proposed:

1. Consider the possibility of introducing a cost analysis when preparing the budget to obtain a critical assessment of the public expenditures and assure budget flexibility;
2. Encourage communication between parliament, policymakers, and independent auditing institutions;
3. Adjust the country's budget according to the e-government policy measures to facilitate consolidation;
4. Design budget management based on a combination of constantly up-to-date data from monitoring studies, strategic reports, independent assessments, and forecasts on exogenous shocks to provide the economy with sustainability and adaptability to changes.

After analyzing the role and consequences of budget management in the context of the response of CIS member states to COVID–19, the following observations can be made:

1. Budget management plays a crucial role in shaping and implementing fiscal policies. In the context of the COVID–19 pandemic, budget management became an essential tool for mitigating the negative socio-economic impacts of the crisis. CIS member states took measures to increase government spending, implement financial and stabilization support packages, provide social protection to vulnerable population groups, and promote the digitalization of the economy.
2. Regarding the consequences of budget management, the response of CIS member states to COVID–19 has had implications for economic growth, unemployment rates, the share of government expenditure in GDP, and fiscal measures.

Thus, the application of new budgeting principles should encompass the entire political spectrum of budget harmonization. This includes incorporating an emergency fund and a results-oriented approach within the global policy framework, based on a forecasting assessment of exogenous shocks, monitoring a country's macroeconomic indicators, and managing the actual limits of public expenditure in terms of the state development strategy. Finally, it is crucial to implement continuity management practices throughout the budget process to ensure the successful execution of these principles.

Discussion

It is widely known that government budgets reflect a country's political priorities (Moser and Korac 2020). At the macro level, budgeting focuses either on the system of budgetary relations, the powers of the subjects, the methods of attracting and allocating resources, or the policy implementation format (Zhyber 2020). Detailing budget policy is rightfully considered a prerequisite for the predictability of its results. The application of effective budgeting principles makes the budget management mechanism more flexible.

The analysis of budget management approaches in CIS countries revealed discernible variations in terms of budgeting transparency. Hence, the budget management systems of Russia, Ukraine, and Kyrgyzstan are deemed open to the public, whereas in Kazakhstan, Moldova, Azerbaijan, and Tajikistan, they are built on the principle of limited transparency. Despite these striking differences, they all have general features based on an identical mechanism for budget implementation (oversight by legislative bodies and the supreme audit institution), sharing risks in society using different policy profiles, and the non-usage of independent assessments provided by extra-budgetary financial institutions. An approach similar to that employed within the current research was used by Melnychuk (2020), who investigated the public administration process using the OBI. She proposed calculating the management of budget resources based on direct (transparency in the budgetary sphere, participation of citizens in the budget-forming process, budget oversight) and indirect performance indica-

tors (political stability, government efficiency, the rule of law, control over corruption). Norman (2020) confirmed that the worldwide outbreak of COVID–19 negatively affected not only budget preparation and implementation but also the country's overall economy. Therefore, considering this factor when forming a budget is necessary for the global political community.

The current situation necessitates the careful management of public finances and maintaining the economy in the short term while investing in the future. Considering the responses of the CIS countries to the coronavirus pandemic, the present study provides a reliable financial justification for the effectiveness of budget management strategies using a statistical approach and ranking by governance effectiveness indicator. Nielsen and Moynihan (2017) found that government effectiveness lies in the theory of democratic accountability. However, for democratic accountability to operate effectively, elected government officials must assume responsibility for the results of government programs and the provision of public services.

This assertion aligns with the findings proposed by the Organization for Economic Cooperation and Development, which emphasizes the importance of fiscal policy tools. The results of the current study show an economic decline in all analyzed CIS countries except for Tajikistan. Even though it has an insignificantly transparent budget system (17 points out of 100), its economy is growing (GDP – 104.7%, the share of government spending in GDP – 29.0%, unemployment rate – 2.1%). Meanwhile, the governance effectiveness indicator was positive only in Russia and Kazakhstan.

Thus, in the face of the pandemic, their governments managed to level the exogenous shocks out at the expense of the created national funds filled with profits of the extractive industries collected before COVID–19. This represents a positive budgeting experience. The comparative analysis based on the review of research on the matter (Clemens and Veuger 2020; Krafchik 2020) demonstrated that the coronavirus pandemic revealed new problems in budget management and reoriented the principles of budgeting to monitoring, reporting, evaluation (by budgetary and extra-budgetary organizations), forecasting, and the creation of emergency funds. According to Michelon, Lunkes, and Bornia (2020) and Sullivan (2021), budgeting gaps can potentially be identified using a thorough review of the existing academic literature on public administration.

The OECD, in turn, having analyzed the economic and social consequences of COVID–19, and the political measures to curb the spread of the virus and help households and businesses to overcome the current situation, proposed a set of budget policy options based on monitoring, forecasting, and digitalization. In the present study, a comparative analysis of public administration related to budgeting showed that the central feature of the modern institutional landscape is the reorientation of the overall budgeting principles towards monitoring the country's socio-economic development, management within actual spending limits, and forecasting exog-

enous shocks. These findings corroborate the data obtained by Beazley, Downes, and Nicol (2019) and Wendling et al. (2020), who also focused on crisis budgeting amid the COVID–19 outbreak. The developed conceptual scheme of budget preparation under uncertainty and the proposals presented at the end of the Results section should improve public budget management effectiveness in the context of a country's potential development. Summing up, the governments of the CIS member states can cope with the COVID crisis using new budgeting principles and approaches, which focus on a combination of continuity in management through the budget. They are expected to provide a progressive budget policy, which is confirmed by the positive values of the governance effectiveness indicator.

Conclusions

The findings of this research can be regarded as a contribution to improving the public administration system related to budget formation. Specifically, they consider the implications of budgeting principles at the stage of determining the priority goals within the framework of the administrative sovereignty of the state. This paper revealed that budgeting in the CIS countries has several points in common. They are connected with an identical oversight system, distribution of risks in society through different budgetary system policies, a lack of an independent assessment provided by extra-budgetary financial institutions, and some problems with the openness of budget-related information. It was also established that the most transparent budget management systems have been adopted by Russia, Ukraine, and Kyrgyzstan, while those in Kazakhstan, Azerbaijan, and Tajikistan are based on a rigid hierarchy, and remain relatively closed to the public. The most prosperous nations that effectively supported the economy during the pandemic are Russia and Kazakhstan (in terms of public administration) and Tajikistan (in terms of financial indicators).

Budget management played a paramount role in the response of CIS member states to COVID–19 by mitigating the consequences of the crisis. Measures such as increased government spending, financial support packages, social protection for vulnerable groups, and the digitalization of the economy were implemented. The consequences included a decline in economic growth, rising unemployment rates, a high share of government expenditure, and fiscal measures such as restrictions and vaccination. In total, it was demonstrated that the practice of appropriate budget management through the budget in the context of the COVID–19 pandemic underwent a dramatic transformation. It was also established that the implementation of fiscal measures in response to the COVID crisis aimed to smooth economic fluctuations and maintain macroeconomic stability (monitoring, reporting on actual government spending limits, assessments by budgetary and extra-budgetary organizations, forecasts of exogenous shocks, and creating emergency funds). They

also became priority recommendations for budget management by establishing budgeting principles. Thus, the study holds significant value in determining political priorities, formulating practical recommendations for enhancing the budgetary process, and achieving strategic development goals of the country. The practical application of the study findings will allow budget policy specialists, economists, and statisticians to examine an overview of the budgetary practice under uncertainty to implement and improve the structure of budgets to positively impact the living standards within the framework of a state's administrative sovereignty.

Future research should systematically analyze two budgeting aspects: organizational and managerial.

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Porównanie reakcji na COVID–19: nowe zasady budżetowania, będące efektem pandemii

Niniejsze opracowanie stanowi analizę porównawczą ograniczeń budżetowych członków Wspólnoty Niepodległych Państw, skupiając się na reakcjach fiskalnych na kryzys wywołany przez pandemię COVID–19 i na możliwościach poprawy ich konstrukcji. Metodologia obejmuje podejście statystyczne oparte na ocenach wskaźników makroekonomicznych dla lat 2020–2021, a także na światowych rankingach i kilku systemach pomiarowych. W wyniku analizy porównawczej administracji publicznej sformułowano nowe zasady budżetowania. Proponowane zasady koncentrują się na monitorowaniu, ocenie i prognozowaniu danych dotyczących długoterminowego zarządzania zrównoważonym rozwojem i innych rodzajów ryzyka fiskalnego. Zaproponowane zasady budżetowania mogą zapewnić krajowi nowe możliwości potrzebne do rozszerzenia jego potencjału w trakcie dalszego rozwoju gospodarczego w polityce globalnej. Głównym rezultatem tych badań jest odnowione podejście do zarządzania budżetem z wykorzystaniem danych dotyczących rzeczywistej sytuacji gospodarczej i zdolności adaptacyjnych do zmian. Proponowany system zarządzania budżetem kładzie podwaliny pod przyszły rozwój potencjału kraju i wpisuje się w priorytetowe cele państw WNP w zakresie demokratyzacji. Wartość tych badań polega na przedstawieniu i podsumowaniu analizy systemu zarządzania budżetem oraz uszczegółowieniu polityk budżetowych w celu identyfikacji i odzwierciedlenia priorytetów politycznych państw. Pomaga to sformułować zalecenia i sugestie dotyczące usprawnienia procesu budżetowego, osiągnięcia zrównoważonego podziału zasobów i strategicznych celów rozwojowych. Praktyczne zastosowanie wyników badań pozwoli specjalistom ds. polityki budżetowej, ekonomistom i statystykom zapoznać się ze zmianami w krajobrazie instytucjonalnym w czasie pandemii COVID–19 i ocenić sytuację w ich regionie z punktu widzenia władz administracyjnych.

Słowa kluczowe: władze administracyjne, nadzór nad budżetem, transformacja cyfrowa, polityka gospodarcza, administracja publiczna

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A Comparison of the Macroeconomic Effects of Increased Defence Spending in Poland and Germany

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 macroeconomic effects of defence spending in the Polish and German economies. Estimating these effects is of particular importance in the context of the substantial increase in defence expenditures in Poland and Germany resulting from the war in Ukraine. The research is based on a dynamic stochastic general equilibrium model that takes into account both demand-side and supply-side mechanisms. The impulse response functions calculated based on the models estimated for the two economies show that the impact of defence spending on GDP is much stronger in Poland than in Germany. Furthermore, the empirical results indicate that in the Polish economy, defence spending also stimulates labour and consumption to a greater extent than in the German economy.

Keywords: defence spending, government spending, fiscal policy

JEL: E62, H30, H50

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Introduction

The war in Ukraine increased government defence spending in many European Union (EU) countries. A particularly strong increase in defence public expenditure occurred in Poland and Germany. In Poland, it jumped from 2.3% of GDP in 2021 to 3% in 2023, while in Germany, it rose from 1.5% to almost 2%. Thus, defence expenditure increased by more than 30% in both countries.

In the context of the rapid increase in defence spending, an assessment of the impact of this expenditure on economic activity becomes especially relevant. There is a broad literature concerning the long-term macroeconomic effects of defence spending changes (Carter, Ondercin, and Palmer 2021). In the long term, the key issue is the impact of defence spending on the formation of capital and the efficient use of resources (Lobont et al. 2019; Mohanty, Panda, and Bhuyan 2020). In the medium term, however, the impact of defence spending on household behaviours is crucial. Its strength largely depends on whether households make decisions based on current or permanent income. In theory, in more developed economies, the share of households that make decisions based on permanent income (i.e., Ricardian households) is higher, reducing the impact of government spending on GDP (Mankiw 2000; Coenen and Straub 2005; Galí, López-Salido, and Vallés 2007). Therefore, considering the heterogeneity of households allows for a more precise estimation of the macroeconomic effects of increased defence spending.

The article aims to quantify and compare the macroeconomic effects of defence government spending in Poland and Germany based on a model that considers the heterogeneity of household behaviours in these countries.

A presentation of the results of such an analysis is especially justified in the context of:

- the increased importance of defence spending as a result of the outbreak of the war in Ukraine,
- the projected economic slowdown in the EU and, therefore, the significant role of fiscal policy in stimulating economic activity (Auerbach and Gorodnichenko 2012; Afonso, Baxa, and Slavik 2018).

The added value of the study is that it is the first comparison of the impact of an increase in defence spending in EU countries after the outbreak of the war in Ukraine, based on a model which considers the heterogeneity of households. Eurostat quarterly data from 2000–2021 were used to estimate the parameters of the models for the Polish and German economies.

The structure of the article is as follows. Firstly, there is a literature review on the impact of defence spending on economic activity. This is followed by the presentation

of the assumptions of the theoretical model based on which the macroeconomic effects of defence spending in Poland and Germany are compared. The next section presents the empirical results for the Polish and German economies, i.e., impulse response functions that show the impact of defence spending on GDP, consumption, and employment. The final section concludes.

Literature review

There is a long-lasting debate concerning the impact of defence spending on economic activity (Alptekin and Levine 2012; Carter, Ondercin, and Palmer 2021). Benoit's (1978) seminal paper indicates the strong and significant positive impact of defence spending on long-term economic growth. However, later empirical studies give mixed findings – both positive and negative effects of defence government spending on economic growth have been reported (Ali 2012; d'Agostino et al. 2012; Yilgör, Karagöl, and Saygili 2014; Compton and Paterson 2016; Hung-Pin and Wang 2022; Karamanis 2022; Clark et al. 2023).

Alptekin and Levine's (2012) meta-analysis indicates a positive correlation between defence spending and long-term economic growth, primarily in developed countries. After analysing approximately 170 studies, Dunne and Tian (2013) found a negative long-term relationship in about 44% of cross-sectional studies, while about 20% indicated a positive relationship, and about 40% an ambiguous relationship. The literature review shows that medium-term and short-term effects of defence expenditures on output are usually positive. The impact on macroeconomic activity in the medium and short run was estimated by Ramey and Shapiro (1998), Eichenbaum and Fisher (2005), Ramey (2011) and Owyang, Ramey, and Zubairy (2013), among others.

Ramey and Shapiro (1998) studied the post-war US economy. Their research allowed them to distinguish three exogenous fiscal shocks associated with a strong increase in defence spending: the Korean War, the Vietnam War, and the Soviet invasion of Afghanistan. The three episodes were extended by Ramey (2011) to four by adding an additional variable for the 2001 terrorist attack on the Pentagon and the World Trade Centre. The defence spending multiplier in this research is positive and relatively high.

Barro (1981) found that defence spending has a different impact on GDP depending on whether it is temporary or not – the short-term effects of a temporary increase in defence expenditure are usually stronger than the short-term effects of a permanent change in defence expenditure. On the other hand, Sheremirov and Spirovska's (2015) panel research, conducted on over one hundred countries, indicates a significant difference between the macroeconomic effects of defence spending on the purchase of durable goods and the macroeconomic effects of defence expenditure on the purchase of non-durable goods and services.

There is no consensus on a theoretical framework for estimating the impact of defence spending on economic activity. Some researchers use an atheoretical approach, like vector auto-regressions and testing for Granger causality (e.g. Chowdhury 1991; Kusi 1994; Kollias et al. 2004). For example, Kolias et al. (2004) used causality tests to examine the relationship between defence spending and economic growth in EU countries between 1961 and 2000. They found that the causality of economic growth on defence expenditures occurs more frequently than the causality of defence expenditure on GDP. It may indicate that those countries would decide on the size of defence spending by considering the economic situation rather than defence spending being the cause for stimulating economic activity.

However, most estimates are based on economic theory. Four types of model dominate the estimation of the economic effects of defence spending:

- Models based on the Feder–Ram supply-side model (Feder 1982); for example, it was used by Biswas and Ram (1986) to analyse the impact of defence expenditure on economic long-term growth;
- Supply-side real business cycle models with elastic prices (e.g. Baxter and King 1993); they are more often used to analyse the short- and medium-term rather than the long-term impact of government spending on economic fluctuations effects of defence spending;
- Demand-side models, based on IS-PC-MR (i.e. IS curve/Phillips Curve/Monetary Rule) and Romer (2000) models; they have been used to analyse the economic effects of defence spending by, among others, Atesoglu (2002);
- New-Keynesian dynamic stochastic general equilibrium models; they consider both supply-side and demand-side factors (e.g., Lorusso and Pieroni 2017; Becerra-Vicario et al. 2020).

Our research uses the last of the above-mentioned methodologies. The main reasons are:

- dynamic stochastic general equilibrium models are especially useful when estimating the short-term and medium-term impact of fiscal policy on economic activity, i.e., the focus of our research;
- New-Keynesian dynamic stochastic general equilibrium models consider both demand-side and supply-side factors, which enables the most comprehensive analysis of the impact of increased defence spending on macroeconomic variables.

The model

As indicated in the previous section, the model on which the research is based includes both demand-side and supply-side factors. In accordance with the demand-side approach initiated by Keynes (1936), along with the increase in government spending, there is multiplied growth in aggregate demand and, as a result, output. Hicks (1937) and Hansen's (1953) famous IS-LM model was created as a result of extending the simple demand model to include the LM curve. The money market weakens the impact of government spending on output due to the increase in demand for money resulting from higher output. This, in turn, leads to an increase in the interest rate, crowding out part of the investment. Consequently, the demand-side effects of fiscal policy depend on money market conditions, e.g., they are particularly strong in the case of zero interest rates and liquidity traps (Eggertsson and Krugman 2012).

At the same time, however, the demand-side effects of fiscal policy on GDP do not depend significantly on what type of government spending is increased. In particular, the demand-side effects of fiscal policy should not significantly differ, whether it is defence spending or any other type of government spending.

A different situation occurs in the case of supply-side effects of government spending. In this case, government spending affects the economy not only at the aggregate level, but also at the micro level by the impact it has on households' and firms' decisions. This impact is mainly due to the wealth effect (Aschauer 1988; Baxter and King 1993). Consequently, the impact of fiscal policy on household decisions depends on the substitutability of a given government spending relative to household consumption (Karras 1994; Kwan 2006; Ercolani and e Azevedo 2014).

Thus, when analysing the supply-side effects of government spending, two kinds of spending should be distinguished: (1) expenditure that is not a substitute for private consumption and (2) expenditure that is partly a substitute for private consumption. Defence spending is not a substitute for private consumption, while non-defence spending is partly a substitute for private consumption (e.g. government spending on healthcare and education is partly a substitute for private expenditure on healthcare and education).

The model analysed in this study is a New-Keynesian dynamic stochastic general equilibrium model with heterogeneous households. As Campbell and Mankiw (1989) indicated, it is reasonable to distinguish between two groups of households based on the role of current income and permanent income in their decision-making. Such a disaggregation is particularly justified when analysing fiscal policy, as each of the above groups of households responds differently to changes in fiscal policy (Galí, López-Salido, and Vallés 2007).

Households that make decisions based on permanent income, i.e., they consider the future development of their income in optimisation decisions, are often referred to in the literature as Ricardian households. The name derives from the fact that for this group of households, there is a Ricardian equivalence between financing government spending with public debt and with lump-sum taxes (Barro 1974). Households that make decisions only based on current income are referred to as non-Ricardian households. This is because, in their case, Ricardian equivalence does not occur. Potential reasons for the non-existence of Ricardian equivalence include a finite planning horizon, a lack of access to the credit market, short-sightedness, or following practical rules (e.g. Galí, López-Salido, and Vallés 2004).

Ricardian households make their decisions to maximise the expected value of the following sum of discounted utilities (Christiano and Eichenbaum 1992):

$$E_t \sum_{t=0}^{\infty} \beta^t \ln\left(C_t^R + \gamma G_t^{non\ defence}\right) + \vartheta(1 - L_t^R), \tag{1}$$

where:

E_t – expected value in period *t*,
β – discount factor,
C_t^R – private consumption of Ricardian households,
$G_t^{non\ defence}$ – non-defence spending (government spending which is partly a substitute for private consumption),
γ – rate of substitution between private consumption and non-defence spending,
L_t^R – labour of Ricardian households,
ϑ – parameter that describes the role of leisure (free time) in Ricardian households' preferences,

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

$\gamma \in (0,1)$,

$\vartheta > 0$.

Consequently, in decisions concerning their consumption level, Ricardian households only consider government spending that is partly a substitute for private consumption (that is, non-defence spending). Non-Ricardian households make their decisions only based on their current budget constraint. They spend all their current income on consumption and taxes, which means that their budget constraint is as follows:

$$P_t(C_t^{NR} + T_t^{NR}) = W_t P_t L_t^{NR}, \tag{2}$$

where:

C_t^{NR} – consumption of non-Ricardian households,

L_t^{NR} – labour of non-Ricardian households,

T_t^{NR} – taxes paid by non-Ricardians,

P_t – price level,

W_t – wages.

Aggregation results in:

$$C_t^R + C_t^{NR} = C_t, \tag{3}$$

$$L_t^R + L_t^{NR} = L_t, \tag{4}$$

$$T_t^R + T_t^{NR} = T_t, \tag{5}$$

where:

C_t – aggregate consumption,

L_t – aggregate labour,

T_t – public revenue from taxes.

Taxes are paid by both groups of households; however, in accordance with Ricardian equivalence, the distribution of taxes over time only affects the decisions of non-Ricardian households (Barro 1974).

The final good is allocated for consumption, investment, and two analysed types of government spending. Thus, aggregate demand is a sum of the following components:

$$C_t + I_t + G_t^{defence} + G_t^{non\ defence} = Y_t, \tag{6}$$

where:

– investment,

$G_t^{defence}$ – defence spending,

Y_t – output.

The final good is produced based on intermediate goods, according to Dixit and Stiglitz's (1974) aggregator:

$$Y_t = \left(\int_0^1 y_t(i)^{\frac{1}{1+\lambda_{p,t}}} di \right)^{1+\lambda_{p,t}}, \tag{7}$$

where:

$y_t(i)$ – intermediate good of type *i*,

$\lambda_{p,t}$ – parameter that describes the markup,

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

Intermediate goods are produced by companies operating within monopolistic competition. The production function for each intermediate good is given by the following formula:

$$y_t(i) = A_t k_t^{\alpha}(i) l_t^{1-\alpha}(i) - FC_t, \tag{8}$$

where:

A_t – total factor productivity,

$k_t(i)$ – capital used to produce intermediate goods of type *i*,

$l_t(i)$ – labour used to produce intermediate goods of type *i*,

FC_t – fixed cost,

α – private capital elasticity of output,

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

Levels of aggregate capital and aggregate labour are defined by the following equations:

$$K_t = \int_0^1 k_t(i) di, \tag{9}$$

$$L_t = \int_0^1 l_t(i) di, \tag{10}$$

where:

K_t – aggregate level of capital.

The aggregate capital increases according to a standard capital growth equation:

$$K_t = (1-\delta)K_{t-1} + I_t, \tag{11}$$

where:

δ – depreciation rate,

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

Ricardian households, unlike non-Ricardian households, derive their income not only from labour but also from capital. Income from capital, in turn, depends on the interest rate. Interest rates result from monetary policy, which is conducted according to the Taylor (1993) rule. It means that:

- the higher the output compared to its potential level, the higher the interest rate set by the central bank,
- the higher the inflation compared to the inflation target, the higher the interest rate set by the central bank.

It is assumed that both prices and wages are set according to the Calvo (1983) setting. The probability that, in a given period, the household will set the wage rate and firms will set prices does not depend on their previous decisions (Erceg, Henderson, and Levin 2000; Kollmann 2001):

$$W_t = \left((1-\xi_w) W_{IND,t}^{-\frac{1}{\lambda_{w,t}}} + \xi_w W_{OPT,t}^{-\frac{1}{\lambda_{w,t}}} \right)^{-\lambda_{w,t}}, \tag{12}$$

$$P_t = \left((1-\xi_p) P_{IND,t}^{-\frac{1}{\lambda_{p,t}}} + \xi_p P_{OPT,t}^{-\frac{1}{\lambda_{p,t}}} \right)^{-\lambda_{p,t}}, \tag{13}$$

where:

$W_{IND,t}$ – indexed wage,

$W_{OPT,t}$ – wage optimized by households,

ξ_w – the probability that households will optimize wages,

$P_{IND,t}$ – indexed price,

$P_{OPT,t}$ – price optimized by firms,

ξ_w – the probability that firms will optimize prices,

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

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

The structure of the model means that defence spending has both supply and demand effects on the economy.

The changes in defence spending are described by the following autoregressive process:

$$G_t^{defence} = \left(1-\rho_g\right)^n \overline{G}_{defence} + \rho_g G_{t-1}^{defence} + \zeta_{defence,t}\ , \tag{14}$$

where:

$\rho_{\tau g}$ – parameter that describes the persistence of defence spending disturbances,

$\overline{G}_{defence}$ – the average level of defence spending,

$\zeta_{defence,t}$ – fiscal policy disturbances concerning the level of defence spending,

$\rho_g \in (0,1)$,

$\overline{G}_{defence} > 0$,

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

The effects of an increase in defence spending

The macroeconomic effects of an increase in defence spending in Poland and Germany were analysed based on impulse-response functions, which were calculated for the presented model estimated for the Polish and German economies. The parameters were estimated separately for each country based on Bayesian estimation (Adolfson et al. 2007) and calibration. The Eurostat quarterly data from 2000–2021 for the Polish and German economies were used to estimate the parameters of the models.

The impact of an increase of 1% GDP of each type of analysed defence spending on GDP, consumption and employment in Poland and Germany is presented in the study. The impulse response functions show the changes defined as percentage points of the initial level of each variable. The impact of an increase in defence spending in Poland and Germany on GDP is shown in Figure 1.

The impulse response functions show that the defence spending multiplier is substantially higher in Poland than in Germany. In Poland, the defence spending multiplier initially equals 0.75, which is only slightly lower than unity. By contrast, the defence spending multiplier in Germany is initially only 0.47. Thus, the results of the study show that in the Polish economy, the impact of defence spending on GDP is 60% stronger than in the German economy.

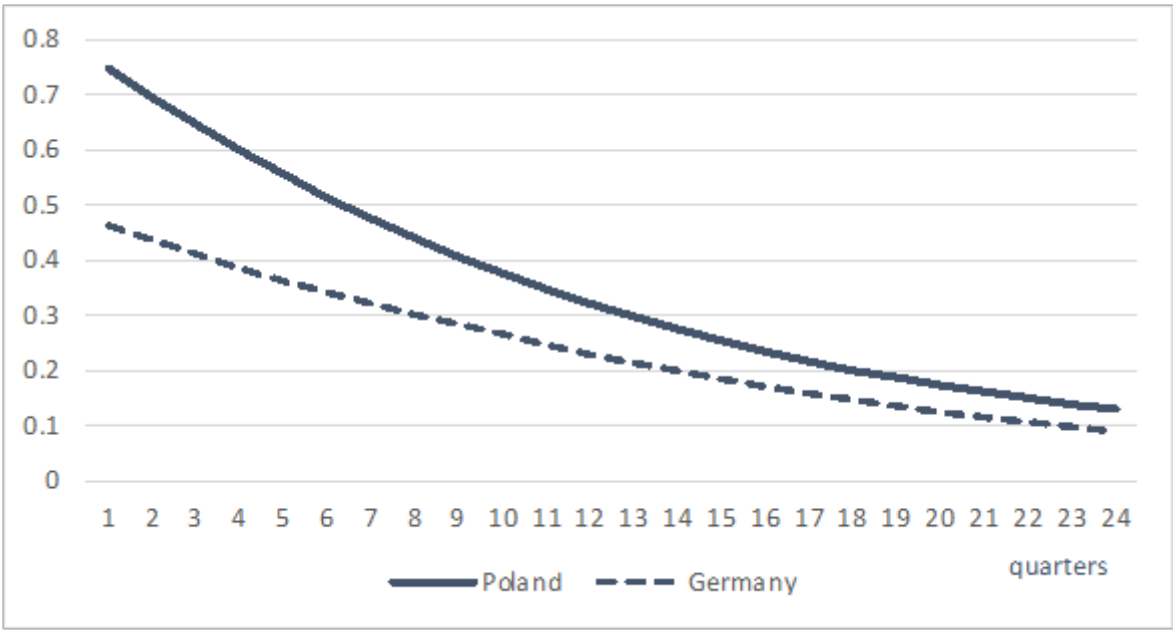

Figure 1. Impact of an increase in defence spending on GDP in Poland and Germany

Source: own study based on Eurostat n.d.

The relatively high value of the defence spending multiplier in Poland results from the fact that:

- Defence spending is not a substitute for household consumption expenditures, decreasing the crowding-out of households' private consumption;
- The relative role of households making decisions on their current rather than permanent income is higher in Poland than in more developed economies, which, in accordance with the consumption function, leads to a relatively high increase in household consumption and stimulates output.

In Germany, the former occurs as in Poland, while the latter is weaker. This is because, in more economically developed countries, the role of non-Ricardian households is smaller.

At the same time, it can be observed that changes in the GDP growth rate caused by the increase in defence spending are temporary and fade over time in both Poland and Germany. This is because defence spending does not directly increase the productive capacity of the economy.

As indicated earlier, the interrelationship between government spending and consumption is important for the impact of defence spending on the economy. The effects of an increase in defence spending on consumption in analysed countries are shown in Figure 2.

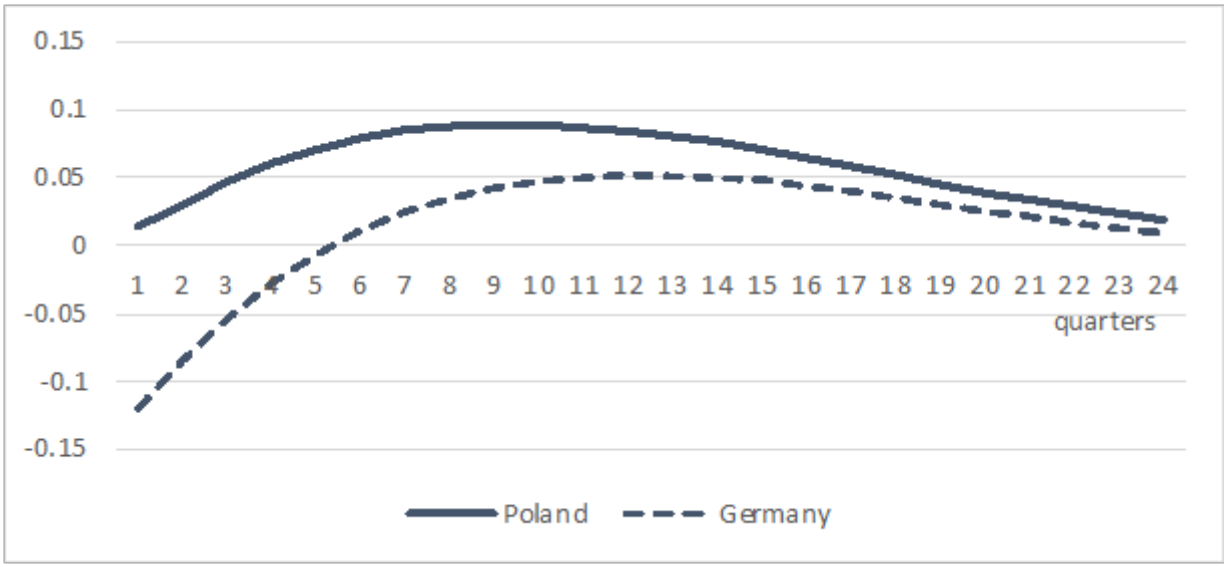

Figure 2. Impact of increase in defence spending on consumption in Poland and Germany

Source: own study based on Eurostat n.d.

In both economies, the changes in consumption caused by the increase in defence spending are small due to defence public expenditure affecting consumption in two opposite directions:

- An increase in defence spending causes a rise in aggregate demand and disposable income, which, according to the consumption function, leads to higher consumption;
- An increase in defence spending causes a crowding-out effect, i.e., a higher interest rate pushes out households' private consumption.

The first effect mainly affects households that make decisions based on their current income (non-Ricardians). The second effect mainly impacts households that make decisions based on permanent income (Ricardians). As a result, the initial response of consumption to the increase in defence spending in Poland and Germany is different. In the Polish economy, consumption grows, whereas in the German economy, it is initially reduced. Consumption in Poland grows immediately after the increase in defence spending because the demand-side effect that results from the growth in current disposable income prevails. According to the consumption function, the growth of current disposable income in the Polish economy leads to a substantial increase in consumption, stronger than the decrease in consumption due to the crowding-out effect. By contrast, in Germany, the crowding out effect, which concerns Ricardian households, initially prevails. After a certain time, however, consumption increases in both economies. This is presumably because the crowding-out effect is relatively weaker for defence spending than for other types of government spending, as it is not a substitute for private consumption (Christiano and Eichenbaum 1992).

In addition to GDP and consumption, the study also examines the impact of an increase in defence spending in the Polish and German economies on labour, as employment is one of the key macroeconomic variables that show the condition of the economy.

The impact of an increase in defence spending on labour is shown in Figure 3.

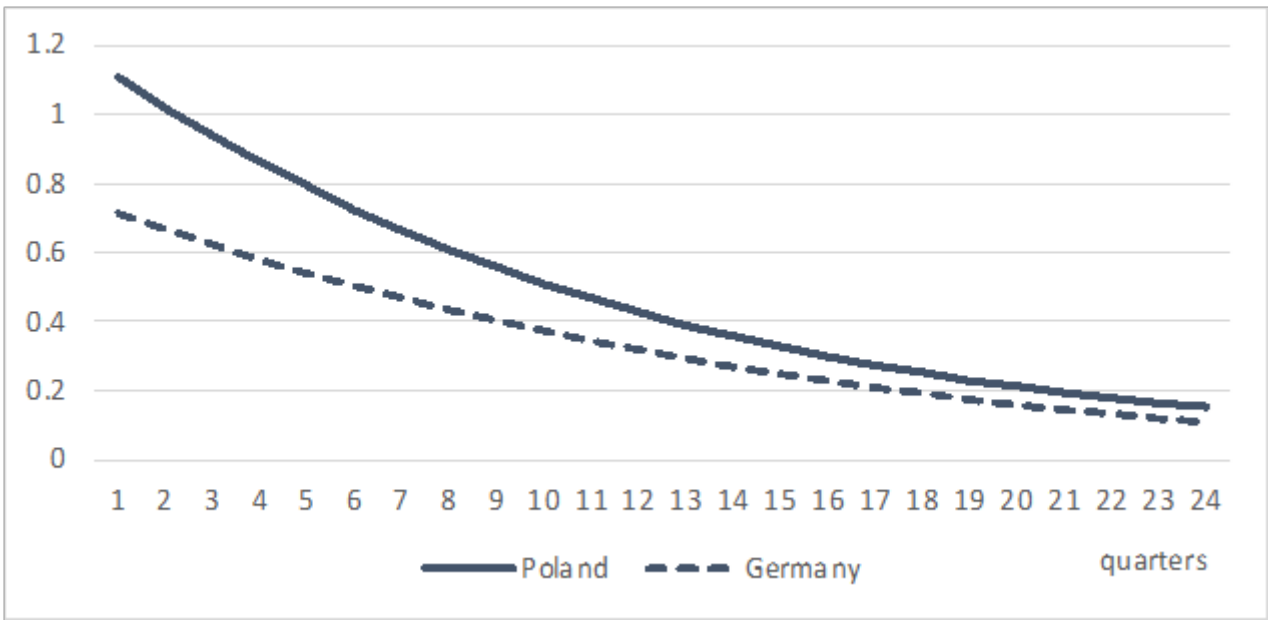

Figure 3. Impact of increase in defence spending on labour in Poland and Germany

Source: own study based on Eurostat n.d.

The results obtained for employment, based on the calculated impulse response functions, are similar to those for GDP. That is, as a result of the increase in defence spending, employment grows much more strongly in Poland than in Germany. In both economies, the percentage rise in employment is higher than the percentage increase in GDP. This is because an increase in defence spending, as in the case of other kinds of government spending, has a different impact on the short-term development of each factor of production. An increase in defence spending raises the level of employment much more strongly than the level of capital (which may even decline). Thus, the boost in GDP is driven by higher employment in both countries.

However, the impulse response functions also show that the impact of defence spending on the growth rate of employment is temporary. It diminishes over time, especially fast in the case of the Polish economy. As a result, in both Poland and Germany, GDP growth is also temporary. It means that an increase in defence spending does not have a long-term impact on economic growth in those countries, although it enhances short-term economic activity.

Conclusion

The research compared the macroeconomic consequences of a rise in defence spending in Poland and Germany. Impulse response functions calculated based on the models estimated for the Polish and German economies show that an increase in defence spending raises GDP in both countries. However, the impact on GDP is much stronger in Poland than in Germany. These results are in line with the theoretical predictions. The role of Ricardian households (i.e., households that make decisions based on permanent income) is higher in more developed economies, which results in defence spending having a lower impact on GDP in the German economy.

The results of the study also indicate that in Poland, defence spending enhances labour and consumption more than in Germany. The differences between the countries are particularly apparent in the case of the impact of defence spending on consumption. The impulse response functions show that, in Germany, an increase in defence spending causes a reduction in consumption that lasts more than one year. This is due to a strong crowding-out effect among Ricardian households. In contrast, the impulse response functions for Poland indicate that consumption increases immediately after the rise in defence spending. The reason for this is the greater role of non-Ricardian households, whose consumption depends on increased current income; therefore, the crowding-out effect is weaker.

To sum up, the research shows that an increase in defence spending is a more effective tool to stimulate economic activity in Poland than in Germany. As a result of an increase in defence spending, GDP, employment, and consumption rose in the Polish economy more than in the German economy.

Still, there are two interesting fields for further research:

- It would be worth investigating whether there is a more general inverse relationship between the level of economic development and the effectiveness of defence spending in stimulating the short-term economic activity;
- The question remains whether and under what conditions an increase in defence spending, which actually does not directly increase household utility, stimulates economic activity in a way that not only boosts GDP but also benefits households.

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Porównanie makroekonomicznych efektów zwiększenia wydatków na obronność w Polsce i w Niemczech

Celem artykułu jest porównanie makroekonomicznych efektów wydatków na obronność w gospodarce polskiej i niemieckiej. Oszacowanie tych efektów ma szczególne znaczenie w kontekście silnego wzrostu wydatków na obronność w Polsce i Niemczech w wyniku wybuchu wojny w Ukrainie. Badanie oparte jest na dynamicznym stochastycznym modelu równowagi ogólnej, który uwzględnia zarówno mechanizmy popytowe, jak i podażowe. Funkcje reakcji na impuls obliczone na podstawie modeli oszacowanych dla gospodarki polskiej i niemieckiej ukazują, że oddziaływanie wydatków obronnych na PKB jest znacznie silniejsze w Polsce niż w Niemczech. Ponadto uzyskane wyniki empiryczne wskazują, że w polskiej gospodarce wydatki na obronność w większym stopniu niż w gospodarce niemieckiej stymulują również zatrudnienie i konsumpcję.

Słowa kluczowe: wydatki na obronność, wydatki rządowe, polityka fiskalna

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The Gender Gap in the Visegrád Group Countries Based on the Luxembourg Income Study

Alina Jędrzejczak https://orcid.org/0000-0002-5478-9284
Ph.D., Associate Professor, University of Lodz, Department of Statistics and Demography, Lodz, Poland
e-mail: alina.jedrzejczak@uni.lodz.pl

Kamila Trzcińska https://orcid.org/0000-0002-4714-4074
Ph.D., University of Lodz, Department of Statistics and Demography, Lodz, Poland
e-mail: kamila.trzcinska@uni.lodz.pl

Abstract

Gender equality is a fundamental human right and one of the core values of the European Union (EU). Great efforts have been made to defend this right and to promote gender equality within the member states and around the world. However, there are still significant differences between men and women, especially in terms of income. The main objective of the paper is to compare income distributions for gender groups across four Central European countries, Poland, Slovakia, Czechia and Hungary, i.e., the members of the Visegrád Group (V4). These countries share similar histories and similar economic development, but there are substantial differences between their approaches to economic reforms, including labour market policy. This, in turn, is reflected in different income distributions and income inequality patterns. There is a debated research issue regarding the methodology of measuring the gender gap – the traditional methods based on comparing means and medians seem unsatisfactory as they do not consider the shape of income distributions. The paper's novelty lies in the application of the relative distribution concept, which goes beyond the typical focus on average income differences toward a full comparison of the entire distribution of women's earnings relative to men's. In the paper, we implement a parametric approach for estimating the relative distribution, which allows us to compare and visualise the "gap" between the gender groups at each distribution quantile. The basis for the calculations was the microdata from the Luxembourg Income Study (LIS). The statistical methods applied in the study were appropriate to describe the gender gap over the entire income range. The results of the empirical analysis helped to reveal similarities and substantial differences between the countries.

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Keywords: income inequality, gender gap, Dagum distribution, relative distribution method, Visegrád Group

JEL: C4, D63, J16

Introduction

Although average incomes across countries have been converging for over two decades (World Bank 2016), COVID–19 directly offset the reduction in the gap between countries. As a result, income inequality and substantial regional disparities are still a great challenge for policymakers in many European countries. One of the critical elements of this phenomenon is the inequality between the income distributions of men and women. The gender pay gap can be a problem from a public policy perspective because it reduces economic output and means that women are more likely to be dependent upon welfare payments, especially in old age.

Reducing inequalities for European Union (EU) citizens and promoting upward convergence in living conditions is high on the policy agenda for the European Commission. Although the EU allocated 347 billion euros (over one-third of its budget) in the period 2007–2013 to transfers for regional policy to reduce economic and social disparities within and among member states, income disparity still grew in both EU and OECD countries, and in 2022 reached its highest level for the past half-century (OECD 2015). Several studies were conducted on the issue for the purpose of social and economic policies, including *Divided We Stand. Why Inequality Keeps Rising* (OECD 2011) and *In It Together: Why Less Inequality Benefits All* (OECD 2015). The trend of rising inequality has become a priority for policymakers, and there have been calls for the analysis of various aspects of income inequality, including its measurement and decomposition by regional area, income source, and, recently, gender (see Jędrzejczak 2015; Zenga and Jędrzejczak 2020).

Gender equality is one of the fundamental values of the EU. The European Commission's work on gender equality policy is based on the *Strategic engagement for gender equality 2016–2019*, which focuses on five priority areas, including increasing female labour-market participation, reducing the gender pay, earnings and pension gaps, combating gender-based violence, improving gender balance in decision-making, and promoting gender equality within the Member States and across the world. Although it is generally illegal for employers in the EU to pay men and women different amounts for doing the same job, there are many reasons why, on average, there are substantial income differences between men and women. The income differences capture differences across many possible dimensions, including education levels, working hours, experience, and occupation, among others. Gender equality, often understood only in terms of income, should be viewed as multidimensional. Gender equality also means equal economic independence for women and men; it refers to equality in decision-making,

and, in the broader setting, it requires equal dignity, integrity, and the ending of gender-based violence.

On the one hand, occupational segregation is perhaps the main reason: men are prevalently in higher-paid industries, while women are mostly in lower-paid industries. There is vertical segregation, too. Few women work in senior, and hence better-paying positions. Finally, some barriers to entry into the labour market are related to the education level and single parenting rate. Blau and Kahn (2000; 2003) developed an in-depth analysis that showed that differences in pay are caused by many concurring factors. Meanwhile, Leythienne and Ronkowski (2018) studied gender gaps in many countries based on the Structure of Earnings Survey (SES) data. Greselin and Jędrzejczak (2020) studied the gender gap in Poland and Italy, comparing data provided by Eurostat for Poland and Italy through the relative distribution approach. Greselin, Jędrzejczak, and Trzcińska (2023) proposed a new parametric approach to gender gap analysis based on different theoretical distributions, and it was applied to EU-SILC data for Poland and Italy. Various dimensions of the discrepancy between men and women have recently been considered in the literature for many countries (e.g., Doorley and Claire 2020; Avram and Popova 2022; Boneva et al. 2022; Cordova, Grabka, and Sierminska 2022; Glaubitz, Harnack-Eber, and Wetter 2022; and Cozarenco and Szafarz 2023).

The research issue of measuring the gender gap is a subject of debate regarding the methodology used. The Eurostat database contains an indicator called "unadjusted gender pay gap", defined as the relative difference between average gross hourly earnings, from the four-yearly Structure of Earnings Survey (Eurotat n.d.). The gender pay gap in the EU in 2019 was 14.1% (i.e., women earn 14.1% less per hour than men on average), and it had only changed minimally over the last decade. Another summary measure used by Eurostat, called "the gender overall earnings gap", stood at 36.7%. It measures the combined impact of average hourly earnings, the monthly average number of hours paid (before any adjustment for part-time work) and the employment rate. Similar indicators can easily be obtained based on EU-SILC (Survey of Income and Living Conditions) data by comparing mean or median incomes for gender groups. However, this approach is unsatisfactory, as the gender gap is related to the whole distribution of incomes in a population, so it is difficult to capture the full range of experiences using a single metric. To reveal the factors that contribute to the gender discrepancy, one should adopt a variety of tools, consider concomitant variables, and go beyond the typical focus on average or median earnings differences toward a full comparison of the entire distribution of women's earnings relative to men's.

The present paper focuses on income distributions across four Central European countries: Poland, Slovakia, Czechia and Hungary, i.e., the members of the Visegrád Group (V4). These countries share not only similar histories but also similar economic development (measured by Gross Domestic Product (GDP)). The idea was to compare the neigh-

bouring countries with different paths of economic transformation from a centrally planned to a market-based economy. Even though state influence was radically weakened in favour of market liberalisations, the effective transformation of these economies was based on country-specific institutional reforms. Differences between the national approaches to economic reforms, including labour market policy, are particularly reflected in different income distributions and income inequality patterns.

According to a World Bank report (World Bank 2000), the first study to include Central European transition countries, income disparities between the rich and poor increased in virtually all transition economies during the 1990s. However, the extent of this increase varied considerably across countries. In explaining the main causes of the observed changes in income inequality, the study highlighted the role of increased inequality of labour earnings, which could be traced to a rapid rise in returns to education. Government tax and transfer policies were also found to have had a huge impact on income distribution, dampening the rises in income inequality due to increased dispersion of earnings. It was visible in Central European countries much more than in many other countries.

On the other hand, public policy in these countries played an important role in reducing income inequalities, both through national taxation as well as benefits systems. This impact was so large in post-socialist countries because of greater inequality aversion, which resulted in social policies against the rise in inequality (World Bank 2000). A Tárki Social Research Institute study on intolerance to income inequality across countries confirmed a markedly lower level of acceptance of inequality in the post-socialist bloc than in the other European countries, with high national differentiation also within the bloc (TARKI 2009). Zaidi's (2009) study of the main drivers of income inequality in Central European and Baltic Countries revealed that Slovakia and the Czech Republic had relatively low income inequality because of the strong redistributive role of taxes and benefits. By contrast, the role of direct taxes and public transfers in redistributing incomes was much smaller in Poland and, to some extent, Hungary.

During the transformation, Slovakia had relatively low average tax shares (around 17–18% of equivalised disposable incomes). In Hungary and the Czech Republic, the share was about 21%, while Poland had the highest share (33%). Meanwhile, in Poland and Hungary, the shares of social benefits in disposable incomes (27% and 33%, respectively) were higher than in the Czech Republic and Slovakia (25% and 23%). Ultimately, however, income inequalities are clearly higher in Poland and Hungary than in the Czech Republic and Slovakia, which can be explained by a more effective tax and benefit policy (see Zaidi 2009). In another study on V4 countries, using aggregated data from Fraser Institute, Eurostat, and the OECD database, Szczepaniak and Szulc-Obłoza (2020) identified the impact of many labour market institutions when trying to limit income inequalities. Using a taxonomic analysis based on aggregated sta-

tistical data coming from Fraser Institute, Eurostat and OECD, they confirmed that the Czech Republic and Slovakia are classified in one group of EU countries, while Poland and Hungary are classified in another one, taking into consideration both labour market institutions and income inequalities. However, the introduction of social programs in Poland in 2016 (e.g., the Family 500+ child benefit program) significantly reduced income inequalities, especially in families with children (Jędrzejczak and Pekasiewicz 2020a). Further changes are expected when the minimum wage increases.

A phenomenon strictly related to income inequalities is the discrepancy between male and female incomes, known as the gender gap. The main objective of this paper is to analyse this discrepancy in the V4 countries using theoretical income distributions and the relative distribution approach. A nonparametric version of the method has already been applied by Greselin and Jędrzejczak (2020), who compared income distributions in Poland and Italy based on EU-SILC data. The current analysis was conducted for 2015–2020, as it was the most recent data available. Due to the relative stability of income distributions, huge changes between particular countries are not observed over time. The statistical analysis was performed using our own numerical procedures implemented in the R-project environment. The calculations were based on microdata from the LIS (Luxembourg Income Study).

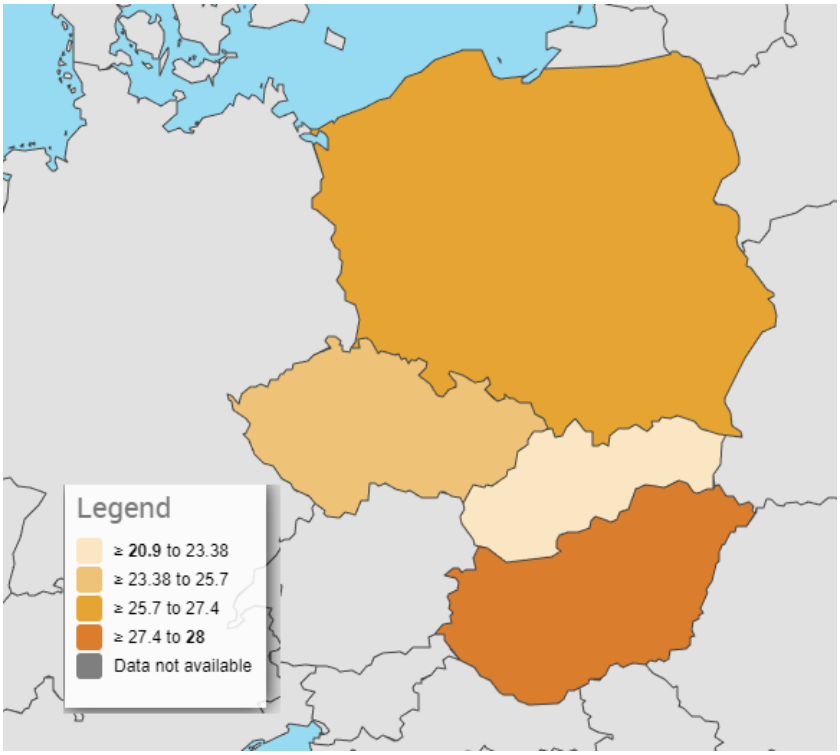

Figure 1. Gini coefficient of equivalised disposable income in 2020 based on EU-SILC survey

Source: own elaboration based on Eurostat database n.d.

This paper aims to show the similarities and differences in the income distributions of women and men in the Visegrad group countries, which differ significantly in terms of their overall income inequality measured by the Gini index (see Figure 1). A new parametric approach for estimating the relative distribution was used, which makes it possible to compare and visualise the "gap" between the gender groups at each distribution quantile. This approach goes beyond the typical focus on average or median earnings differences toward a full comparison of the entire distribution of women's earnings relative to men's.

Theoretical income distributions

Since Pareto proposed his first income distribution model in 1896, many economists and mathematicians have tried to describe empirical distributions using simple mathematical formulas with few parameters. These formulas can be useful for many reasons. Firstly, applying a theoretical model simplifies the analysis because different distribution characteristics can be performed using the same parameters. Secondly, a theoretical model that is well-fitted to the data can be used to predict wage and income distributions in different divisions. Additionally, approximating empirical wage and income distributions using the theoretical curves can smooth irregularities from the data-collecting method, which is often the case for income data. Two different economic size distributions widely employed in the literature for fitting income data are the two-parameter Lognormal model and the three-parameter Dagum model. We provide a definition and basic information for making inferences from survey data.

The Lognormal distribution is a two-parameter model frequently applied for fitting income distributions in many countries, mainly due to its simplicity and the straightforward interpretation of its parameters (see Aitchison and Brown, 1957). It fits lower income levels better than the Pareto distribution, but its fit towards the upper tail is far from satisfactory. Nevertheless, it can be applied to approximate selected empirical income distribution, especially in post-socialist countries. A Lognormal random variable Y has the following density function:

$$f(y)=\frac{1}{y\sigma\sqrt{2\pi}}exp\left(-\frac{(\ln y-\mu)^2}{2\sigma^2}\right) \text{ for } y\in R, \tag{1}$$

where: $\mu\in R-$ the expected value of the logarithms of income Y,

$\sigma>0-$ the standard deviation of the logarithms of income Y.

The Lognormal random variable cannot be explicitly expressed by the formula; it can only be written as:

$$F(y)=\frac{1}{y\sigma\sqrt{2\pi}}erf\left(-\frac{\ln y-\mu}{\sigma\sqrt{2}}\right), \tag{2}$$

where: $erf(x)=\frac{2}{\sqrt{\pi}}\int_0^x e^{-t^2}dt$.

The methods most frequently applied to estimate the parameters μ and σ of the Lognormal model $LN(\mu,\sigma)$ based on empirical data are the following are the maximum likelihood method (ML), the method of moments (MM), and the method of quantiles. The ML estimators, which present the best statistical properties for large samples $Y_1,Y_2,\ldots,Y_n$, are given by the following formulas:

$$\hat{\mu}=\frac{1}{n}\sum_{i=1}^{n}\ln Y_i. \tag{3}$$

$$\widehat{\sigma^2}=\frac{1}{n-1}\sum_{i=1}^{n}\left(\ln Y_i-\hat{\mu}\right)^2. \tag{4}$$

Both estimators are unbiased and most efficient; what is more, their large sample variances are given by simple formulas: $D^2(\hat{\mu})=\frac{\sigma^2}{n}$ and $D^2\left(\widehat{\sigma^2}\right)=\frac{2\sigma^4}{n}$.

The Dagum model takes its name from Camilo Dagum, who introduced it in the 1970s when looking for a statistical distribution that closely fit empirical income and wealth distributions. To mimic the characteristic properties observed in such datasets, Dagum (1977) searched for a model that simultaneously permitted an interior mode (like the Lognormal) and could handle heavy tails (like the Pareto). He based his proposal on the empirical observation that the income elasticity $\eta(F, y)$ of the cumulative distribution function (*cdf*) of income is a decreasing and bounded function of *F*, and, therefore, of *y*. After decades of applications to real data in different divisions, the Dagum model has proven to be an appropriate candidate to model male and female income distributions.

We can say that F belongs to the Dagum family if its probability density function (*pdf*) is given by the following formula:

$$f(y)=\begin{cases} \dfrac{ap}{b}\left(\dfrac{y}{b}\right)^{ap-1}\left(1+\left(\dfrac{y}{b}\right)^{p}\right)^{-a-1} & for \quad y>0, \\ 0 & for \quad y\le 0. \end{cases} \tag{5}$$

The *cdf* of the Dagum distribution takes the form:

$$F(y)=\begin{cases} \left(1+\left(\dfrac{y}{b}\right)^{-p}\right)^{-a} & for \quad y>0, \\ 0 & for \quad y\le 0, \end{cases} \tag{6}$$

where: $a>0, b>0$ i $p>0$.

The quantile function of the Dagum distribution has the form:

$$F_D^{-1}(u;a,b,p)=b\left[u^{-1/p}-1\right]^{-1/a}, \quad \mathrm{u}\in(0,1). \tag{7}$$

The Dagum model $D(a, b, p)$ can be seen as a special case of the generalised beta distribution of the second kind (GB2); it is also a member of the Burr family, equivalent to the Burr type III distribution (for more detail on this distribution in the framework of economic size distributions, see Kleiber and Kotz 2003; Kleiber 2008, Jędrzejczak and Pekasiewicz 2020b).

This model allows for various degrees of positive skewness and leptokurtosis; moreover, it has built-in flexibility to be unimodal (to approximate income distributions) or zero modal (to describe wealth distributions). The ML estimators of the Dagum model parameters, namely $\hat{a}_0, \hat{b}_0, \widehat{p}_0$, can only be obtained using numerical procedures, but they present good inferential properties for large samples (for detail, see Jędrzejczak, Pekasiewicz, and Zieliński 2021).

Quantifying the gap between income distributions

Let Y denote a random variable that represents the analysed income distribution with density $f(y)$ and distribution function $F(y)$, i.e., the comparison distribution. Let Y_0 denote a random variable that represents a reference distribution with density $f_0(y)$ and distribution function $F_0(y)$. Our objective is to study the differences between distributions Y and Y_0, using Y_0 as the reference distribution.

The relative distribution of random variable Y with respect to the variable Y_0 is defined as the distribution of the transformed random variable R (see Handcock and Morris 2006):

$$R = F_0(Y). \tag{8}$$

Therefore, variable R determines the ranks of random variable Y with respect to the distribution of random variable Y_0. In other words, the value of the income of an individual from one population is assigned to the rank that this income would have in the distribution of the other population.

The distribution function of random variable R (i.e., *relative distribution function*) is expressed as:

$$G(r) = F\left(F_0^{-1}(r)\right) \text{ for } r \in [0,1]. \tag{9}$$

The respective density of random variable R (i.e., *relative density*) can be obtained as the integral of $G(r)$, and takes the form:

$$g(r) = \frac{f\left(F_0^{-1}(r)\right)}{f_0\left(F_0^{-1}(r)\right)} \text{ for } r \in [0,1]. \tag{10}$$

For the Dagum distribution $D(a, b, p)$, assumed as an underlying income distribution model, the relative distribution function can be expressed as:

$$G_{D(a,b,p;a_0,b_0,p_0)}(r) = \left[1 + \left(\frac{b}{b_0}\right)^{p} \left(r^{-1/p_0} - 1\right)^{p/a_0}\right]^{-a}. \tag{11}$$

Given two Dagum distributions, well fitted to the empirical data for both gender groups, the function $G(r)$ can be expressed using the estimates of their parameters, namely $\hat{a}, \hat{b}, \hat{p}$ and $\hat{a}_0, \hat{b}_0, \hat{p}_0$:

$$G_{D(\hat{a},\hat{b},\hat{p};\hat{a}_0,\hat{b}_0,\hat{p}_0)}(r) = \left[1 + \left(\frac{\hat{b}}{\hat{b}_0}\right)^{\hat{p}} \left(r^{-1/\hat{p}_0} - 1\right)^{\hat{p}/\hat{a}_0}\right]^{-\hat{a}}. \tag{12}$$

Formula (12) will further be applied to estimate the gap between the income distributions of men and women for the Visegrád Group countries.

Applications to LIS data

The Luxembourg Income Study Database (LIS) is a cross-national data centre which serves a global community of researchers, educators, and policymakers. LIS is the largest available income database of harmonised microdata collected from about 50 countries in Europe, North America, Latin America, Africa, Asia, and Australia, spanning five decades.

Harmonised into a common framework, LIS datasets contain household- and person-level data. The focus of the survey is to measure the standard of living and to gather information about household income. The survey acquires datasets with income, wealth, employment, and demographic data from many high- and middle-income countries, harmonises them to enable cross-national comparisons, and makes them publicly available in two databases, the Luxembourg Income Study Database (LIS) and the Luxembourg Wealth Study Database (LWS).

We used individual monthly disposable household income in all calculations, but households with negative or zero incomes were excluded from the statistical analysis for methodological and interpretation reasons. The analysis of the Visegrad Group was based on the latest data available for those countries, i.e. from 2020 for Poland, from 2018 for Slovakia, from 2016 for the Czech Republic and from 2015 for Hungary (Luxembourg Income Study (LIS) Database n.d.).The results are given in Tables 1–3 and Figures 2–9.

Tables 1 and 2 reveal remarkable differences between the estimates of basic statistical characteristics for men and women, which are visible for all the countries considered. The biggest discrepancies between means and medians were observed for the Czech Republic, where men's incomes were, on average, almost 50% higher. Poland and Slovakia had the next highest results (men out-earned women by approximately 30%, on average), while for Hungary, this difference was relatively small (20%). When comparing income inequality within the gender groups for each country, there are relatively big differences between the Gini ratios for the Czech Republic and Hungary (they are about 10% higher for men), while for Poland and Slovakia the Gini indices for men and women are more similar. It is worth noting that the Gini indices for personal income are visibly different than those observed for equivalised household incomes in the Eurostat database (see Figure 1).

Table 1. Lognormal model parameters and estimates of basic statistical characteristics for income distributions in V4 countries by gender

Country		Sample size	Lognormal model parameters		Mean [in euros or national currency]	Median [in euros or national currency]	Gini coefficient
			μ	σ^2			
Czech Republic	Male	7,124	9.9146	0.4567	25,412.12	20,224.46	0.3672
	Female	7,780	9.5605	0.3974	17,312.63	14,192.51	0.3442
Hungary	Male	2,275	11.6899	0.3618	143,030.05	119,363.65	0.3294
	Female	2,766	11.5222	0.3243	118,701.87	100,932.78	0.3128
Poland	Male	26,811	7.8562	0.3681	3,103.37	2,581.70	0.3321
	Female	29,070	7.5922	0.2975	2,300.68	1,982.69	0.3002
Slovakia	Male	5,228	6.5478	0.4235	862.24	697.71	0.3546
	Female	6,075	6.2931	0.3861	656.01	540.85	0.3396

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

Table 2. Dagum model parameters and estimates of basic statistical characteristics for income distributions in V4 countries by gender

Country		Sample size	Dagum model parameters			Mean	Median	Gini coefficient
			a	b	p			
Czech Republic	Male	7,124	3.152	24,999.1	0.696	25,233.52	21,104.35	0.3478
	Female	7,780	3.499	16,999.8	0.705	16,905.15	14,675.13	0.3138
Hungary	Male	2,275	3.537	141,000	0.700	138,352.24	122,587.08	0.2940
	Female	2,766	4.279	120,000	0.658	113,470.07	103,719.92	0.2647
Poland	Male	26,811	3.581	3,002.4	0.732	3,022.00	2,643.55	0.3034
	Female	29,070	3.755	2,203.1	0.796	2,274.29	2,017.13	0.2831
Slovakia	Male	5,228	4.448	1,036.8	0.433	828.92	761.44	0.2992
	Female	6,075	4.190	731.1	0.526	633.31	575.38	0.2900

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

Table 3. Accuracy of the parametric estimates based on the lognormal and Dagum models

Income distribution		Dagum model		Lognormal model	
		Relative difference [%]		Relative difference [%]	
		Mean	Median	Mean	Median
Czech Republic	Male	1.09	3.62	1.81	1.22
	Female	0.72	11.68	1.68	8.01
Hungary	Male	1.77	1.93	1.55	4.51
	Female	2.76	0.27	1.72	2.95
Poland	Male	1.98	1.67	0.66	0.70
	Female	0.70	0.86	0.36	0.87
Slovakia	Male	0.38	1.17	4.42	9.44
	Female	0.08	3.53	3.67	2.68

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

The results obtained using the Dagum model (Tab. 2) are more reliable, as this model exhibits a better fit to the empirical data (see Tab. 3 and Figures 2–5). The differences between the observed and estimated means and medians mostly do not exceed 3% of the parameters, indicating a close-to-perfect fit. For the Lognormal model, the differences between the empirical and theoretical distributions are higher. In some cases, they are not acceptable for further analysis, which is connected with the number of parameters and the shape of the density curve. The Lognormal distribution has light tails and only two parameters, making it generally less flexible and not well suited to high-income groups, in particular. In Figures 2–5, the heavy-tailed three-parameter Dagum model behaves better for higher income groups, and the difference between genders is more visible.

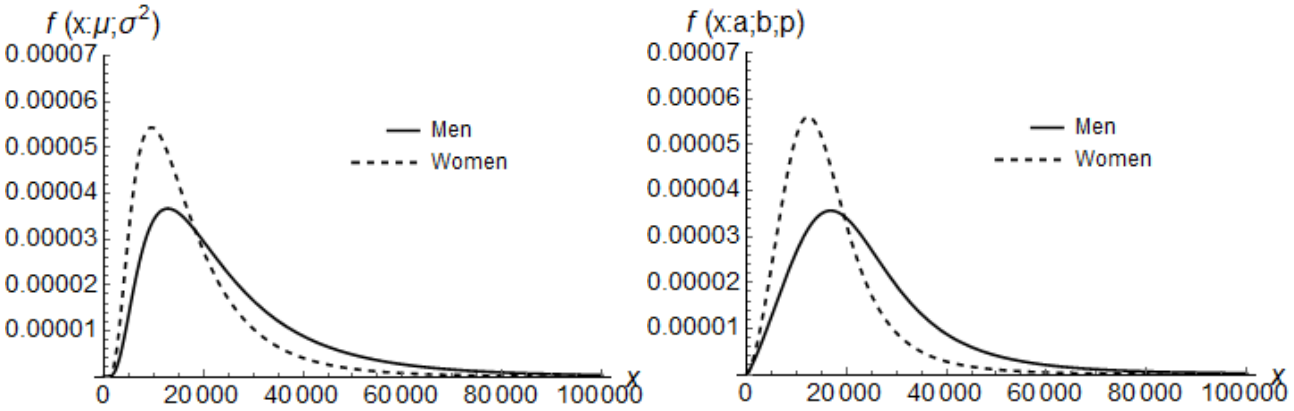

Figure 2. Estimated models: Lognormal (left) and Dagum (right) for men and women in the Czech Republic

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

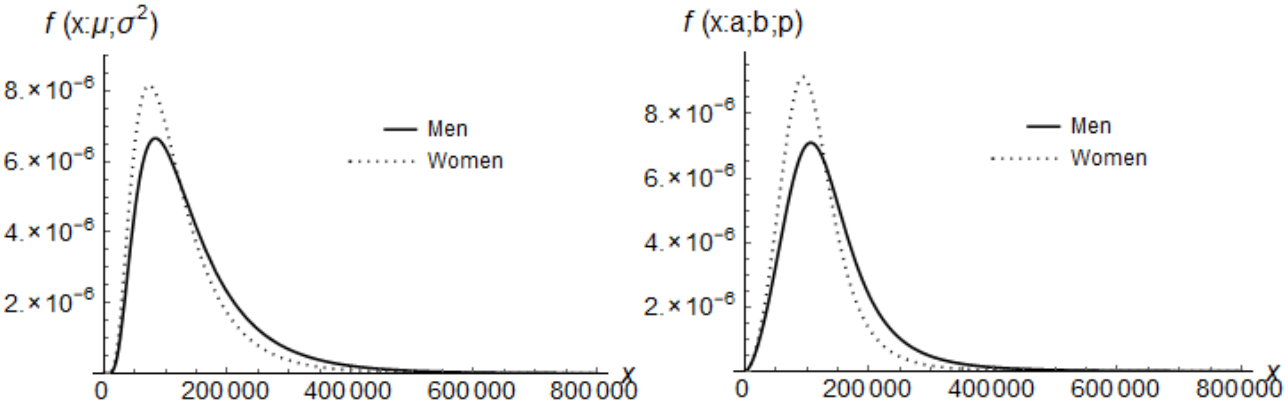

Figure 3. Estimated models: Lognormal (left) and Dagum (right) for men and women in Hungary

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

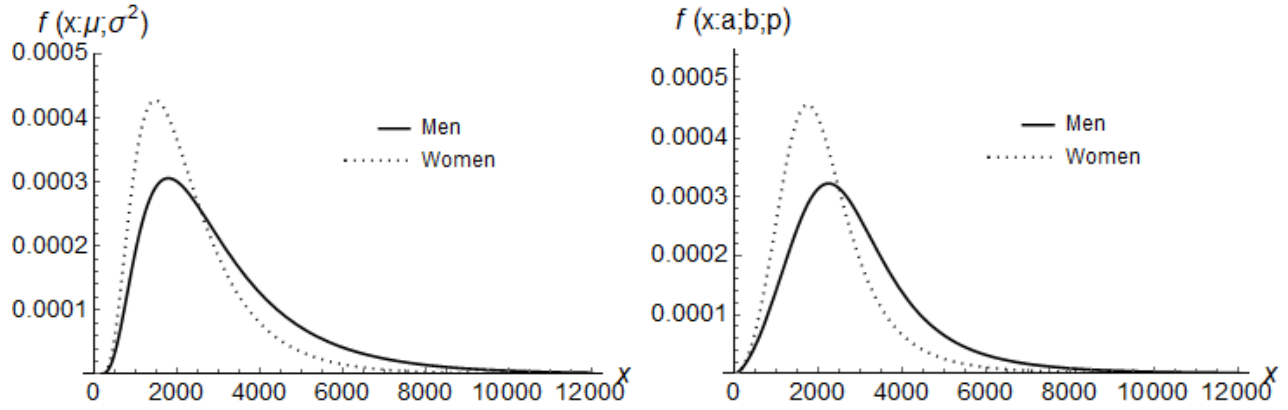

Figure 4. Estimated models: Lognormal (left) and Dagum (right) for men and women in Poland

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

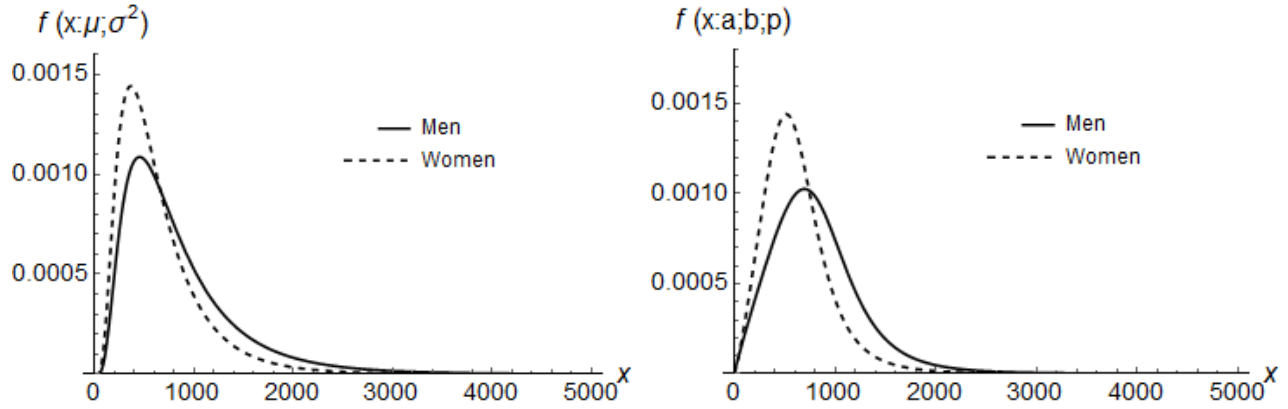

Figure 5. Estimated models: Lognormal (left) and Dagum (right) for men and women in Slovakia

Source: own elaboration based on LIS individual monthly disposable household income data: LIS Cross-National Data Center in Luxembourg n.d.

Figures 2–5, which show the theoretical income distributions for each country, show the same regularity: the income distributions of men are all shifted to the right and show a higher dispersion than for women. This suggests that, in all these countries, there is a large income gap between the genders. It is difficult to fully recognise this phenomenon based on a comparison of density curves (Figs. 2–5) as they are not scale-invariant. To that end, to measure and visualise the gap across the entire income range, we applied the relative distribution method, as described in section 3. The results are shown in Figures 6–9.

Figures 6–9 show the gender gaps using the relative distribution functions (9), estimated for the Dagum distribution as the underlying income distribution model (11). The gap is understood as the discrepancy between the curve and the diagonal line, which represents perfect equality between the groups. The values of the third, sixth and ninth income deciles, which are visible on the upper and right axes, are given for each country in its national currency or in euros (for Slovakia). The distances between the euro values on the right-hand scale are measured in units of persons rather than in euro (or national currency). Therefore, the distance between, e.g., 0 and 1000 euros is larger than the distance between 1000 and 2000 euros because a larger fraction of people have an income falling in the former range of incomes than in the latter. The curve of the relative income distribution provides rich and detailed information about the two income distributions being compared. Each point on the curve has a precise interpretation – in particular, the intersecting inner lines show the gap that corresponds to the third decile of the male distribution, which means the value below which 30% of the lowest earners are.

There are remarkable differences between the V4 countries concerning the gap between the income distributions of men and women. The gender gap is the most pronounced for the Czech Republic (Figure 6), where we can observe that at the third decile of the male distribution, i.e., $p = 0.3$, it holds $G(0.3) = 0.54$. This means that approximately 54% of women earn less than the third decile male's income. The result is even more striking for the median, i.e., $p = 0.5$, where this share equals 76%. The second biggest result, which is obviously unfavourable for women, was observed for Poland (Figure 8), where 50% of women earn less than the third decile male's income. This result is very close to Slovakia, where it was 49%. Hungary (Figure 7) had the smallest gender gap, as only 41% of women earned less than the "third decile man".

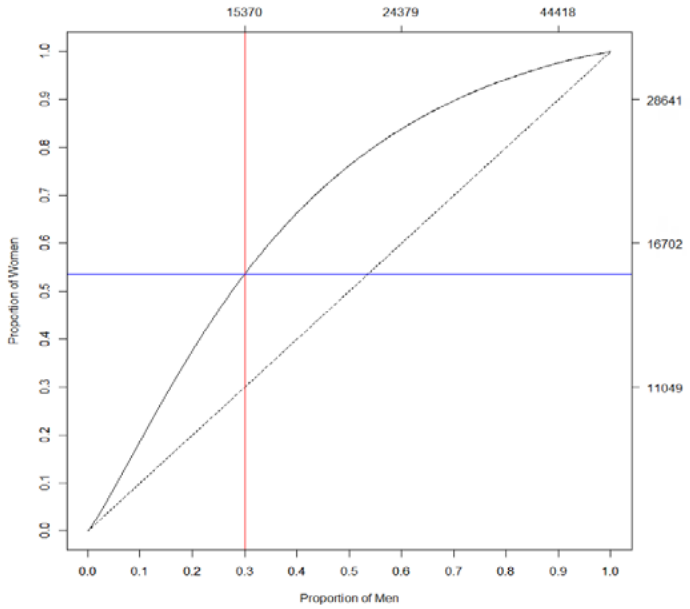

Figure 6. Gender gap between women (comparison) and men (reference) distributions in the Czech Republic

Source: own elaboration based on LIS data.

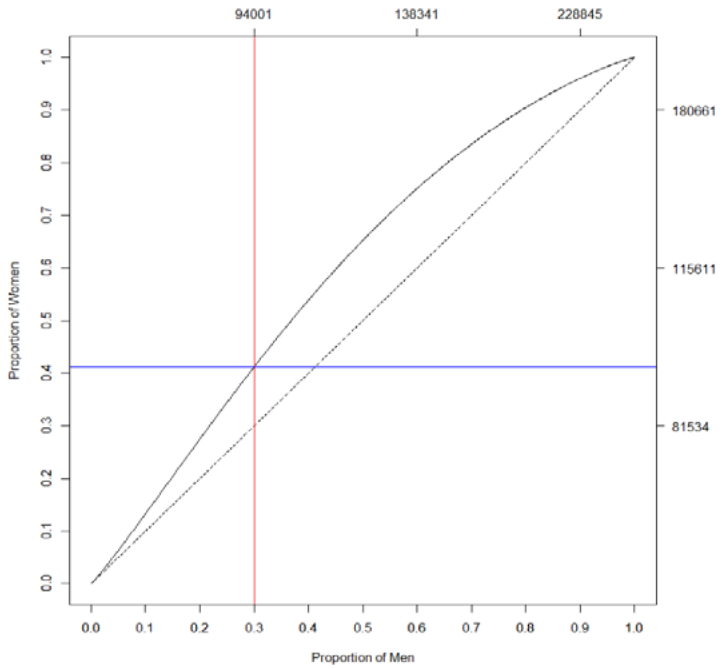

Figure 7. Gender gap between women (comparison) and men (reference) distributions in Hungary

Source: own elaboration based on LIS data.

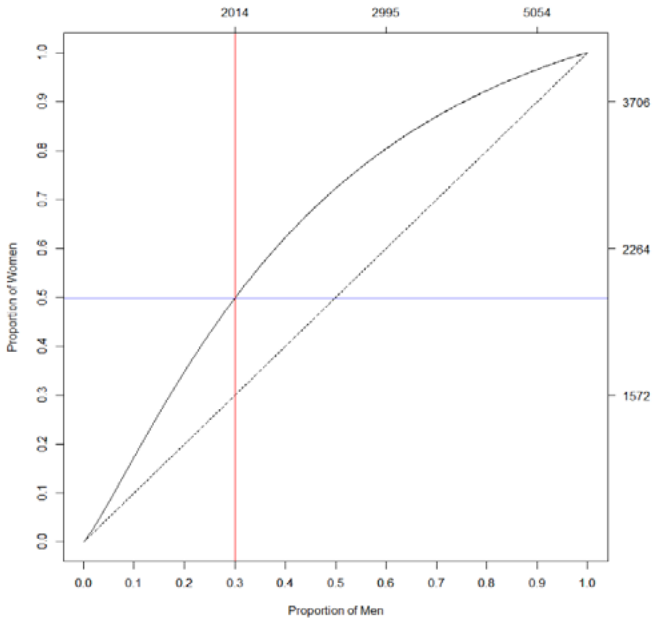

Figure 8. Gender gap between women (comparison) and men (reference) distributions in Poland

Source: own elaboration based on LIS data.

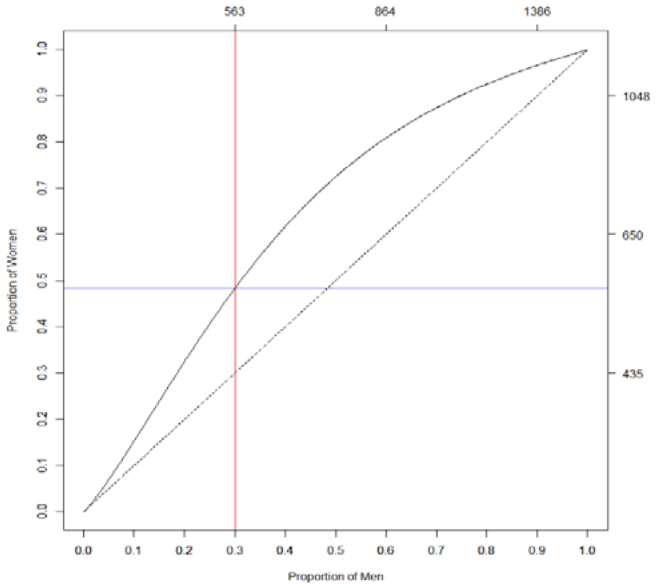

Figure 9. Gender gap between women (comparison) and men (reference) distributions in Slovakia

Source: own elaboration based on LIS data.

In all the countries except Poland, the gaps are asymmetric, increasing for the higher income group, while in Poland, the curve is symmetrical. It can be interpreted as the result of social programmes which smoothed out income inequality and made income distribution more symmetrical (see also Figs. 2–5). Moreover, for the Czech Republic and Hungary, income inequality measured by the Gini index was higher for men (see Tab. 2), suggesting that most of the discrepancies between the gender groups in these

countries came from extremely high male incomes. In Slovakia, by contrast, the gender gap could be a result of a "shift" in the distributions, connected with different means, rather than distributional inequality.

Conclusion

In this paper, we investigated the gender gaps in the Visegrád Group countries using the relative distribution method based on a parametric approach. The idea was to fully compare income distributions of men and women. In the parametric approach, we utilised the Dagum distribution, which is well-fitted to empirical data and performs better than its competitor, the Lognormal model. This approach allowed us to smooth out irregularities due to imperfections in the sampling method and to consider the full range of incomes, including high-income groups that were key to the analysis. The relative distribution methods applied in the study were appropriate to describe the gender gap for the entire income range and helped to detect and highlight important similarities and differences between the V4 countries.

- There are large discrepancies between income distributions of gender groups in all V4 countries – the economic advantage of men is visible not only in aggregate measures such as means, medians and the Gini ratios, but also across the entire income range.
- Compared to popular gender gap indices, the parametric approach based on the Dagum model made it possible to better describe the gender gaps in the V4 countries, especially at the tails.
- The relative distribution method has proven to be a useful tool for displaying and visualising gaps between income distributions.
- The parametric approach can also be helpful to smooth out the irregularities due to sample data.
- Within-group inequalities, measured by the inequality measures, were diverse across the countries, although they have a small impact on the discrepancy between gender groups.
- The size of the gap between the personal incomes of gender groups in each country does not reflect the overall level of household income inequality in these countries.

The next natural step of the analysis would be to evaluate the impact of the main drivers of income discrepancies between men and women using a decomposition approach.

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Luka dochodowa w krajach Grupy Wyszehradzkiej na podstawie danych pochodzących z Luxembourg Income Study

Równość płci jest jedną z podstawowych wartości Unii Europejskiej (UE). Wiele wysiłków włożono w obronę tego prawa i promowanie równości płci w państwach członkowskich i na całym świecie, jednak nadal obserwuje się znaczne różnice między mężczyznami i kobietami, które dotyczą między innymi dochodów. Wciąż dyskutowana jest także kwestia badawcza dotycząca metodologii pomiaru zjawiska tzw. luki dochodowej – tradycyjne metody oparte na porównywaniu średnich i median wydają się niezadowalające, ponieważ nie uwzględniają całego rozkładu dochodów. Celem artykułu jest analiza rozkładów dochodów obserwowanych w czterech krajach Europy Środkowej: Polsce, Słowacji, Czechach i na Węgrzech, należących do Grupy Wyszehradzkiej (V4). Kraje te mają podobną historię, podobny rozwój gospodarczy, ale istniały i wciąż istnieją znaczne różnice między ich podejściami do reform gospodarczych, w tym do polityki rynku pracy, co znajduje odzwierciedlenie w odmiennych rozkładach dochodów i ich nierównomierności. W artykule proponujemy parametryczne podejście oparte na rozkładzie relatywnym, które umożliwia porównanie i wizualizację „luki" między grupami płci dla każdego kwantyla rozkładu. To nowe podejście wykracza więc poza typowe analizy oparte na średnich lub medianach, w kierunku porównania całego rozkładu dochodów kobiet z rozkładem dochodów mężczyzn. Podstawą obliczeń były mikrodane pochodzące z LIS (*Luxembourg Income Study*). Zastosowane w badaniu metody statystyczne okazały się odpowiednie do opisu luki między mężczyznami a kobietami w całym przedziale dochodów. Wyniki analizy empirycznej pozwoliły ujawnić zarówno podobieństwa, jak i istotne różnice między krajami.

Słowa kluczowe: nierówności dochodowe, luka płci, rozkład Daguma, metoda rozkładu względnego, Grupa Wyszehradzka

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A Comparative Analysis of the Issues Related to Fintech Development in Kazakhstan and China

Yelena Patashkova https://orcid.org/0000-0002-3905-0190
MA, Senior Lecturer at the Turan University, Department of Finance, Republic of Kazakhstan
e-mail: ye.patashkova@gmail.com

Madina Serikova https://orcid.org/0000-0001-5340-8833
Ph.D., Associate Professor at the L.N. Gumilyov Eurasian National University, Department of State Audit, Astana, Republic of Kazakhstan, e-mail: ma.serikova@proton.me

Galina Margatskaya https://orcid.org/0000-0002-2392-3030
Associate Professor at the Turan University, Department of Finance, Almaty, Republic of Kazakhstan
e mail: g.margatskaya@turan-edu.kz

Abstract

The relevance of fintech development in Kazakhstan is evident due to the ever-growing role of financial technologies not only there but also worldwide. This expansion is closely tied to the progress of electronic commerce and advertising, technical development, socio-demographic changes, and social development. The article identifies problem areas of fintech development in Kazakhstan and provides practical methods for solving them. The main research method is structural-analytical, which combines all the problem areas of fintech into structural units and considers their importance. A forecasting method is also applied to predict certain scenarios of fintech development in Kazakhstan. The practical methods of solving the issues related to fintech development can be characterised as methodological, analytical, informative, effective, and predictive. The predictive component made it possible to determine the obstacles in fintech development and ways to achieve results. The results are of great importance due to the relevance of fintech in Kazakhstan. Although it is likely to develop well, there are numerous obstacles, both public and private, and the measures for overcoming the problematic areas will be important and effective. Given the country's advantages, Kazakhstan is capable of becoming a leader in financial technology start-ups.

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JEL: A1, B26, P5

Introduction

In the modern world, China leads the financial technology market (Akhmetova et al. 2021). Therefore, it is useful from a methodological standpoint to compare the dynamics of the development of financial technologies in China and Kazakhstan (Tan, He, and Teng 2022). The objective of the study is to identify the causes of financial technology growth and problem areas, including geographical, international, state, and socio-demographic factors. The financial technology market in Kazakhstan has doubled annually since 2014, and even greater growth was provoked by the 2020 COVID–19 pandemic. The financial technology market is vast and heterogeneous. Dozens of companies operate in nine fintech segments in the country, the most important of which are payments and transfers. Previously, microcredit was also an important area (Baidybekova 2019). However, in 2020, the law on microcredit was adopted, and now this segment is absent in fintech (Akhmetova et al. 2021). The structure of Kazakhstan fintech is crowdfunding, online accounting, infrastructure solutions for banks and microfinance, neobanks, marketplaces, venture funds, loyalty, payments, and online lending. Studying the role of these segments in fintech makes it possible to evaluate the scientific and practical value of their development (Kuruchbekova 2018).

The development of financial technologies around the world is rapid (Rubini 2020), and Kazakhstan is no exception. However, to date, there are few studies on financial technologies there. It is possible to present a qualitative study devoted to the geographical and socio-demographic issues of Kazakhstan. The country is vast and sparsely populated, which has advantages and disadvantages for the development of financial technologies. A large and sparsely populated area requires large investments in the development of the Internet, and the size of the country creates a demand for the development of financial technologies (Tanda and Schena 2019). In this regard, Kazakhstan can be compared with China. The socio-demographic feature of the Kazakh population is positive. Thus, a large proportion of ambitious young people, who are the most active users of financial technologies, can contribute to their development (Ziyabekov, Akindeev, and Yakushev 2019).

E-commerce is developing in Kazakhstan, despite difficulties associated with the volatility of the national currency exchange rate. Online shopping sites are currently seen as a "showcase", where consumers view products before buying them offline (Denissova and Born 2021). Banking operations related to the sector and consumer lending ser-

vices are faced with low-quality loan portfolios and a growing risk of loan default due to a decrease in real incomes. Nevertheless, this makes it possible to develop the credit sector of financial technologies. Online lending services can complement conventional banks, focusing on borrowers without official income, those who have poor credit scores, and the unbanked population (Baymuldin and Shaugumbekova 2021).

Financial technologies in Kazakhstan are at an early stage of development and can provide the market that adopts the latest, proven services and products. A favourable technological infrastructure of the Internet and financial institutions is being created. The COVID–19 pandemic affected the economic situation at the beginning of the new decade. It was accompanied by the devaluation of the national currency and a decrease in the real incomes of the population. These problems limit the development of financial literacy among the population and increase people's vulnerability to the risks associated with new virtual products (Akhmetova et al. 2021; Pysmak, Mazhnyk, and Sigaieva 2021). Kazakh banks have mastered tools such as advanced Internet banking, electronic purchases, and banking management, and they have gained the trust of many consumers. Financial technologies have huge prospects for development and innovation. The neighbouring country, China, is a great example of financial technology development and application in everyday life. Modern technologies allow people to overcome distances and perform financial transactions remotely. Therefore, the country must quickly integrate itself into a dynamic virtual market (Baidybekova 2019).

Materials and methods

The main research method is structural-analytical, combining all the fintech issues into structural units and analyses them. The reasons for fintech growth in Kazakhstan and the obstacles that hinder it are identified. The forecasting method is used to establish the stages of fintech development in the future. Fintech in Kazakhstan is most frequently compared with the Chinese fintech market. For that reason, the comparative-analytical method is applied. The issues related to fintech are relevant, and the methods for solving them can be practically applied. Several fintech issues are systemic and structural. Thus, the main task is to identify them using annual statistical data on fintech development. The question arises about whether neighbouring countries have the same issues and how they solve them. It is essential to cover Kazakh society – its geographical location and socio-demographic characteristics, the population's mentality, Internet availability, and the percentage of people who use smartphones in everyday life.

The research was conducted in three stages.

1. Comparing Kazakh and Chinese fintech using data from articles. Chinese fintech is an example of Asian fintech development. The geographical proximity of China and Kazakhstan makes such a comparison very effective. People aged 20–34 in both states occupy a quarter of the total population, and they are most actively involved in developing fintech and fintech start-ups.

2. Combining the fintech issues in Kazakhstan into structural units, which required structural-analytical and systems methods. The systems method allowed us to consider the fintech issues from various perspectives. Considering one issue will consequently lead to examining other issues. The study analyses these structural units and identifies ways to solve them. For example, lending is associated with the volatility of the tenge – the national currency. Introducing the Chinese lending method – through Chinese banks and its national currency, the yuan – is inappropriate since it harms the Kazakh banking system. Microcredit development is also hindered by the instability of the tenge and high-interest rates in banks. To develop this sector, the percentage of microcredit should be lowered, and the guarantees of microcredit repayment should be increased (Thomas 2018).

3. Forecasting the fintech development in Kazakhstan. The forecasting method effectively determines the current and future state of the economy in Central Asia, specifically within the Commonwealth of Independent States (CIS). It takes into consideration the challenging geographical position of Kazakhstan as well as the socio-demographic characteristics within society. The socio-demographic state in Kazakhstan's society is quite optimistic, providing new opportunities to develop structural units of fintech such as Internet banking, lending to various consumers, electronic purchases, and banking management. The optimal forecast for fintech development provides great opportunities for the future (Scorpio 2019).

The fintech market has developed exponentially in China. Its geographical and socio-demographic features and the lack of banking resources for a large population have created favourable conditions for e-commerce development and the increase in electronic wallets and online payments. Alibaba, one of the largest e-commerce companies in the world, is located in China (Akhmetova et al. 2021). What is the basis for the success and progress of the fintech industry in China? Several factors contributed to this at once. Firstly, the number of broadband Internet users in China is growing rapidly: in 2016, there were 731.4 million, more than in the United States and Europe combined. In addition, 95% of these "advanced" citizens also use mobile Internet due to the widespread development of wireless communications in cities. Although the overall level of national internetisation was only 53%, considerably lower than in developed countries, its absolute values provided an effective "quantitative" platform for the development of various online services (Baymuldin and Shaugumbekova 2021).

Results and discussion

Fintech is also actively developing in Kazakhstan, although the results are not yet so impressive. For example, the market was strongly exposed to drastic changes in the tenge exchange rate, especially online payments and transfers. Nevertheless, Kazakhstan is considerably ahead of China in Internet infrastructure (Baymuldin and Shaugumbekova 2021). By successfully combining established production with an extensive national market, the rapid growth of people's purchasing power, and the advancement of Internet technologies, e-commerce in China has led to a phenomenally rapid development of fintech. In Kazakhstan, the data on online commerce is not so impressive. Internet sales are only 3% of retail sales (compared to 12.6% in China). However, e-commerce has not yet been established enough to become a leader in fintech development (Ziyabekov, Akindeev, and Yakushev 2019).

According to experts, another reason for fintech development in China is the "underdeveloped" banking sector. Most Chinese banks are, to some extent, state-owned and primarily serve the corporate sector. Meanwhile, the banks that deal with private clients offer banking products that do not meet modern needs. Fintech companies were the only ones capable of meeting the demand of Chinese consumers and considerably increased their appetite by offering them alternative forms of financial services. Compared to their Chinese counterparts, Kazakh banks are more focused on lending to the retail segment: credit penetration among the economically active population is constantly growing, covering more than half of the population. Online transfers and payments are gaining momentum, and banks can expand their positions in this market. Nevertheless, Kazakh banking activity in the consumer lending sector is characterised by the poor quality of the loan portfolio and the growing risk of loan default due to a decrease in the real incomes of the population (Ziyabekov, Akindeev, and Yakushev 2019).

An important factor in the development of fintech in China is the youth. People aged 20 to 34 account for about 25% of the population but 45% of online service consumption. They are more likely to use new technologies, are better oriented in the Internet space, are adapted to financial risks, and, most importantly, they tend to spend more compared to older generations. In addition, they demonstrate individual preferences and a desire to receive immediate service. In Kazakhstan, young people also account for a quarter of the population. However, unlike China, where there is a rapidly ageing population, in Kazakhstan, due to the active life of people born after 1995, the share of potentially active online service consumers will increase by almost one and a half times by 2030 (Sagintaeva and Aimurzina 2015).

Investments play a considerable role in the field of fintech. No start-up can be launched without investment (Figure 1).

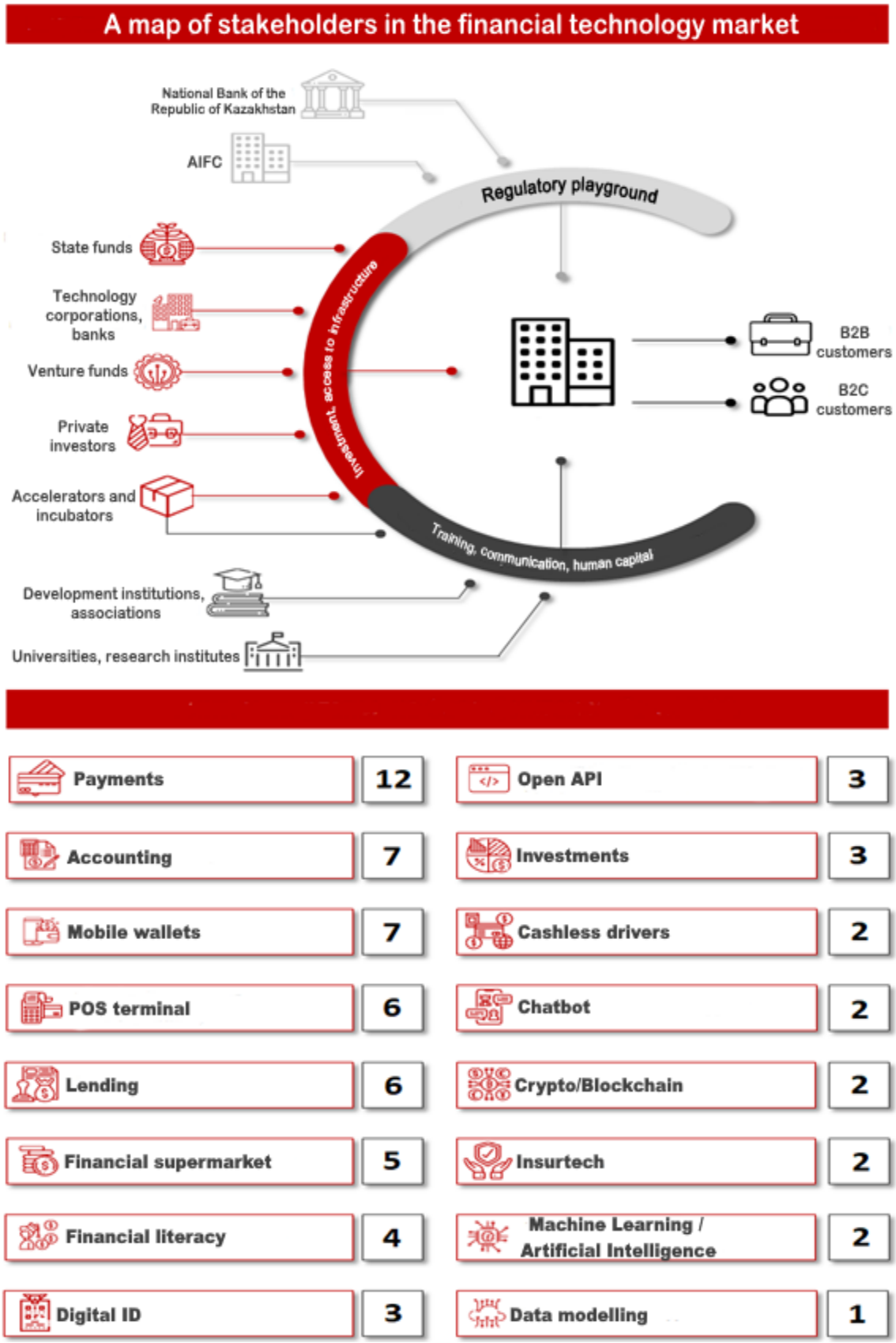

Figure 1. Investments

Source: adapted from Akhmetova et al. 2021.

Investments can be both internal and external. External investments are of great importance, and therefore investors must be attracted by favourable conditions and prospects. The volume of investments in fintech in Kazakhstan is still insufficient, and there is also a shortage of qualified fintech specialists. Fintech companies primarily begin as fintech start-ups, with an entrepreneurial spirit. There are issues with personnel in the field of fintech and entrepreneurship, and these issues must be solved. It is necessary to encourage people to become finance and IT technology specialists. Thus, it is necessary to expand the capabilities of universities by increasing the number of faculties, departments, teachers, and student groups on financial technologies (Brummer 2018).

In 2020, Kazakhstan introduced a general declaration which stimulated the growth of fintech in the country as the COVID–19 pandemic took hold. There is a lot of cash and many cash payments in the country. However, the declaration led to a reduction. It popularised online payments and non-cash payments, and a growing number of people now use non-cash payments (Figure 2). Promising areas of fintech include nano-and micro-lending, which is developing due to the numerous pawnshops, but even more so because of the online segment (Baidybekova 2019).

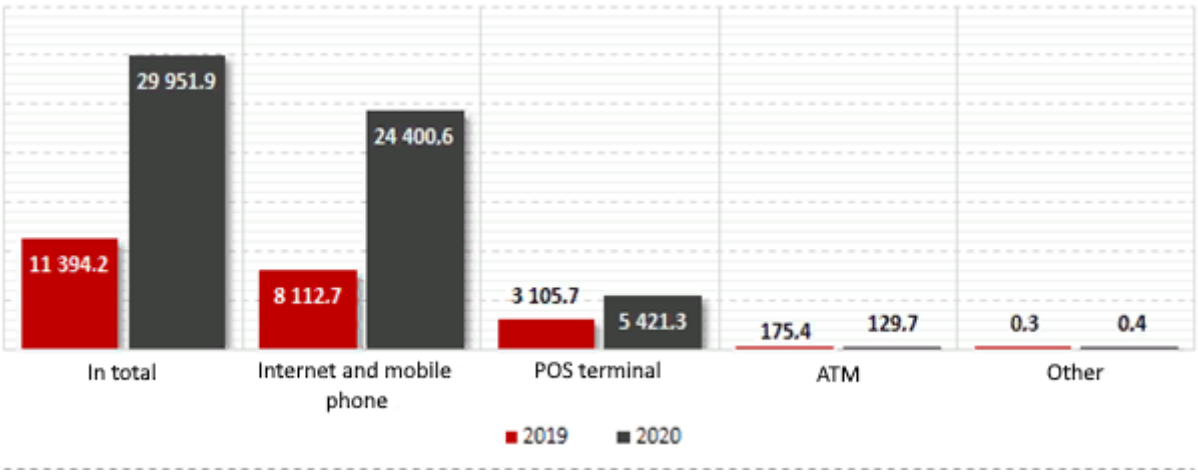

Figure 2. The volume of non-cash payments by transaction type

Source: adapted from Akhmetova et al. 2021.

The Internet is highly accessible; thus, there is a good basis for developing online businesses. However, although Internet availability is not a problem area, it requires further improvement. As mentioned, Internet sales account for only 3% of retail sales (compared to 12.6% in China). Thus, the level of e-commerce can also be considered an area that requires improvement. Therefore, it is essential to establish ways to motivate the population to use online commerce (Akhmetova et al. 2021).

Forecasting fintech development in Kazakhstan is based on identifying related issues and the opportunities for solving them. There are great opportunities for fintech development in the country. The favourable socio-demographic state and the spread of the In-

ternet and smartphones will contribute to the increasing yet relatively low level of online commerce in the country (compared to China). However, by 2030, it will have reached a high level, comparable to China (Baymuldin and Shaugumbekova 2021).

The consumer credit sector has internal and external issues. Internal problems should be solved by improving the loan portfolio for consumers in banks and improving the economy and the currency. External problems include the global demand for oil and gas, the course, and the global imbalance of supply and demand for oil. A key component of the Kazakh economy is the production and sale of oil and gas, and the average wages in the country and the stability of the national currency depend on it. One way to reduce this dependence on oil and gas revenues is the development of the "green" economy, in particular, the digital economy. This is the most powerful incentive in developing financial technologies, including fintech start-ups. Such start-ups are created by active and determined youth, which Kazakhstan has a great number of (Alam, Gupta, and Zameni 2018).

China has become an international leader in fintech development, and numerous start-ups are flourishing. China's experience in developing fintech has become an example for other Asian countries. Globally, it is a leader in financial technologies, and in 2016, it surpassed the United States in terms of investment in financial technologies (more than $10 billion). Of the 27 largest fintech companies in the world, eight are based in China with an estimated value of more than $1 billion (Amstad et al. 2020). In numerous scientific publications, China occupies the most important place in developing modern financial technologies. Moreover, for Asian countries, which have a high proportion of young people in the population, China is the fintech gold standard (Goldfinch 2018; Akhmetova et al. 2021), although Kazakhstan is ahead of China in some aspects.

The network readiness index, which is calculated by international economic organisations, ranks Kazakhstan 36th in the world, with China in 52nd place. In the post-Soviet space, Kazakhstan is the leader in the number of smartphone owners. Of all mobile communication users in the country, 85% have smartphones. Thus, from the Internet accessibility standpoint, Kazakhstan has created a good basis for the development of online business and financial technologies (Baymuldin and Shaugumbekova 2021).

A country the size of Kazakhstan needs good connections. In the past, the most demanded connection was telephone communication and the availability of telephones. Nowadays, connections are primarily established via the Internet and social networks due to the active use of smartphones and laptops by the vast majority of people. Their everyday use and number play a large role in the development of the fintech services market. Indicators, including country size, the share of young people in the population, Internet prevalence, and the number and spread of smartphones and laptops, were con-

sidered by Schueffel (2019) and Rubini (2020). In their research, the leaders are the United States and China.

Young people represent the future development of financial technologies. They are more actively involved in online trading. In Kazakhstan, consumers are not active enough in online trading because they distrust online purchases, and other complex financial transactions have not yet gained popularity due to sceptical attitudes towards online trading. Financial literacy must be constantly developed as it is necessary to overcome the negative perception of digital services and financial technologies. The leader in the spread of online commerce will be young people. Many Asian countries have an advantage thanks to the high birth rate, as the proportion of young people is higher than in other countries (Arslanian and Fischer 2020).

The development of financial technologies in Kazakhstan faces various issues. According to a Statistics Committee survey, only 18.1% of consumers purchase online (Ziyabekov, Akindeev, and Yakushev 2019). When buying online, consumers prefer to use cash. Approximately 39.2% of respondents pay in cash upon receipt of the goods, while 18.1% use mobile payments (Ziyabekov, Akindeev, and Yakushev 2019). However, the country's banks remain insufficiently active in expanding favourable lending opportunities. Consumers need more profitable loan portfolios. Profitable loan portfolios would create favourable conditions for the development of the fintech credit sector. By focusing on the non-covered segment, e.g., borrowers without official income or with poor credit scores, online lenders complement conventional banks (Madir 2019).

King (2020) and Mills (2020) considered the current and future importance of fintech in various countries, while Liermann and Stegmann (2020) attached great importance to online lending. Fintech in Kazakhstan focuses mainly on online lending services, although services such as payments, transfers, and electronic money also play big roles. Electronic money is gaining popularity. For example, in 2016, the number of e-transactions increased 2.7 times to 43.3 million, while the volume increased 3.5 times to 154.2 billion tenges. In 2016, consumers had 5.9 million electronic wallets (compared to 2.9 million in 2015). In 2016, 63 companies worked in 10 segments of Kazakh fintech. The main spheres were payments and transfers, with 26 companies, as well as 15 micro-credit companies. In 2020, the government restricted microcredit by law. Therefore, the number of micro-credit companies decreased. Nevertheless, micro-lending and nano-lending remain attractive for companies and investors (Baidybekova 2019).

According to Akhmetova et al. (2021), the size of the financial technology market in 2021 had a potential estimated at 35 billion tenges, and the forecasted growth for 2022 was 22%. Companies in the fintech sector are approximately nine years old, on average. Almost 1,600 people are employed in one medium-sized company, while 50 employees work in small companies. The number of B2C clients is approximate-

ly 88,000, and the number of B2B clients is about 1000. Baymuldin and Shaugumbekova (2021) assessed the index of optimism about the state of financial technologies in Kazakhstan quite highly. This indicator is approaching 0.7. They also assessed the prospects for fintech development highly, at slightly more than 0.6. One observation in the study is that there are virtually no companies in Kazakhstan in which capitalisation reaches $1 billion.

In research conducted by Akhmetova et al. (2021), respondents were asked to assess the relevance of financial technology trends in Kazakhstan for the future 1–3 years. A conditional rating of prospects was then established on a scale from 0 to 4, where 0 is irrelevant, and 4 is very relevant. Leading areas included digital banks (3.9), lending, including online and point-of-sale loans in real-time (3.4), and electronic purchases (3.3). Other areas in the rating were ranked as follows: loyalty (cashback service, advertising platform) – 3.1; marketplace – 3.1; infrastructure solutions (bank chatbots and robo-advising) – 3.0; management accounting (online accounting, online reporting, integrated solutions) – 2.8; investments (crowdfunding and P2P lending) – 2.7; insurance (insurance telematics, crowdsurance) – 2.3.

According to Baymuldin and Shaugumbekova (2021), the digital penetration from 2016 to 2021 equals 0.21, which indicates that the general perception of online loans is just above neutral. The largest share of users with a positive perception is in the capital of the country, Nur-Sultan (0.55). Women's attitudes were 2.2 times more optimistic than men's: 0.33 versus 0.15. Respondents aged 25 to 44 also had a more positive attitude to online lending: the key index is 0.35, and older people have a less positive attitude to online lending. Therefore, for members of the older age group (45+), the key index is 0.24.

Akhmetova et al. (2021) identified five factors that hinder the development of financial technologies. These include information risks (on a scale from 0 to 4) – 3.9, imperfection of national management and regulation of the industry – 3.6, currency instability – 3.3, shortcomings in the protection of personal data – 3.2, and insufficient attractiveness of Kazakh financial technologies for foreign investors – 3.1.

According to Baymuldin and Shaugumbekova (2021), specialists in Kazakhstan frequently solve issues related to the internal state of financial technologies in the country. In another study, Akhmetova et al. (2021) provided a qualitative rating of the strategic development of financial and technological companies. The highest in terms of attractiveness are strategic services for expanding the range of goods and services offered (on a scale from 0 to 1 – 0.96, and cost reduction – 0.94). In Kazakhstan, there is a necessity to optimise working capital (0.86) and a desire to revise this operating model. This study highlights the interest of businesses in finding the most optimal model for fintech development in the current unstable economic situation in the national market.

According to Kuruchbekova (2018) and Ziyabekov, Akindeev, and Yakushev (2019), Kazakh fintech companies have an optimistic view of the current state of fintech development in the country, as well as high hopes and various ideas about the prospects for this development. The majority of respondents (85%) were optimistic. Ninety-five per cent of participants were confident that development would improve considerably by 2022. At the time of the research, they assessed the prospects for developing their company with 0.85. Based on the respondents' answers, digital banks and lending are among the few promising fintech areas.

As noted by Akhmetova et al. (2021), the fintech market in Kazakhstan is in its infancy. Kazakhstan is interested in attracting foreign investment, so various laws are being passed to stimulate and regulate the venture capital and online lending markets. The development of the Internet, the active use of smartphones among a great share of the population, and the large proportion of young people are advantages that will help the country develop financial technologies. Problems are caused by fundamental factors and lie in the mentality of the population, e.g., a deep distrust of everything official, state bodies, banks, and companies engaged in financial services. The financial literacy of the population is forecast to increase. However, this requires time, renewal of the population of Kazakhstan, and the development of companies engaged in financial services.

Conclusions

In Kazakhstan, relevant issues related to fintech include the lack of investment and start-ups. Start-ups cannot be initiated without investments. Foreign investments are in demand and can be attracted by favourable conditions and prospects, while close neighbour China can considerably influence the state of the country. China is a key trading partner, and it is necessary to attract Chinese investors to the fintech services market. To do this, based on the forecast of overcoming fintech issues, the state and companies need to create attractive conditions and prospects for investors. E-commerce and digital services are the future of the economy.

The progress of fintech in Kazakhstan is associated with the introduction of the general declaration in 2020. Cash payments, which are used in large quantities, are one of the obstacles to developing fintech in the country. The general declaration is an important reason for reducing cash payments and increasing online, non-cash payments. A growing number of people have been using non-cash payments since 2020. Thus, as forecasted, the introduction of the universal declaration has become a tool for overcoming the issues of fintech development there.

Kazakhstanis are optimistic about the development of financial technologies in the country. However, to solve the issues associated with fintech development, it is necessary to con-

sider that the financial services market is still in its infancy. Based on the forecast, the main objective in overcoming the fintech development issues is to attract investment in fintech and create the largest possible number of fintech service start-ups.

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Analiza porównawcza zagadnień związanych z rozwojem technologii finansowych w Kazachstanie i w Chinach

Znaczenie rozwoju technologii finansowych (fintech) w Kazachstanie jest oczywiste ze względu na ich stale rosnącą rolę nie tylko tam, ale także na całym świecie. Ekspansja ta jest ściśle związana z postępem handlu elektronicznego i reklamy, rozwojem technicznym, zmianami społeczno-demograficznymi i rozwojem społecznym. Artykuł identyfikuje problematyczne obszary rozwoju fintech w Kazachstanie i przedstawia praktyczne metody ich rozwiązywania. Główną metodą badawczą jest metoda strukturalno-analityczna, która łączy wszystkie obszary problemowe fintech w jednostki strukturalne i uwzględnia ich znaczenie. Zastosowano również metodę prognostyczną do przewidywania niektórych scenariuszy rozwoju fintech w Kazachstanie. Praktyczne metody rozwiązywania problemów związanych z rozwojem fintech można scharakteryzować jako metodologiczne, analityczne, informacyjne, skuteczne i predykcyjne. Komponent predykcyjny umożliwił określenie przeszkód w rozwoju fintech i sposoby osiągania wyników. Wyniki badań mają ogromne znaczenie ze względu na aktualność zagadnień fintech w Kazachstanie. Rozwój fintech w Kazachstanie, mimo pozytywnych perspektyw, napotyka na liczne przeszkody. Istotne będą działania na rzecz przezwyciężenia problematycznych obszarów na ścieżce rozwoju technologii finansowych w Kazachstanie. Kazachstan ma szansę stać się liderem rozwoju start-upów z branży technologii finansowych.

Słowa kluczowe: technologia finansowa, e-commerce, pożyczki online, dynamika społeczno-demograficzna, usługi finansowe

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Is the Knowledge-intensive Business Services Sector Crisis-robust or Crisis-resilient? A Comparative Study of European Union Countries

Joanna Wyszkowska-Kuna https://orcid.org/0000-0002-0750-1719
Ph.D. Associate Professor at the University of Lodz, Faculty of Economics and Sociology, Department of World Economy and European Integration, e-mail: joanna.kuna@uni.lodz.pl

Abstract

The paper examines the crisis robustness and resilience of the knowledge-intensive business services (KIBS) sector. The hypothesis is tested that the KIBS sector is crisis-robust rather than crisis-resilient. The study covers 2000–2021, divided into two crisis periods (the global financial crisis and the COVID–19 pandemic) and three non-crisis periods. The growth rates of value added and employment for the sectors and periods covered by the study are compared. The study is based on data from Eurostat, and it refers to the EU–27, making it possible to carry out comparative research between EU countries, as well as between the EU members before 2004 (i.e., the EU–14 or 'old' members) and those who joined in 2004 or later (i.e., the EU–13 or 'new' members). The study contributes to the literature by demonstrating that it is necessary to distinguish between the concepts of crisis resilience and crisis robustness in both scientific research and policy strategies, as well as to pay more attention to the issue of crisis robustness. It also makes a contribution by indicating that KIBS have significant potential to contribute to building crisis resilience and crisis robustness in the companies that use them and in the whole economic system. The empirical results demonstrate that the KIBS sub-sectors, i.e., computer and information services and professional, scientific and technical services, are crisis-robust, which is not the case for the manufacturing sector. The KIBS sector's ability to maintain stable growth during crisis periods is more visible than for other service industries. The Polish sector of professional, scientific and technical services showed the most stable upward trend through all analysed periods. Poland also recorded impressive growth in value added in computer and information services during the pandemic period, but when considering the whole period, other countries achieved better results, e.g., Romania.

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JEL: F44, O14, O40

Introduction

In today's knowledge-based economies that operate in a competitive global landscape, knowledge is an essential asset, and the ability to create and apply new knowledge is considered one of the primary sources of competitive advantage. The abilities of companies from the knowledge-intensive business services (KIBS) sector to produce knowledge and disseminate it to all parts of the economy give them an essential role in innovation and efficiency growth.

KIBS may positively affect economic efficiency in various ways: (1) by developing the KIBS sector, which involves creating highly qualified jobs in the economy, as well as through innovation activities and productivity growth in the KIBS sector; (2) using KIBS in production and innovation by enterprises from other industries, which should stimulate their output, productivity and innovation performance. Finally, KIBS may also indirectly contribute to productivity growth in other industries through their embodiment in various products used as intermediate inputs or investment equipment in production in other industries. This channel for KIBS' contribution to productivity growth should become more important as modern services can be unbundled and splintered in a value chain, just like goods, and they can be delivered online at very low costs (Wyszkowska-Kuna and Przybyliński 2021). A review of the literature demonstrates the growing interest in KIBS and their contribution to productivity growth and innovativeness (Wyszkowska-Kuna 2016).

KIBS also seem to have enormous potential to contribute to overcoming economic crises. According to the definition proposed by Gallouj (2002, p. 264): "to deliver KIBS […] this is mainly to organise the solution to the problem, not deliver the good itself. The activity of the KIBS company is aimed at putting up a package of its capabilities and competencies (human, technological, organisational) at the customer's disposal in order to process information and knowledge and then to organise the solution to the problem in the client's company". In the light of this definition, KIBS play a key role in preparing companies to cope with a crisis, i.e., managing any disruptive or unexpected emergencies as soon as possible after they happen. By supporting the stability of its clients, the KIBS sector supports the stability of the whole economic system during crises.

Finally, KIBS activities can help achieve other important goals, such as building greener, more digital and more competitive companies and economies. Knowledge-intensive services have enabled the development of new business models character-

ised by increased servitisation and dematerialisation of consumption; therefore, they have supported the development of the Circular Economy. Both enhance efficiency within the economy and thus contribute significantly to sustainable development and the transition to a green economy (EU COM 2020). In this regard, the KIBS activities can also play an important role in overcoming the current energy crisis.

There is no official definition of KIBS. In the subject literature, KIBS are generally defined as knowledge-intensive services provided for other firms (Schricke, Zenker, and Stahlecker 2012, p. 6). Eurostat's definition of knowledge-intensive services (KIS) refers to the following divisions (NACE Rev. 2): Telecommunications (J61); Computer programming, consultancy and related activities; information service activities (J62–63); Financial and insurance activities (K64–66); Legal and accounting activities; activities of head offices; management consultancy activities (M69–70); Architectural and engineering activities; technical testing and analysis (M71); Scientific research and development (M72); Advertising and market research (M73); Other professional, scientific and technical activities (M74); Employment services (N78); Security and investigation services (N80). A review of the literature shows that KIBS are defined in different ways, quite often in a narrower sense, comprising only divisions J62–63 and M69–74 (Schnabl and Zenker 2013, p. 5; Wyszkowska-Kuna 2016, p. 81). The present study refers to KIBS defined this way. However, due to the lack of relevant data on division M75, the whole section M is included.

The concepts of crisis resilience and crisis robustness

While studying the issue of crisis resilience, the distinction between crisis resilience and crisis robustness should first be explained. Crisis resilience means the capacity to recover quickly after a disruption, while crisis robustness means the ability to continue to produce despite external or internal disruptions (Brandon-Jones et al. 2014; Miroudot 2020). Definitions of robustness focus on the ability to continue with operations while resisting the impact of disruptions.

Resilience has become central in the policy strategies of many governments and international organisations (e.g., IFRC 2012; OECD 2014; UK Cabinet 2014; UNISDR 2016; cited after Capano and Woo 2016). Building more crisis-resilient economies has also become an EU priority for the years 2021–2027 under the Recovery and Resilience Facility (European Commission 2020). In contrast, robustness is much less popular as a concept and a policy-guiding principle. Rather, robustness is very often adopted as an instrument of resilience in official documents.

The question arises regarding what is more important for enterprises and economic systems, crisis resilience or crisis robustness. Resilience involves reacting to shocks and un-

expected events. In contrast, robustness involves resisting them by facilitating the analysis and assessment of the capacities required to affect the necessary policy changes in a specific context or time (Capano and Woo 2016). Thus, robustness seems to be more important. This opinion is shared by Hunter (2021). He noted that whilst cities have made significant investments to become smarter and more resilient, large-scale shocks (e.g., lockdowns during the COVID–19 pandemic) require such robust, adaptable and unique solutions that this focus may not be enough. Thus, he demonstrated that robustness should be used to better explain how cities can improve resilience and decrease fragility. Robustness shifts the focus from cities as reactive and static systems. Instead, it moves towards cities as dynamic, proactive and predictive systems, capable of not only absorbing a shock but also sense-making before a shock occurs and adapting and maintaining the same level of system functions.

There is no one simple answer to what is more important, crisis resilience or crisis robustness. Some managers may feel it is more appropriate to invest heavily in withstanding disruptions and therefore making their supply chains more robust to disruptions. Others may instead focus on ensuring that if and when a disruption occurs, their organisation is able to recover quickly and with minimal disruption, therefore making their supply chains more resilient. Building robustness requires different strategies and investments from building resilience. It is associated with important costs, such as investing in tools to monitor risks, and thus some companies are more interested in resilience in their supply chains. Choosing a strategy in this area is influenced by performance objectives. Brandon-Jones et al. (2014) demonstrated that robustness can support supply chains that rely heavily on dependability, whereas resilience may be more suited to organisations that compete on speed and flexibility. Building robustness or resilience may also depend on the specifics of a given situation, for example when it came to distributing key medical supplies (such as face masks, ventilators, and medicines) during the COVID–19 pandemic, it was robustness that mattered, not resilience (Miroudot 2020).

The characteristics of services in general, and of KIBS in particular (described in Sections 3 and 4), indicate that the KIBS sector should be less subject to cyclical fluctuations than other industries. Thus, the present study tests the hypothesis that the KIBS sector is crisis-robust rather than crisis-resilient. For this purpose, the paper examines changes in value added (VA) (production volume) and employment in the KIBS sub-sectors, compared to other service industries, the manufacturing sector and the total economy, during two crisis periods, i.e., the global financial crisis (2008–2009) and the COVID–19 pandemic (2019–2020), and three non-crisis periods (2000–2007, 2010–2019, and 2020–2021). The study refers to the EU countries. To compare the results for the 'old' and 'new' EU member states, weighted averages for the countries that joined the EU before 2004 (referred to as EU–14) and the countries that joined in 2004 or later (referred to as the EU–13) are calculated (with weights assigned based on each country's share in the EU–14's and EU–13's VA respectively).

KIBS should play a key role in building dynamic, proactive and predictive economic entities, which is the basis for constructing more crisis-robust economic systems. This issue, however, is not a subject of the present study.

The paper is organised as follows. Section 3 describes the characteristics of service activities, and Section 4 describes the characteristics of the KIBS sector regarding their crisis robustness. Section 5 reviews the related studies. Section 6 presents and discusses empirical results, while Section 7 concludes.

The crisis robustness characteristics of service activities

Service activities tend to be less subject to economic shocks than manufacturing ones for several reasons. First, services often involve long-term contracts or continuity in their provision that limit the role of fluctuations in demand. Long-term contracts are preferred in an uncertain environment (e.g., in the maritime shipping industry, about 85–90% of transactions are under contract). Such contracts do not offer full protection against shifts in demand; nevertheless, they mitigate the impact, particularly in terms of costs (Swinney and Netessine 2009). The tendency to conclude long-term contracts also results from the characteristics of services. A need for contact between a service provider and recipient (direct or online) and a need to build trust between them (as service output and its quality are unknown until it is delivered) should also encourage the establishment of long-term ties between service companies and their clients.

Second, services are not storable, so they are less subject to big declines in demand in downturns that affect durable goods (Baldwin and Venables 2013; Davies and Markusen 2021). When demand collapses, services cannot be overproduced, and the decrease in demand is instantly known by the producers. The economic impact is immediate, but there is no bullwhip effect or hysteresis related to inventories along the value chain, which can amplify the impact of the shock or delay the recovery. Not being storable and not being subject to inventory adjustments is actually an advantage for services (Ariu 2016).

Finally, most service activities are characterised by relatively low market entry and exit costs compared to industrial activities, which has two consequences. First, service activities usually need finance less than manufacturing activities in normal times; thus, they are less affected by the crisis-induced scarcity of finance (Borchert and Mattoo 2010). Second, service activities are more flexible in reacting to the changing economic situation than manufacturing ones. It should be remembered, however, that the service sector comprises a wide variety of economic activities, including those with large market entry costs (e.g., financial services and network services).

Therefore, different service activities may appear more or less crisis-robust or crisis-resilient. Moreover, a service sector's crisis resilience or robustness may depend on the causes and course of a crisis. The global financial crisis hit financial services hard, while during COVID–19, those services that require direct contact between service providers and recipients (e.g., hotels, restaurants, culture and entertainment, and travel) were most heavily affected.

The crisis robustness characteristics of the KIBS sector

Economic crises can positively and negatively impact the demand for KIBS. On the one hand, an economic crisis reduces the economic activity of enterprises from different industries, which involves a decline in their demand for various components of intermediate inputs, including KIBS. Moreover, during a crisis, enterprises try to cut their expenses, and they may perceive purchasing certain KIBS as unnecessary expenses (e.g., advertising, R&D expenditures). Some companies may also stop purchasing certain KIBS (e.g., market research, marketing) from external suppliers and try to perform these tasks on their own. Finally, some companies may take advantage of free KIBS (e.g., advisory or legal services) delivered by publicly funded entities, whose activities may be expanded during the crisis period[1].

On the other hand, the demand for certain KIBS (e.g., computer and information, bookkeeping, and accountancy) seems to have contracted less than the demand for material goods (e.g., computers) because: (1) these services are constant 'necessities' for producers and, like all services, they cannot be overproduced, (2) demand for them is unrelated to the scale of production (Borchert and Mattoo 2010). KIBS companies also help their clients solve problems and adapt to the changing situation, so during a crisis, KIBS input may be more important than other types of intermediate inputs. Thanks to this role, KIBS can strengthen both the robustness and resilience of their clients' companies and the entire economic system. Some companies may also increase their demand for certain KIBS, such as bankruptcy, financial advisory and crisis management services.

During the COVID–19 pandemic, we also saw the impact of factors that increased and decreased the demand for KIBS. KIBS are among those services that can be delivered remotely, although they are provided in cooperation with a client. Additionally, as these services may require access to confidential information, delivery may require a degree of direct contact between the KIBS company and its client. During COVID–19, the functioning of global and regional value chains was also disturbed,

1 For example: The Recovery Advice for Business scheme, supported by the UK government, gave small firms access to free, one-to-one advice with an expert adviser to help them through the COVID–19 pandemic and prepare for long-term recovery.

and as KIBS are part of these chains, demand for them decreased as well. Reduced production capacities in most industries due to lockdowns and employee absences also affected the demand for KIBS, as different industries, both manufacturing and service, are KIBS users. Still, KIBS companies were able to help their clients find new solutions that were necessary to continue operations in the completely new reality of COVID–19.

To sum up, some factors will reduce the demand for KIBS during a crisis, while others will increase it. The overall change in demand largely depends on awareness among business owners about the KIBS sector's contribution to the effectiveness and stability of economic systems and the recovery process. Thus, an important question arises regarding whether KIBS activities are less subject to cyclical fluctuations than other industries. This study tries to answer this question based on the example of the EU. This question refers mainly to one of the two KIBS sub-sectors, i.e., Professional, scientific and technical activities, as the demand for the second KIBS sub-sector (Computer programming, consultancy, and information service activities) should show a constant upward trend with the ongoing digitalisation in EU.

Literature review

The counter-cyclical role of the service sector has already been discussed in the economic literature, but mainly concerning public services (Beyers 1991; 1992; Harrison 1994; Beyers and Lindahl 1996; Atkinson and Noord 2001; Navarro-Espigares, Martin-Segura, and Hernandez-Torres 2012). Atkinson and Noord (2001) pointed out the existence of a clear counter-cyclical model of public spending on public services in most OECD countries, with strong increases in the 1975, 1982, and first recessions of the 1990s. Navarro-Espigares, Martin-Segura, and Hernandez-Torres (2012) demonstrated that in both the 1992 and 2008 economic crises, service-intensive regions in Spain showed greater resilience, defined as resistance to the loss of gross VA and jobs derived from the initial impact of the crisis (the counter-cyclical behaviour of private services is less evident than that of public services regarding the employment variable). However, if the periods are extended to 1991–1994 and 2008–2010, which show the reaction after the initial shock, greater economic resilience of the most intensive service sector regional economies is maintained only for the first period.

Holm and Østergaard (2010) found that resilience in the Danish ICT sector from 1992–2006 varied across the regions and that the variability depended on industry structure. Regions with more diversity tended to have a growth rate of ICT employment that is counter-cyclical to the ICT business cycle. By contrast, regions with less diversity had an ICT employment growth rate pro-cyclical to the ICT business cycle.

They concluded that diversity is beneficial for both the growth rate and resilience up to a certain point, beyond which it is still good for growth but decreases resilience.

The belief that the services sector would be more resilient to an economic crisis prevailed until the outbreak of the COVID–19 pandemic. The immediacy and severity of the containment measures and the supply-side shock it induced set this crisis apart from previous economic crises. Shutdowns in many industries disrupted production and cut off the flow of services that could not be provided remotely; meanwhile, changes to consumer behaviour as a result of restrictions altered demand patterns (OECD 2021). Highly customer-facing industries such as accommodation and food services, and arts, entertainment, and recreation, where fewer than 20% of jobs can be done through telework, suffered heavily from containment restrictions. By contrast, in financial services, computer and information services, and other business services, roughly 70% can be done remotely (Dingel and Neiman 2020). Moreover, shifts in demand have also benefitted some categories of services, such as e-commerce, computer services and health services (WTO 2020; Shingal 2021), giving them new development opportunities.

Miles et al. (2021) found that KIBS firms have been active in providing a substantial range of services aimed at helping their clients (and others) deal with the various contingencies thrown up by the COVID–19 crisis. Not least is the need to conform to shifting regulatory frameworks and requirements for longer-term resilience. Finally, KIBS are also likely to play an important role in the recovery from the crisis, and some KIBS are likely to be critical for rendering economies more resilient in the face of future pandemics. Miles et al. (2021) pointed out, however, that KIBS themselves have had to adapt their working practices considerably to reduce face-to-face interaction with clients and within teams collaborating on projects. Adaptation is easier for those whose tasks are relatively standardised and codified.

Similar conclusions can be drawn from the study based on a group of Polish companies (ABSL 2021). The KIBS sector in Poland showed a significant adaptability and crisis resilience higher than most of the manufacturing and other service industries. Over the past 15 years, centres operating in Poland have learned to work in virtual, global teams, and thanks to this, they were able to continue operating during disruptions caused by the COVID–19 lockdowns. Larger companies with well-established positions were more crisis-resilient due to the broader scope of their activities and available resources. Simpler tasks adapted faster to the changing environment, while more complex knowledge-based tasks that require closer collaboration with customers suffered more from the restrictions. Certain KIBS actually benefited from the crisis. COVID–19 was seen as a challenge, but also as an opportunity to digitise the sector to a greater extent (in 2020, 43% of processes in Polish KIBS companies had been digitised). This seems very important especially considering possible future restrictions imposed due to the current energy crisis.

To summarise the literature review, the papers described in this section used the term crisis resilience. However, they demonstrated that the service sector (in particular, public services) was less subject to cyclical fluctuations before COVID–19. Two studies demonstrated that KIBS companies continued operating during the pandemic. This, in turn, indicates that services, including KIBS, have more of an issue with robustness than resilience.

Empirical results

The empirical analysis refers to VA and employment, and it is based on data derived from Eurostat. Data on VA at constant prices (from 2005) is used. Employment is measured by two indexes: the number of persons employed (EMP) and the number of hours worked (HEMP) (Eurostat, total employment, domestic concept). These two indicators are used because, during a crisis, companies mainly reduce working hours by sending employees on leave rather than dismissing them. This only affects the number of hours worked, not the number of employees (they may also get state aid to save jobs). The analysed period is divided into two crisis periods, i.e., the financial crisis (2008–2009) and COVID–19 (2019–2020) and two or three non-crisis periods, i.e., 2000–2007, 2010–2019 and 2020–2021.

Table 1 presents the growth rates of VA, the number of employees, and the number of hours worked (only for the crisis periods) in the service sector, compared with the manufacturing sector and total economy. It also shows the growth rates for each service division (G–U). Average annual growth rates are calculated for the non-crisis periods, and annual growth rates are calculated for the crisis periods.

In the period before the financial crisis, the growth rate of VA in the service sector in the EU–27 was similar to that in the total economy but lower than in the manufacturing sector. However, it was different for employment because the number of employees increased in services but declined in manufacturing. Additionally, the average annual growth rate of EMP in services was nearly twice that of the total economy. The crisis of 2008 hit the EU's service sector much less significantly than the manufacturing sector, as the decline of VA in services (–2.1%) was seven times lower than that in manufacturing (–14.2%) and twice as low as the total economy (–4.3%). Similar tendencies are visible for employment, although it generally decreased less significantly than VA, especially concerning hours worked.

In the following years, both services and manufacturing returned to growth. However, the upward trend was generally weaker than in the pre-crisis period (except for employment in manufacturing). The growth rates in services were lower than in manufacturing, and they were lower for EMP than VA. During the COVID–19 pandemic, the service

sector was again less heavily hit by the crisis than the manufacturing sector, although it was much harder than the earlier crisis. VA and the number of hours worked in the service sector recorded deep declines, which was not the case for the number of employees. The HEMP index declined five times more than the EMP index, and this large disparity, much higher than during the previous crisis, resulted from the extensive state aid to maintain jobs during the COVID–19 lockdowns. The decreased rate of VA in manufacturing was twice as low, whereas in services, conversely, it was more than twice as high compared to the global financial crisis.

Table 1. Growth rates[a] of value added (2005 prices, euro) and employment, EU–27 and Poland, 2000–2020, %

IND[b]	Period	2000–2007		2008–2009			2010–2019		2019–2020		
	Index[c]	EMP	VA	EMP	HEMP	VA	EMP	VA	EMP	HEMP	VA
TOT	EU–27	0.9	2.2	–1.8	–3.2	–4.3	0.7	1.5	–1.4	–6.9	–5.8
	PL	0.6	4.1	0.4	–0.4	3.1	0.7	3.6	0.0	–0.8	–2.0
MFG	EU–27	–0.7	2.6	–6.3	–9.8	–14.2	0.5	2.1	–2.6	–7.7	–7.6
	PL	0.7	8.6	–5.2	–6.1	1.8	1.9	4.9	–4.0	–4.7	–2.6
SER	EU–27	1.7	2.2	–0.3	–1.1	–2.1	1.1	1.7	–1.4	–7.5	–5.4
	PL	1.6	3.7	3.1	2.2	2.6	1.2	4.0	0.5	–0.1	–2.2
G	EU–27	1.4	2.9	–1.9	–2.9	–5.3	0.3	2.2	–1.8	–7.8	–3.8
	PL	2.8	3.1	0.4	–0.1	5.7	0.2	2.7	–4.1	–5.0	–9.9
H	EU–27	0.9	2.8	–1.9	–3.6	–6.1	1.1	1.2	–0.2	–6.8	–17.4
	PL	2.9	4.2	–0.9	–2.0	–8.4	2.3	5.2	4.8	4.8	–6.3
I	EU–27	2.6	0.3	0.3	–1.2	–4.3	2.4	1.7	–12.3	–32.2	–43.7
	PL	3.9	2.0	7.4	5.4	2.4	2.2	4.6	–13.0	–18.0	–16.3
J	EU–27	1.7	5.8	0.0	–0.3	–0.6	2.3	4.7	2.8	–0.4	1.9
	PL	6.2	7.7	6.5	3.7	3.1	4.4	8.0	3.7	4.7	6.3
K	EU–27	0.9	1.9	0.5	0.1	–1.2	–0.5	0.1	–0.1	–1.7	1.0
	PL	5.7	7.4	9.0	8.8	–6.3	1.6	7.1	1.4	1.7	–7.4
L	EU–27	1.5	2.4	–3.2	–3.3	1.0	0.9	1.4	–1.0	–4.2	–1.3
	PL	–4.9	1.5	9.2	9.7	–0.3	–0.4	3.5	–11.0	–12.0	3.6
M	EU–27	3.3	2.6	1.0	–0.3	–5.0	2.2	2.4	1.4	–4.0	–0.4
	PL	4.9	4.4	10.2	7.7	5.4	3.3	4.8	4.8	4.6	5.1
N	EU–27	4.3	3.1	–3.8	–4.8	–8.5	2.5	3.1	–5.6	–11.7	–11.4
	PL	3.9	5.8	5.6	5.6	7.6	1.4	8.4	–3.6	–4.0	5.9

IND[b]	Period	2000–2007		2008–2009			2010–2019		2019–2020		
	Index[c]	EMP	VA	EMP	HEMP	VA	EMP	VA	EMP	HEMP	VA
O-Q	EU–27	1.0	1.1	1.5	1.2	1.3	0.9	0.7	0.7	–2.4	–2.7
	PL	–0.7	3.0	3.5	3.7	5.3	0.8	1.7	0.1	0.2	5.0
R-U	EU–27	1.9	1.5	0.9	0.3	–1.6	0.7	0.7	–1.6	–10.0	–17.9
	PL	2.0	2.9	2.7	0.8	1.6	0.8	3.1	24.1	21.7	–19.5

[a] Average annual growth rates for the periods 2000–2007 and 2010–2019 and annual growth rates for the periods 2008–2009 and 2019–2020.

[b] TOT – total economy; MFG – manufacturing; SER – services; G – Wholesale and retail trade; repair of motor vehicles and motorcycles; H – Transportation and storage; I – Accommodation and food service activities; J – Information and communication; K – Financial and insurance activities; L – Real estate activities; M – Professional, scientific and technical activities; N – Administrative and support service activities; O–Q – Public administration, defence, education, human health and social work activities; R–U – Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies.

[c] EMP – persons, total employment domestic concept; HEMP – hours worked, total employment domestic concept; VA – value added, gross, chain linked volumes (2005), million euro.
Source: own calculations based on data derived from Eurostat 2022; 2022b.

As far as the development of the service sector in Poland is concerned, during the financial crisis, it showed an upward trend for all indicators, and the growth rate of VA was only slightly weaker than in the pre-crisis and post-crisis periods. VA in manufacturing also was on the increase, although at a slower rate than in services; by contrast, employment in manufacturing suffered from a steep decline. During COVID–19, VA and hours worked in services declined, although less than in manufacturing and less than on average in the EU–27 – the HEMP index in services decreased only by 0.1%, compared to 4.7% in manufacturing and 7.5% in both sectors in the EU–27. During the non-crisis periods, the growth rates of VA were higher in manufacturing than in services. In the case of employment, this occurred only before the first crisis.

These findings show that the service sectors in the EU–27 and in Poland were robust to both crises, which cannot be said about the manufacturing sectors. This phenomenon is more clearly visible during the financial crisis than during the COVID–19 crisis, and it is more clearly visible in Poland than in the EU–27, on average.

During the non-crisis periods, in most cases, VA and employment were on the increase in all service industries, both in the EU and Poland. The situation was the reverse in the EU during both crises. VA in section N, followed by sections M, H, G, and I, was most heavily affected during the financial crisis. Interestingly, VA in section K (financial and insurance services) recorded only a slight decline in 2009 (–1.2%, compared with –13% in the USA in 2008, see: OECD 2022). During the COVID–19 crisis, section I (accommodation and food) suffered most dramatically. There were also strong declines in sections H, R–U, and N. By contrast, section J (information and communication) in-

creased, except for a slight decline during the financial crisis. Two divisions within this section, i.e., Computer programming, consultancy (J62) and information service activities (J63), referred to as computer and information (C&I) services, are one of the KIBS subsectors, and thus they are discussed in more detail later in the study, based on data for all EU countries. The same refers to section M (Professional, scientific and technical activities), referred to as professional services or PS&T. In Poland, most service industries continued to grow during the financial crisis (except for sections H and K), which was not the case during COVID–19. Sections J, M and N showed a stable upward trend through all analysed periods (except for employment in section N during COVID–19).

Regarding computer and information services, the C&I sector's development is not only stable but also continuous. The COVID–19 pandemic also accelerated the digital transformation and created new opportunities for the development of these services. Thus, the data presented in Table 2 are used not to examine the robustness of this area but to examine the advancement of this process and the differences between EU countries.

Table 2. Value added and employment in Computer programming, consultancy, and information service activities, EU, 2000–2021, %

Country	Value added gross (2005 prices, euro)							Employment (persons)						
	Share[a]	Growth rate[b]						Share[a]	Growth rate[b]					
	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021
EU27[c]	3.9	5.8	6.4	–0.3	6.5	4.3	–	2.1	4.8	5.0	3.1	5.1	6.0	–
EU14[c]	3.9	5.3	6.0	–0.7	6.1	2.7	–	2.1	3.6	3.7	1.3	3.9	4.7	–
EU13[c]	4.4	11.6	11.9	4.8	11.5	19.4	–	2.0	8.8	9.3	9.1	9.1	10.3	–
AT	2.6	5.6	6.6	–2.4	7.3	–0.7	4.5	2.1	4.5	4.3	–1.9	5.2	4.8	6.4
BE	2.7	5.4	5.3	4.5	6.0	3.3	8.6	1.8	4.4	3.4	10.8	4.7	4.2	6.0
BG	4.1	16.1	21.6	9.6	9.3	7.7	11.1	2.5	11.4	7.4	10.1	9.0	11.9	13.8
CY	3.0	12.9	10.4	–17.5	17.7	6.5	–	1.8	10.5	13.6	–3.0	11.4	6.3	6.6
CZ	4.1	8.9	12.3	0.6	9.0	5.2	3.0	2.3	5.9	8.1	10.3	4.2	4.9	3.3
DE	4.9	7.3	8.6	–1.5	8.6	2.5	–	2.2	3.8	4.1	0.6	4.5	3.5	–
DK	3.5	6.7	8.2	10.1	3.6	11.3	12.6	2.1	3.6	4.4	4.3	2.1	1.7	10.2
EE	5.0	13.5	16.6	–8.0	13.6	13.5	25.1	3.3	9.6	11.5	7.8	10.5	5.6	4.0
ES	1.9	4.0	5.9	1.1	4.4	0.4	–	1.8	4.2	4.6	0.4	4.3	6.4	–
FI	3.7	4.7	6.2	–9.4	6.0	4.5	5.3	2.9	3.7	3.7	–4.0	4.3	3.5	4.5
FR	3.8	4.3	4.4	–3.3	4.7	1.7	9.5	2.1	2.6	1.8	0.2	3.3	3.4	–
GR	0.8	2.8	2.0	–0.7	4.1	3.9	17.9	0.9	7.4	11.6	1.4	2.6	5.3	9.2
HR	1.9	8.5	10.8	2.4	6.3	10.6	30.9	1.2	2.3	2.7	5.5	3.2	–1.7	–6.4

Country	Value added gross (2005 prices, euro)							Employment (persons)						
	Share[a]	Growth rate[b]						Share[a]	Growth rate[b]					
	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021
HU	4.1	9.3	8.4	9.1	9.3	8.6	24.0	2.7	8.2	8.7	12.5	8.3	15.5	12.1
IE	8.8	12.8	8.7	-8.8	19.1	15.7	16.1	4.6	6.1	2.0	6.3	7.7	63.0	15.9
IT	2.2	2.3	3.2	1.7	2.2	-2.6	6.0	1.9	2.2	3.0	2.9	1.8	2.1	4.6
LT	1.9	13.7	20.1	4.6	12.4	10.9	–	2.1	16.0	27.5	16.0	11.6	11.7	–
LV	1.9	9.5	15.0	-19.0	10.0	3.1	–	3.0	10.5	12.8	-7.8	12.7	4.6	–
NL	4.4	5.8	6.0	-2.2	6.3	8.3	8.7	2.7	3.5	3.1	0.0	4.0	6.0	4.8
PL	3.6	12.8	8.8	15.1	13.1	36.8	–	2.0	9.3	9.3	14.3	10.2	7.0	13.6
PT	2.3	6.7	4.3	5.2	8.8	10.0	–	1.7	7.8	5.8	9.6	9.3	7.9	–
RO	10.3	15.9	20.8	-24.9	16.0	11.9	15.2	1.3	9.5	8.8	0.9	11.6	21.3	–
SE	7.3	8.0	9.8	0.5	7.3	8.2	–	2.6	2.3	2.3	-3.9	3.0	0.8	–
SI	3.1	9.2	10.6	0.3	8.5	7.4	16.8	2.1	8.0	12.5	7.6	5.3	6.1	5.4
SK	3.9	9.3	10.2	26.3	6.9	6.7	6.3	2.4	6.9	7.6	5.4	6.7	6.3	11.0

[a] Share in total value added and employment.

[b] Average annual growth rates for the periods: 2000–2021, 2000–2007 and 2010–2019, and annual growth rates for the periods: 2008–2009, 2019–2020 and 2020–2021. For countries that lack data from 2021, data from 2020 is used; the same refers to the EU–27, EU–14 and EU–13 averages.

[c]EU–27 excluding Luxembourg and Malta, EU–14 excluding Luxembourg, and EU–13 excluding Malta due to a lack of data.

Source: own calculations based on data derived from the source as in Table 1.

The average annual growth rate of C&I services in the EU–27 accounted for 5.8% in VA and 4.8% in employment between 2000 and 2021. In general, the growth rates of all indicators in this area in the 'new' EU members were double those of the 'old' members; additionally, during the crisis periods, the gap increased. As a result, in 2021[2], C&I services accounted for a higher share in VA in the EU–13 than in the EU–14. C&I services had the highest share in VA and employment in Romania (only VA – 2.6 times higher than the EU–27 average) and Ireland (double the EU–27 average for both indexes). The highest growth rates of C&I VA are in Bulgaria and Romania, but C&I employment in Lithuania. Despite the steadily growing shares of C&I services in employment through all analysed periods (the EU–27, EU–14 and EU–13 averages), in 2020/21 they accounted for only half the share in employment than in VA (only in Greece, Lithuania, and Latvia was the situation reversed). This generally results from relatively high productivity and compensation in C&I services. The largest and most visible disparities between

2 For some EU countries, data from 2021 is not available; data from 2020 is then used.

these two indexes occurred in countries with the highest shares of C&I services in VA, i.e., Romania, Ireland, and Sweden.

In 2021, Romania introduced a personal income tax break for workers with specific IT-relevant bachelor's degrees and who work directly on software development for a firm with an eligible IT sector code. In 2013, the tax break law was amended to allow a significantly larger list of eligible sector codes for firms and eligible bachelor's degrees for workers. Manelici and Pantea (2021) found that this policy reform led to strong and lasting growth for IT firms in Romania, significantly faster than the other sectors in Romania and compared to the same relative growth in similar countries. Labour productivity (measured as revenues per worker) increased thanks to the tax break, which explains the much higher share of this division in VA than in employment.

Thanks to the favourable tax regulation, the Irish economy has attracted significant investment from multinational companies in recent decades (including the largest American ICT companies, e.g., Google, Microsoft, Intel, Apple, and Facebook). It has also become the world's largest centre for telecommunications and computer and information services. The ICT sector, dominated by foreign multinationals, generated high productivity growth and dramatically increased its share in VA growth in the 2014–2019 period relative to the earlier period. As a result, the gap between the ICT sector's shares in VA and employment increased significantly (Houses of the Oireachtas 2021). However, during the COVID–19 period, the situation began to change, as C&I employment recorded tremendous growth (63% in 2020 and 15.9% in 2021).

Sweden is at the forefront of the rapid growth in digital transformation that the Nordic region is experiencing, which the COVID–19 pandemic accelerated. Sweden has excellent infrastructure and widespread Internet use, both among individuals and businesses, which makes it easier for C&I companies to adapt quickly and explore new ideas. Sweden is also the birthplace of many well-known global tech brands, such as Spotify and Skype, that play a leading role in delivering C&I services worldwide (OECD 2018; Ultiro AB 2021).

During the financial crisis, C&I services showed an upward trend in VA in half of the EU countries (mainly the EU–13) and in employment in most EU countries. The most impressive growth rates of VA occurred in Slovakia (26.3%), Poland (15.1%), Denmark (10.1%), Bulgaria (9.6%) and Hungary (9.1%). By contrast, Romania (–24.9%), Latvia (–19%), and Cyprus (–17.5%) saw the largest falls. The highest growth rates of employment were in Lithuania (16%), Poland (14.3%), and Hungary (12.5%). During the COVID–19 crisis, the upward trend was visible in nearly all EU countries regarding both VA (except for Italy and Austria) and employment (except for Croatia). The highest growth rates of VA took place in Poland (36.8%) and employment in Ireland (63%). There is data only for some EU countries for 2021 (ex-

cluding Poland). However, generally, the C&I sector is still experiencing significant growth, with the strongest growth of VA in Croatia, Estonia and Hungary, and employment in Ireland.

Poland saw a large increase in C&I VA, although five of the EU–13 achieved better results (including six regarding EMP). C&I services in Poland accounted for a slightly lower share in VA than the EU–27 average and nearly one-third that of Romania (in 2000, C&I VA in Poland was more than double that of Romania, whereas, in 2020, it was only 30% higher). However, Poland also draws attention, as in 2020, it recorded the highest growth in C&I VA, much stronger than in other EU countries. Interestingly, this was accompanied by much lower growth in the number of employees (7%) and in the number of hours worked (7.9%). This may be explained by an increased use of existing labour resources in light of the growing demand for C&I services during COVID–19 and the limited possibilities to increase employment in the short term. It appears, however, that this increased employee utilisation was largely unofficial in Poland. This means that, as it was more difficult to monitor them, the C&I employees were carrying out additional projects for other companies (Dean 2021). Alternatively, they may have worked overtime hours informally (because the excessive amount of overtime worked is inconsistent with the provisions of the Labour Code, and working this way is financially more beneficial for both parties). However, this demonstrates that there is great potential to develop the C&I sector in Poland. The growth rate of employment in this field in 2021 was almost double that of the previous year (13.6%) and was among the highest in the EU (data on C&I VA is not yet available).

The second sub-category of the KIBS sector, i.e., professional services (Table 3), accounted for higher shares in VA (7.1%) and employment (6.3%) than C&I services (3.9% and 2.1%, respectively). However, their growth dynamics (2.1–2.4%) were lower than C&I services (one-third in the case of VA and half in the case of EMP). Despite the stronger upward trend in the 'new' EU members compared to the 'old' ones, the importance of professional services was lower in the former. In 2021, Belgium (11%) had the highest shares of professional services in VA and employment; the highest growth rates in the period 2000–2021 occurred in Malta (9.5% and 7.9%, respectively). Compared to the EU–27 average, professional services in Poland accounted for a slightly lower share in VA (but higher than the EU–13 average) and a significantly lower share in employment (by 2.1 pp, below the EU–13 average).

Table 3. Value added and employment in Professional, scientific and technical activities, EU, 2000–2021, %

Country	Value added gross (2005 prices, euro)							Employment (persons)						
	Share[a]	Growth rate[b]						Share[a]	Growth rate[b]					
	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021
EU27	7.1	2.1	2.6	– 5.0	2.4	– 0.4	7.6	6.3	2.4	3.3	1.0	2.2	1.4	1.2
EU14	7.2	1.8	2.3	– 5.3	2.1	– 0.6	7.1	6.9	2.2	3.3	0.0	1.9	1.2	1.3
EU13	6.4	5.1	6.0	– 1.3	5.4	1.9	12.4	4.4	3.1	3.5	4.2	3.2	1.8	1.0
AT	5.7	2.9	3.7	– 3.2	3.4	– 3.1	5.2	6.6	3.1	4.2	3.3	2.1	1.1	3.3
BE	11.3	3.5	4.8	3.1	2.8	– 0.9	9.2	11.0	2.9	3.7	0.6	2.5	2.4	2.5
BG	3.4	7.1	12.0	15.1	3.5	14.2	– 5.2	3.5	3.9	7.7	3.2	0.9	2.3	2.2
CY	9.0	4.1	5.1	– 1.6	3.4	1.6	2.7	7.3	5.5	6.2	5.1	5.0	3.3	1.3
CZ	5.6	3.6	4.6	– 6.6	4.0	– 1.5	12.4	5.9	1.8	3.0	– 1.0	1.5	– 1.8	1.2
DE	6.5	1.0	1.2	– 11.7	1.9	– 0.8	5.6	6.7	2.3	3.1	0.8	2.2	0.3	0.9
DK	5.8	1.8	– 0.3	– 4.4	3.5	0.9	6.9	6.0	1.9	3.0	– 0.6	1.7	0.6	4.6
EE	6.6	6.4	10.9	– 8.2	5.0	5.4	15.7	4.8	3.3	2.6	4.7	3.8	2.4	– 0.1
ES	5.9	3.5	5.0	0.1	3.5	– 6.1	12.8	5.6	2.7	6.1	– 2.4	1.9	– 0.2	– 0.8
FI	4.7	1.4	1.6	– 5.7	2.2	0.8	5.9	6.2	2.8	4.4	– 1.6	1.9	1.7	1.9
FR	8.9	2.4	2.7	– 3.3	2.6	– 3.7	7.6	7.7	2.1	2.0	1.0	2.4	2.4	3.0
GR	3.0	– 0.4	8.0	– 2.6	– 4.0	0.6	– 0.3	5.8	2.7	5.1	1.3	0.4	– 1.6	3.2
HR	6.1	3.0	6.2	– 8.5	2.3	– 3.0	12.6	4.2	3.2	4.9	– 0.7	2.5	– 2.0	– 1.0
HU	8.1	4.7	3.7	– 3.0	6.0	2.4	12.3	6.2	4.6	3.0	4.8	6.6	6.4	1.0
IE	4.6	4.9	3.6	– 9.0	6.4	18.7	8.8	6.7	3.5	5.4	– 9.0	2.8	10.1	12.1
IT	7.1	0.2	0.8	– 4.9	– 0.4	1.9	6.2	6.9	1.5	2.6	– 0.8	1.0	2.4	0.1
LT	4.5	5.9	14.1	– 16.8	4.9	– 0.3	12.4	4.5	3.9	4.8	– 4.5	3.6	5.2	– 5.4
LU	8.7	4.9	5.1	– 4.2	7.5	– 0.4	– 3.8	10.8	6.0	6.8	7.0	5.5	4.2	3.9
LV	3.5	3.3	10.4	– 18.6	2.3	3.3	5.8	4.5	3.5	8.7	– 10.1	4.5	– 0.6	– 11.0
MT	10.0	9.4	7.1	0.6	13.5	– 4.2	10.1	6.9	7.9	7.0	13.5	9.4	4.2	4.9
NL	8.7	1.5	1.2	– 2.8	1.5	2.7	6.2	8.5	1.4	1.8	0.1	1.5	2.0	1.7
PL	6.9	5.2	4.4	5.4	4.8	5.1	17.5	4.2	4.3	4.9	10.2	3.3	4.8	5.3
PT	5.0	2.5	2.1	– 4.2	3.5	0.6	6.3	4.7	2.6	3.0	0.4	2.2	0.8	6.5
RO	3.7	7.4	10.7	– 7.3	12.2	– 8.5	4.9	2.0	0.3	– 1.3	– 0.9	3.1	– 3.8	– 4.8
SE	9.0	4.0	5.3	– 4.2	4.2	0.8	8.4	6.4	1.7	2.7	0.4	2.7	– 1.4	– 9.8
SI	7.4	3.2	3.6	– 3.3	3.0	– 4.4	9.0	7.9	4.0	7.0	5.8	2.0	0.9	2.6

Country	Value added gross (2005 prices, euro)							Employment (persons)						
	Share[a]	Growth rate[b]						Share[a]	Growth rate[b]					
	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021	2021	2000 2021	2000 2007	2008 2009	2010 2019	2019 2020	2020 2021
SK	8.2	5.8	7.6	0.0	3.5	10.7	7.6	6.1	3.1	4.6	9.2	3.1	1.6	– 1.3

[a] Share in total value added and employment.

[b] Average annual growth rates for the periods: 2000–2021, 2000–2007 and 2010–2019, and annual growth rates for the periods: 2008–2009, 2019–2020 and 2020–2021.

Source: own calculations based on data derived from the source as in Table 1.

During the non-crisis periods, VA and employment grew faster before the financial crisis, particularly employment, although there are some differences between the EU countries in both cases. During the financial crisis, VA in professional services decreased by 5%, more than double that of the service sector (–2.1%), but nearly one-third that of manufacturing (–14.2%). The decline in the EU–13 was four times lower than in the EU–14. The largest declines in VA in professional services occurred in Latvia (–18.6%), Lithuania (–16.8%) and Denmark (–11.7%). By contrast, five countries experienced an increase in VA, and most countries experienced an increase in employment. Poland was among the countries with an upward trend, recording the second-highest growth rates of VA and employment (5.4% and 10.2%, respectively). During the COVID–19 pandemic, VA in professional services in the EU–27 recorded only a slight decrease (by –0.4%), much lower than during the previous crisis, and lower than in the service sector (–5.4%) and the manufacturing sector (–7.6%). This happened only in the EU–14 countries. This indicates that professional services have significantly improved their crisis robustness after the financial crisis. Estonia and the Netherlands achieved the best results in this area. In 2009, they recorded strong declines in VA in professional services, but the situation was reversed in 2020. The same can be said for Ireland and Lithuania regarding employment. Overall, most EU countries improved the stability of VA and eleven improved employment in professional services during COVID–19. Employment in this area appeared to be less subject to cyclical fluctuations than VA, as it increased in both groups through all analysed periods, with higher growth dynamics in the EU–13.

The lower vulnerability of professional services to the COVID–19 pandemic can be attributed to the fact that the decline in VA in manufacturing was only half as much during the pandemic compared to the financial crisis in 2009. This indicates that the demand for professional services from manufacturing companies decreased less significantly in 2020 than it did in 2009. However, the conclusion on the improved crisis robustness of professional services seems justified considering the opposite trend in the case of VA in administrative and support services (N), a section that also plays a vital role in manufacturing activities.

In Poland, VA and EMP in professional services showed the most stable upward trend through all analysed periods, and the growth rates of both indexes in the crisis periods were slightly higher than in the non-crisis periods. Apart from Poland, only Bulgaria and Slovakia maintained positive growth rates in this field during both crisis periods. Additionally, in 2021, Poland recorded the highest growth of VA in this area. Legal and accounting activities, activities of head offices, and management consultancy activities (divisions M69–70) were the main driving force behind the rapid development of this sector in Poland – their share in VA in section M doubled in the analysed period, reaching 51.4% in 2020 (similar to the EU–27 average). Accounting, auditing, bookkeeping, and tax consulting services[3] deserve special attention due to the high comparative advantage of Polish exports in this field. In 2020, the revealed comparative advantage index in Polish exports of these services reached 4.7 in intra-EU trade and 8.3 in extra-EU trade, compared to 2.6 and 3.5, respectively, in 2010 (own calculations based on Eurostat 2022c).

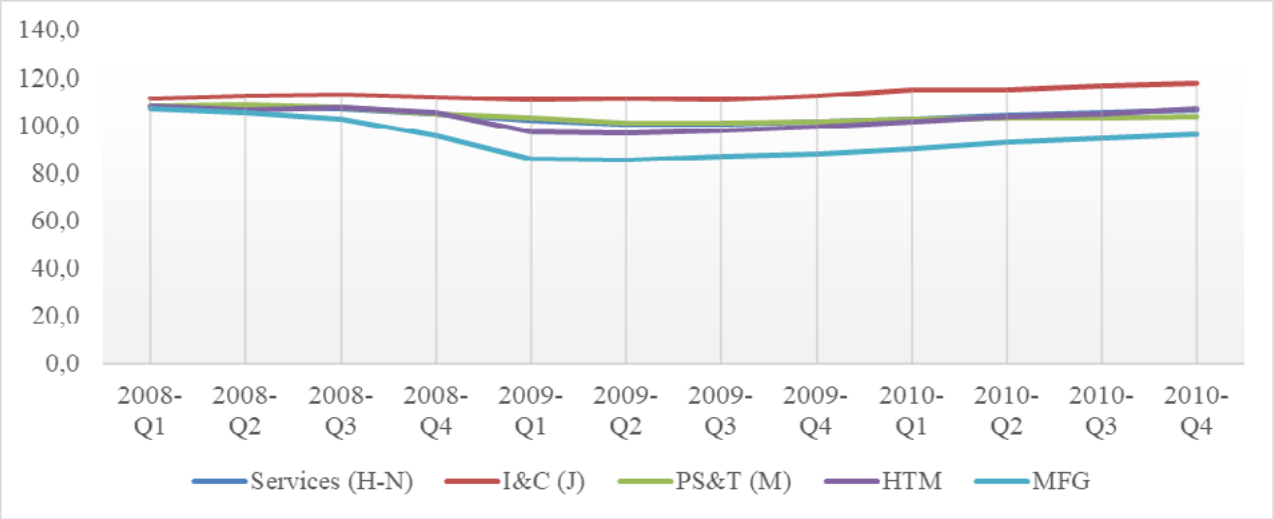
Graphs 1 and 2 present the production volume (in 2006 prices) in subsequent quarters in the periods 2008–2010 and 2019–2021. This is helpful in a more detailed examination of changes in production in the crisis year compared to the pre-crisis and post-crisis years. The charts compare the changes in production volume in the KIBS sub-sectors with such changes in the service sector (defined as comprising only divisions H–N), the manufacturing sector (MFG), and the high-tech manufacturing sub-sector (HTM). Data on division J[4] (information and communication, I&C) is used as data for division J62–63 are not available for 2021. However, generally, the curve showing the production growth in J coincides with the curve showing the production growth in J62–63.

I&C services showed stable, constant growth dynamics through all analysed periods, higher than in other areas covered by the study. During the financial crisis, the growth dynamics were stable in 2008–2009, with a slight decline in the first quarter of 2009. In the last quarter of 2009, an upward trend started. During the COVID–19 pandemic, there was an upward trend throughout almost the whole period, except for the second quarter of 2020, when the most restrictive lockdowns occurred in the EU. The growth dynamics subsequently accelerated. The curve showing the production growth in professional services coincides with the curve showing the production growth in the service sector during both crises, which is particularly visible during the financial crisis. During the COVID–19 pandemic, the production dynamics in professional services increased and were more stable than in the service sector; first, they were lower, and after the second quarter of 2020, higher than in the service sector. The second quarter of 2020

3 The categories in the national accounts do not match exactly the categories in the balance of payments.

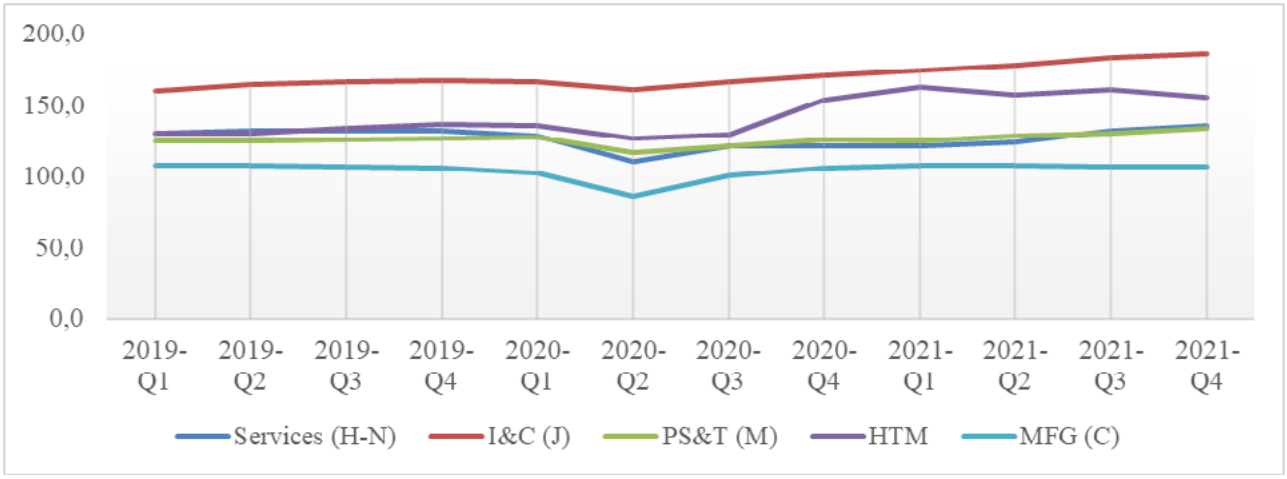
4 Section J comprises, apart from C&I services, Publishing, audiovisual and broadcasting activities (J58–60) and Telecommunications (J61).

was again an exception. The growth dynamics of I&C services are generally higher than those of professional services, and this disparity tends to increase.



Graph 1. Volume index of production (2006 prices), quarterly data, 2008–2010, EU–27

Source: Eurostat 2022d.



Graph 2. Volume index of production (2006 prices), quarterly data, 2019–2021, EU–27

Source: as in Graph 1.

Manufacturing recorded the lowest growth dynamics throughout both periods, though in the first quarter of 2008, it was at a similar level to the other analysed areas. Production in manufacturing declined most significantly in both crisis periods. During the financial crisis, as far back as 2008, the volume index of production declined to a level lower than in 2006. Moreover, the recovery was not fast or rapid, as production volumes did not manage to return to the pre-crisis level in 2010. During the COVID–19 pandemic, in the second quarter of 2020, the volume index of production again reached a value lower than in 2006. However, this time, the recovery was faster and more

rapid, as the index reached the pre-crisis level as soon as the last quarter of 2020, and since then, it has remained stable. Finally, the curve showing the production volume in high-tech manufacturing followed the same course as for manufacturing, but only in Graph 1. However, the growth dynamics in high-tech manufacturing were higher than in manufacturing, at a similar level to that in the service sector and professional services, but with a stronger decline during the financial crisis. In turn, during the pandemic, the growth dynamics declined less significantly than in manufacturing and services, and since the last quarter of 2020, it accelerated rapidly, reaching the second-highest value. This change probably results from the growing demand for electronic devices that were necessary for remote work and education during the pandemic.

Conclusion

This study used Eurostat data to examine the crisis robustness and resilience of the KIBS sector on the example of the EU countries. Three improvements on the existing literature emerge from the study. First, there is no distinction between the concepts of crisis robustness and crisis resilience in most previous research. Most studies referred to crisis resilience, which has become central in the policy strategies of many governments and international organisations, including the EU's priorities for 2021–2027. In contrast, robustness is much less popular as a concept and policy-guiding principle. Instead, robustness is very often adopted as an instrument of resilience in official documents. The study also indicates that although robustness seems to be more important, as it involves resisting shocks and unexpected events, not only reacting to them as in the case of resilience, choosing a strategy of building crisis robustness or crisis resilience is also influenced by performance objectives of a company and the specifics of a given situation.

Second, the study demonstrated that in the literature on the counter-cyclical role of services, crisis resilience was examined. However, those papers demonstrated that the service sector, in particular, public services, was less subject to cyclical fluctuations than other industries, meaning it was crisis-robust rather than crisis-resilient.

Third, the study makes a contribution by indicating that KIBS have significant potential to contribute to overcoming economic crises. By definition, KIBS play a key role in preparing companies to cope with a crisis as they help to solve problems and adapt to the changing situation (according to Gallouj 2002: "to deliver KIBS […] this is mainly to organise the solution to the problem in the client's company"). Thanks to this role, KIBS can strengthen both the robustness and resilience of their clients' companies and the entire economic system. An important question arises

about business owners' awareness of the role of different KIBS in building crisis robustness and crisis resilience in their organisations, and this issue can be the subject of a separate study. Such awareness should be raised through research that shows the impact of KIBS input on economic performance, in particular regarding those KIBS that play a key role in building crisis robustness and resilience. Another area of study could be KIBS intensity in various companies or industries and how it affects economic performance during both crisis and non-crisis periods.

This paper helps raise such awareness by showing that KIBS activities are less subject to cyclical fluctuations than other industries based on the examples of the two most severe crises of the 21st century, i.e., the financial crisis and the COVID–19 pandemic. Service production was generally only slightly subjected to cyclical fluctuations in the EU–27 during both crises, significantly less than manufacturing production. The KIBS sector's ability to maintain stable growth during both crisis periods is even more visible than in other service industries. This indicates that the service sector, and the KIBS sector in particular, are crisis robust, whereas the manufacturing sector is more crisis resilient. Computer and information services showed a stable upward trend, as well as the highest growth dynamics, and they are not subject to any cyclical fluctuations (on the contrary, the pandemic accelerated their development). The second KIBS sub-sector, i.e. Professional, scientific and technical services, improved their crisis robustness after the financial crisis in most EU countries, with the best results in Estonia and the Netherlands. These findings make it possible to positively verify the hypothesis put forward in this paper. They also show that more attention should be paid to crisis resilience in future research.

The Polish sector of professional, scientific and technical services showed the most stable upward trend throughout all analysed periods, mainly thanks to the growing comparative advantage in the exports of accounting, auditing, bookkeeping, and tax consulting services. The crisis robustness of the whole service sector in Poland is even stronger than the EU–27. Poland also recorded impressive growth in VA in computer and information services during the COVID–19 period. However, while considering the development of the C&I services sector throughout the whole analysed period, Romania and Ireland achieved much better results. It shows that there is still great potential for further growth of this sector in Poland, but it requires improvements in the digital transformation and perhaps taking appropriate economic policy measures.

Finally, the KIBS sector has developed much faster in the 'new' EU member states than in the 'old' ones, but its role is still lower in the 'new' EU economies. This refers to both KIBS sub-sectors, except for VA in computer and information services.

The findings of this study have potential implications for further research and policy strategies. First, a distinction should be made between crisis resilience and crisis

robustness, as: (1) they require different approaches and investments, and (2) their importance may vary for different companies and under different conditions. Additionally, the issue of crisis robustness should receive more attention both in scientific research and in policy strategies. Second, we can assume that thanks to the crisis robustness of the KIBS sector, the robustness of the whole economic system is enhanced as the KIBS sector is an important part of this system. But the contribution of the KIBS inputs to building both crisis robustness and crisis resilience in the companies that use them and in the whole economic system should be further investigated, and policy strategies at all levels should be considered.

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Czy sektor usług biznesowych opartych na wiedzy jest *crisis-resilient*, czy *crisis-robust*[5]? Badanie porównawcze krajów Unii Europejskiej

Celem artykułu jest zbadanie *crisis robustness* oraz *crisis resilience* sektora KIBS. W pracy weryfikowana jest hipoteza, że sektor KIBS należy uznać raczej za *crisis-robust* niż *crisis-resilient*. Badanie obejmuje lata 2000–2021, podzielone na dwa okresy kryzysowe (globalny kryzys finansowy i pandemia COVID–19) oraz trzy okresy pozakryzysowe. Przedmiotem badania jest porównanie zmian w wartości dodanej i zatrudnieniu w różnych sektorach gospodarki oraz w wyróżnionych okresach. Badanie oparte jest na danych Eurostatu i odnosi się do krajów UE–27, co umożliwia porównanie krajów UE, a ponadto krajów członkowskich sprzed 2004 roku (UE–14 lub „stare" kraje UE) z krajami członkowskimi po 2004 roku (UE–13 lub „nowe" kraje członkowskie). Praca wnosi wkład w dotychczasowe badania poprzez wskazanie na konieczność odróżnienia pojęć *crisis resilience* i *crisis robustness* zarówno w badaniach naukowych, jak i w strategiach politycznych, a ponadto zwracania większej uwagi na kwestię *crisis robustness*. Wkładem pracy jest również wskazanie istotnego potencjału KIBS w zakresie budowania *crisis resilience* i *crisis robustness* w przedsiębiorstwach wykorzystujących KIBS oraz w całym systemie gospodarczym. Wyniki badania pokazują, że podsektory KIBS, tj. usługi komputerowe i informacyjne oraz profesjonalne, naukowe i techniczne są *crisis robust*, czego nie można powiedzieć o sektorze przetwórczym. Sektor KIBS utrzymał bardziej stabilny wzrost w okresach kryzysowych niż inne sektory usługowe. Usługi profesjonalne, naukowe i techniczne w Polsce wykazały się najbardziej stabilną tendencją wzrostową we wszystkich analizowanych okresach. Polska notowała również imponujący wzrost wartości dodanej w usługach komputerowych i informacyjnych w okresie pandemii, ale w całym analizowanym okresie inne kraje UE, np. Rumunia, osiągnęły lepsze rezultaty w tym obszarze.

Słowa kluczowe: usługi, KIBS, kryzys, *resilience*, *robustness*, UE

5 Zarówno *crisis resilience*, jak i *crisis robustness* tłumaczone są na język polski jako 'odporność na kryzys'. Jednakże jednym z celów pracy jest pokazanie, że te dwa pojęcia nie są tożsame. Dlatego zdecydowałam się na używanie angielskich nazw dla tych dwóch pojęć.

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The Financial Dimension of Developing Social Entrepreneurship: Polish and Ukrainian Experiences

Alona Revko https://orcid.org/0000-0001-7888-3657
Doctor of Economic Sciences, Academic Visitor at Skoll Centre for Social Entrepreneurship, Saïd Business School, University of Oxford within Researchers at Risk Programme by British Academy; Professor at Chernihiv Polytechnic National University, Chernihiv, Ukraine, e-mail: alohaha19@gmail.com

Anna Verbytska https://orcid.org/0000-0001-7805-1412
Ph.D. in Public Administration, Chernihiv Polytechnic National University, Chernihiv, Ukraine, e-mail: annaverbytska.che@gmail.com

Tetyana Zaharina https://orcid.org/0000-0003-0357-7457
Ph.D. in Pedagogy, Chernihiv Polytechnic National University, Chernihiv, Ukraine, e-mail: tanyakolenichenko@gmail.com

Małgorzata Marks-Krzyszkowska https://orcid.org/0000-0001-9430-8476
Ph.D. in Economics in the field of Management, University of Lodz, Faculty of Economics and Sociology, Poland
e-mail: malgorzata.marks@uni.lodz.pl

Abstract

This paper summarises the arguments within the scientific discussion on the financial dimension of social entrepreneurship. The purpose of the research is to investigate the Polish and Ukrainian experiences of financial foundations for developing social entrepreneurship and, based on the Polish experience, to provide recommendations for social entrepreneurship development in Ukraine. Are view of literary sources and approaches to solving the problem of limited financial resources for social enterprises indicates that state support in Ukraine is in its infancy. The governmental policy should identify the needs of social enterprises and what social problems they will solve. The relevance of these issues is that the level of financial commitment to the development of social entrepreneurship is dependent on the cooperation of various stakeholders, i.e., state authorities and local governmental bodies (regulatory mechanism of financial support),

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business (mentoring and grant support), higher educational institutions (social entrepreneurship training), and civil society organisations (public awareness, social promotion).
The research analyses the experience of financing mechanisms of social entrepreneurship in Poland for recommendations on the development of the domestic financial model for social enterprise support. Based on the Polish experience, government expenditure in the social sphere should go towards organising social entrepreneurship support programs for those social enterprises that use effective models to commercialise the social impact, which will force the development of social businesses.
Methodologically, this study is based on a comparative method of analysing the main sources of social enterprise financing in Poland and Ukraine, including public institutions (grants, loans, guarantees, subsidies and prizes) and other international funds. To investigate the financial foundations of social entrepreneurship development, the research determines the variety of revenue sources of social enterprises in Poland and the financial dimension of social enterprises by analysing the level of public and private funding.
As the concept of social entrepreneurship is becoming more widespread in Ukraine, the research has significant strategic and applied importance. The research shows that social entrepreneurship in Poland is recognized at the state level as an important tool for achieving social goals in society. The results of the study are particularly relevant in the context of modern challenges, as Ukrainian business owners can take advantage of the analysed European sources of support to start or expand their businesses. As many domestic social enterprises begin to grow, they may think of internationalising their social businesses. The results of the study contribute to the growth of support for the concept of internationalising social business, which has not yet become a common practice in Ukraine. Therefore, in the context of Ukraine today, international expansion maybe a logical step for existing and newly created social enterprises. The tools, resources and mechanisms for supporting social entrepreneurship in Poland identified as a result of the research may help Ukrainian social enterprises overcome obstacles to internationalisation.

Keywords: social entrepreneurship, financial support, financial sources, governmental support, community development, social problems

JEL: D630, M130, M140

Introduction

Social entrepreneurship is the innovative activity of a person who makes systemic changes in the social or environmental spheres, profits from this activity, and significantly affects regional economic growth. Therefore, social entrepreneurship is an important resource for the socio-economic development of local space and the financial independence of local communities. For example, social entrepreneurs create new workplaces, pay taxes and improve living standards in the definite territory (Revko 2017).

Social entrepreneurship has the potential to solve various social problems, thereby easing the burden on local and national governments and reducing expenditures in local government budgets (Licite-Kurbe and Gintere 2021). Social entrepreneurship covers a wide range of social policy tasks that should ensure the normal living conditions of the local community (Waligora and Revko 2019). In the European Union (EU)

Member States, support for social entrepreneurship development is provided by public and private financial institutions, ministries and local governments, social enterprises, social economy funds, and network organisations. In addition, there are different types of tax benefits for social enterprises: corporate income tax exemption for retained earnings, reduced social security costs or subsidies, exemption from or reduced value-added tax, as well as other kinds of tax relief that are granted to donors or organisations (Revko and Verbytska 2019; Borzaga et al. 2020).

Funding for social entrepreneurship can generate major advantages or disadvantages depending on the point of view and, above all, on the context. Considering the social impact of an activity, collecting funds from contributors that maybe specifically interested in a business's long-term sustainability can sometimes be simpler (Amouri et al. 2021).

Social entrepreneurship is an effective tool for solving social problems, and it is a rapidly emerging sector in the EU and worldwide. Even though it is still a relatively new concept in Ukraine, every year, social enterprises solve many social problems, offering a wide range of innovative solutions. As an interdisciplinary type of entrepreneurship, social enterprises often face challenges that normal businesses and even civil society organisations have already overcome, e.g., the lack of a legal framework, complex business models, enterprise identity issues, insufficient awareness among the population, low visibility, and problems of accessing investment sources. Solving these challenges requires that social enterprises themselves search for rational and effective solutions. However, there should also bean effective social entrepreneurship ecosystem that can provide long-term integrated solutions based on stake holder collaboration.

Financial viability is an important factor since, without funding, the social enterprise would not be able to achieve its defined purposes. Profitability is not the goal of a social enterprise but a basis for how it functions on the market. Social enterprises should work on increasing financial performance and social impact simultaneously. To reach their target audience and provide more social benefits for the community, social enterprises often decrease the price of their products and services or distribute them for free to people in difficult living conditions. This influences the social enterprise's financial state.

The economic, political and social situations in today's Ukraine necessitate the development of social entrepreneurship from charity activity to social business. It will not only become a source that ensures employment for people who cannot compete in the labour market, but it also helps solve various urgent social problems. The establishment of social enterprises should be accomplished with a set of legal, economic and social guarantees from the state and society. The evolution of social entrepreneurship should be accompanied by a solution both global (for example, the formation of social consciousness) and applied (for example, the sustainable development of social entrepreneurship re-

quires effective business models) tasks. In these terms, adapting a foreign country's experiences, one of the most relevant of which is Polish practices, would benefit Ukraine.

In Poland, several targeted public support measures are specifically tailored for social enterprise types of social cooperatives. The programmes funded by the European Social Fund often support social enterprises that are considered a part of the social economy. Access to financial resources is of critical importance for social enterprises in Ukraine. Financial resources are necessary to support their foundation, as well as the development and growth of their activities. Thus, investigating the financial foundations of social entrepreneurship development is a relevant topic.

The purpose of the study is to investigate the Polish and Ukrainian experiences of financial foundations of social entrepreneurship development and, based on the Polish experience, to elaborate recommendations for social entrepreneurship development in Ukraine.

Literature review

Foreign researchers have reached a consensus regarding the importance of both economic and social dimensions in defining social entrepreneurship. According to Costa and Pesci (2016), social entrepreneurs must implement strategies to achieve economic efficiency while maintaining their social mission. The economic dimension is seen as critical to ensuring social entrepreneurial sustainability. Grieco (2018) stated that investigating the economic dimension is crucial to differentiating social entrepreneurship from other social activities, such as non-profit organisations, charitable organisations, and community initiatives. Alegre, Kislenko, and Berbegal-Mirabent (2017) believed that social entrepreneurship combined social and financial goals, community values and innovations.

Newth and Woods (2014) studied social entrepreneurship resistance and innovations. The possibilities of social entrepreneurship are defined in entrepreneurial activity and motivation, organisational, social, institutional and economic contexts. They argued that resistance to change impacts social innovations as they become the products of stakeholders' financial, social and cultural expectations of social entrepreneurship. Kamaludin, Xavier, and Muslim (2021) also identified four key dimensions of social entrepreneurship: social, economic, behavioural, and governmental. They categorised these dimensions based on their effect on social entrepreneurship and sustainability.

According to Akbulaev, Aliyev, and Ahmadov (2019), financing methods of social enterprises ensure competitiveness in providing the highest quality services and improving social standards. They defined investment transparency with an open accounting system of social enterprises as a necessary condition for the future development of social

entrepreneurship. Shahi and Parekh (2021) investigated the organisational factors that govern social enterprises' financing strategies. He conceptualised a vision of what a social enterprise is in the financial paradigm.

Staicu (2018) analysed the entrepreneurial dimension of social enterprise activity in Central and East European countries. He showed that business failure among social enterprises was related to different difficulties related to size, a lack of resources, and financing issues. Most of the social enterprises he researched are aware of the need to ensure financial stability for their social mission. They are trying to diversify their income sources to avoid being overly dependent on one source and to ensure sustainability.

Meanwhile, from a Ukrainian perspective, the social entrepreneurship business model is an innovative way to solve social problems. The road-mapping development of social entrepreneurship in Ukraine will ensure the formation of an effective ecosystem of social entrepreneurship (Smachylo, Khalina, and Kylnytska 2018). Based on international experience, Breus et al. (2020) formulated conceptual foundations of the model of entrepreneurship and social responsibility. They view entrepreneurship social responsibility management as "a system of measures to regulate the interactions between the subjects and objects of social responsibility, taking into account the levels of responsibility and management. Finally, Aranchii and Ihnatenko (2021) stated that social enterprises form a special sector of entrepreneurial activity to solve social problems. Social enterprises are becoming more widespread and can rely only on their own resources and the capabilities of their participants as long-term support for large businesses in the form of start-ups or outsourcing.

Methodology and research methods

We aim to provide recommendations for governmental policy in Ukraine better develop social enterprises. Poland will be used for comparison. Comparative analysis is frequently applied to examine the context in cross-national comparative studies, inter alia, in political, administrative, and social institutions and their structures and economic systems (Hantrais 2011). Research on public policy and public management plays a crucial role in administrative changes. Jreisat (2005; 2019) listed several advantages of comparative analysis, including fostering the growth of and improving the theory of administration, creating administrative typologies, identifying patterns of similarity and difference, and identifying characteristics and states of systems in various regimes that favour efficiency. Comparisons between nations and societies can also further increase the scope of generalisation of conclusions and create an additional context of interpretation (Frankfort-Nachmias and Nachmias 2001). In addition, as Jreisat (2019, p. 2) stated, "The examination of the administrative practices of other so-

cieties permits us to see a wider range of administrative actions, beyond the horizon of our own experiences, and, as a result, to increase our knowledge of a variety of administrative issues and problems".

Comparative analysis in public policy management and development considers the impact of institutional, cultural, and political contexts (Wilson 2011). The cultural factor plays an important role in cross-national comparative research (Hofstede 1984) and provides interesting results. For instance, comparing the dimensions of Ukrainian and Polish business cultures (based on Hofstede's classification of cultural factors) shows many similarities regarding power distance, uncertainty, and restraint. The differences are revealed in Ukrainian collectivism and Polish individualism, the masculinity of Polish business culture and femininity of Ukrainian culture, and the medium-term orientation of Ukrainian culture versus Polish short-termism (Wackowski and Blyznyuk 2017). Other interesting comparative institutional, economic, and political studies are also provided in *Economic Transformation in Poland and Ukraine: National and Regional Perspectives*, edited by Wisła and Nowosad (2020). Our attention is predominantly focused on the organisational and financial aspects.

Methodologically, this study is based on a comparative analysis of the main sources of funding for social enterprises in Poland and Ukraine, including public institutions (grants, loans, guarantees, subsidies and prizes) and other international funds. As secondary data is widely used in international comparative studies (e.g., Dale, Wathan, and Higgins 2008), we have used it in our research.

The paper has two main objectives: (1) to determine the various revenue sources of social enterprises in Poland and Ukraine; (2) to determine the financial dimension of social enterprises in Poland and Ukraine by analysing public and private funding. Data were collected from relevant country reports, studies, legal regulations and research. The research methodology is a comparative and retrospective analysis of statistical and analytical materials, the regulatory framework, and how it was applied. It uses methods of statistical scaling, and it models the regulatory impact on social entrepreneurship.

Comparison of the main sources of social enterprise financing in Poland and Ukraine

The funding sources for social enterprise activities are important in their development. Figure 1 shows the characteristics of the main sources of financing for social enterprises in Poland.

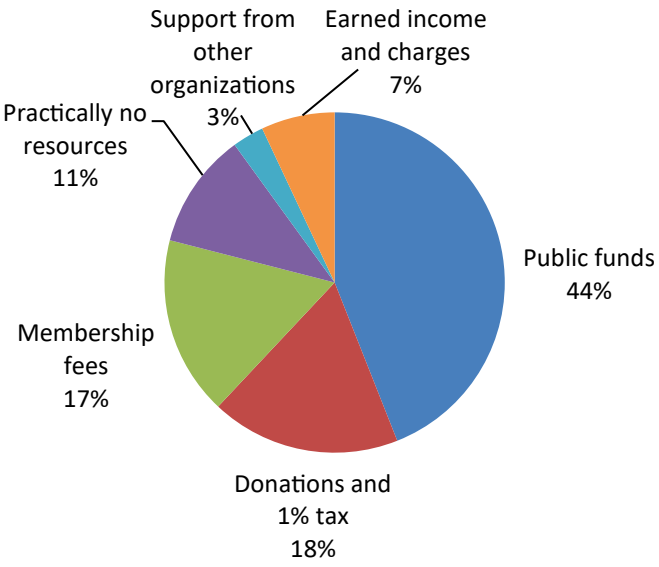

Figure 1. The main sources of social enterprise financing in Poland

Source: own elaboration based on Portal organizacji pozarządowych n.d.

According to the Common Regulations for Subsidies Granted by Social Economy Support Bodies in the Wielkopolski Region (*Wspólny regulamin dotacji…* 2018), entities of the social economy in Poland are financed mainly from public funds (44%). Membership fees accounted for 17%, and income and charges accounted for 7%. Most Polish social enterprises are formed in the third sector, and they operate mainly through grants and donations. Grants could be allocated to cover the costs necessary to open a business or to carry out activities related to the social enterprise creating jobs.

Figure 2 shows the sources of financing for social enterprises in Ukraine.

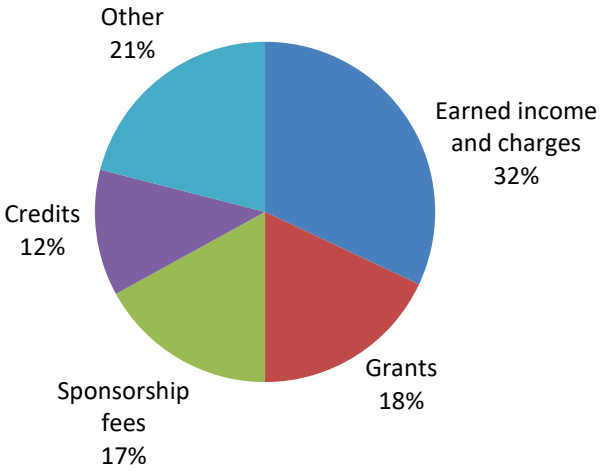

Figure 2. The main sources of social enterprise financing in Ukraine

Source: own elaboration based on *Social enterprises in Ukraine…* 2017.

In contrast, one of the funding sources for social enterprises in Ukraine is income (32%). A significant proportion of financing comes from other sources (21%), including subsidies and budget funds, own resources, non-material support of partners, and founders' investments.

The development of social entrepreneurship needs to establish productive cooperation with local governments to achieve a common goal. Such cooperation provides many benefits, including the creation of social value and contributing to the economic development of local space. Local authorities support the activities of social enterprises in Ukraine by waiving rent, granting free use of equipment, and providing information support, as well as the purchase of goods or purchase of social enterprise products. However, about half of Ukraine's social enterprises do not have any support from the local authorities (Revko 2017, p. 15).

National Programme for the Development of the Social Economy in Poland: lessons learnt

In Poland, state support for the development of social entrepreneurship is provided by the National Programme for the Development of the Social Economy for 2014–2020, developed by the Ministry of Labour and Social Policy in 2014. The National Programme defines the main directions of state aid, which aims to create the best conditions for developing the social economy and social enterprises in Poland. The objectives set out in the National Programme, the consequences, and the expected results were formulated based on a diagnosis of the social economy sector, taking into account the political, social and economic development in Poland and the European Union at the time. The structure and content of the Programme impact the short- and long-term development of Poland's social economy.

In 2019, the government updated the National Programme until 2023 (Krajowy Program Rozwoju Ekonomii Społecznej 2019), and it now includes new employment opportunities for people at risk of social exclusion and provides access to most social services.

The state measures envisaged by the National Programme cover four thematic areas:

1. Community solidarity. This direction concerns cooperation between the subjects of the social economy and the state administration, in particular, local authorities. The measures it provides will change the principles of cooperation between local governments and institutions of the social economy to improve access to quality social services provided by, in particular, local governments.
2. United labour market. This area includes measures related to social and professional reintegration carried out by social economy entities. This direction determines

the conditions necessary for obtaining the status of a social enterprise, as well as the most important tools to support employment. All these measures will help to increase the chances of work and greater participation in the public life of people who find themselves in difficult life circumstances (e.g., unemployed, disabled, or poor people).

3. Competitive social entrepreneurship. This direction includes activities that will allow social economy entities to compete with other entrepreneurs and increase their independence. Taking this into account, jobs created by social enterprises will be more stable. The updated National Programme envisages, in particular, the provision of advisory support and loans to social economy entities, as well as the creation of networks and partnerships, including the development of public-social partnerships.

4. Solidarity society. This area includes educational activities to promote the development of the social economy. These activities are mainly aimed at young people. In addition, within this area, it is planned to spread knowledge about the social economy among government officials (Krajowy Program Rozwoju Ekonomii Społecznej 2019, p. 25).

An important role in implementing the Programme until 2023 is entrusted to the local self-government of voivodships in supporting the development of a social and solidarity economy. Their main tasks include:

- preparing, implementing and monitoring the National Programme of Social Economy Development, taking into account regional specifics and conditions, as well as directions of social economy development defined at the national level;
- participating in consultations for the program and other documents related to social and solidarity economy for the implementation of the partnership agreement;
- coordinating the development of public social services in the voivodship;
  - supporting partnership cooperation between the commune and county local self-government bodies with social and solidarity organisations, especially for joint planning, implementing, and monitoring local social development policy;
  - monitoring and evaluating the quality of support services for the subjects of social and solidarity economy, provided by the Centres of Support of the Social Economy (Krajowy Program Rozwoju Ekonomii Społecznej 2019, p. 59).

Funding for the National Programme is provided from the state budget, budgets of territorial self-government bodies, trust funds, national private funds, and European Union funds.

The tasks of the National Programme are implemented at the expense of the following sources:

- regional operational programmes – partially funded by the European Social Fund;
- the "Knowledge. Education. Development" Operational Programme (2014–2020), funded by the European Social Fund;
- State Fund for Rehabilitation of the Disabled;
- labour fund;
- programs of the Ministry of Family, Labor and Social Policy of the Republic of Poland.

More than PLN 20 billion (€5 billion) has been allocated to finance the Programme, which directly contributes to developing the social and solidarity economy. EU funds account for 85%, local government funds – 6%, and the state budget – 9%. Based on the thematic areas provided by the Programme, the distribution of funds is as follows:

- Area 1 – Community solidarity – requires almost PLN 4.7 billion (€1.2 billion);
- Area 2 – United labour market – requires almost PLN 14 billion (€3.5 billion);
- Area 3 – Competitive social entrepreneurship –requires almost PLN 878 million (€219.5 million);
- Area 4 – Solidarity society –requires almost PLN 40 million (€10 million) (Krajowy Program Rozwoju Ekonomii Społecznej 2019, pp. 63–64, 71–73).

International cooperation to support the development of social enterprises

In addition to the state and the European Union supporting the development of social enterprise, Poland cooperates with other countries, namely Switzerland and Norway. Thus, the development of Poland's social economy was significantly influenced by the Swiss-Polish Cooperation Programme, or the "Swiss Fund", which is a form of non-refundable international aid provided by Switzerland to Poland under Swiss aid to the 10 EU member states that joined on 1 May 2004. Under the international agreement, more than 1 billion Swiss francs were distributed among the countries, with Poland receiving almost half (about 489 million Swiss francs). In 2010, Romania and Bulgaria also joined the programme. The main goal of the Swiss Fund is to reduce the socio-economic disparities between Poland and the more developed EU countries, as well as the disparity within the country, i.e., between the urban centres and the structurally underdeveloped regions.

The Norwegian Financial Mechanism and the Financial Mechanism of the European Economic Area (namely, the Norwegian and European Economic Area (EEA) funds) are also a form of non-repayable international assistance provided by Norway, Iceland, and Liechtenstein. Access to these funds is related to Poland's accession to the European Union and the simultaneous accession to the European Economic Area (EU + Iceland, Liechtenstein, Norway, and Switzerland).The main objective of Norwegian and EEA funds is to help reduce economic and social disparities within the EEA and to strengthen bilateral relations between donor countries and beneficiary countries. On 3 May 2016, Iceland, Liechtenstein and Norway signed an agreement with the EU at the third edition of the EEAFinancial Mechanism (2014–2021). Poland signed an international agreement (Memorandum of Understanding) at the third edition of the Norway-EEA Fund (2014–2021) on 20 December 2017, receiving €809.3 million (from a total fund of more than €2.8 billion), making it, as in the previous editions, the largest beneficiary (Figure 3).

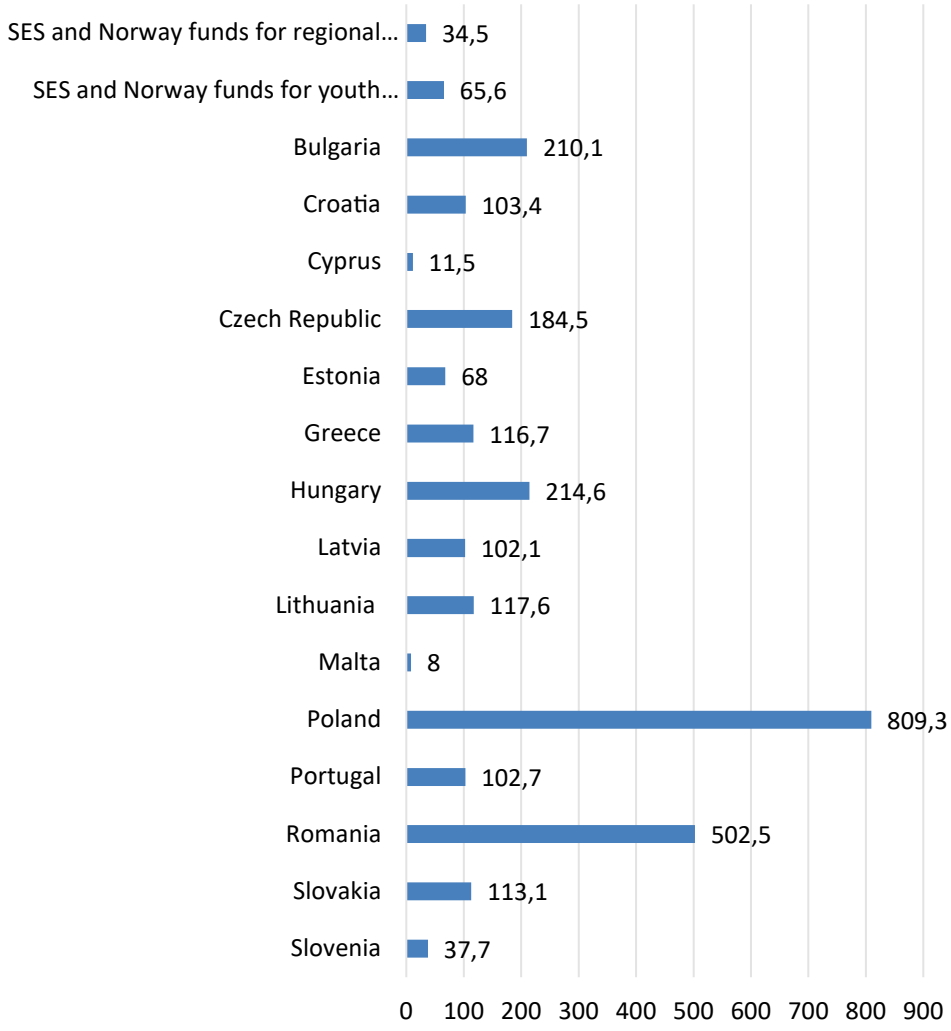

Figure 3. Distribution of funds of the third edition of the Norway and SES Fund for 2014–2021 between EU countries, € millions

Source: own elaboration based on Ministerstwo Funduszy i Polityki Regionalnej n.d.

The third edition of the Norwegian and SES Fund programmes, related to developing social infrastructure of the socio-humanitarian space, is presented in Table 1.

Table 1. Programmes of the third edition of the Norway and SES Fund

Programme name	Operator	Programme partner	Budget
Local development	Polish Ministry of Investment and Development	Norwegian Association of Local and Regional Authorities	€100 million
Science	National Centre for Science and National Centre for Research and Development of Poland	National Council for Scientific Research	€110 million
Education	Polish Education System Development Fund	Norwegian Agency for International Cooperation to Improve the Quality of Higher Education, Icelandic Science Centre, Agency for International Education	€20 million
Culture	Ministry of Culture and National Heritage	Norwegian Council of the Arts and Norwegian Cultural Heritage Authority	€75 million
Medicine	Ministry of Health	Norwegian Department of Health	€20 million

Source: own elaboration based on Ministerstwo Funduszy i Polityki Regionalnej n.d.

Conclusion

Social entrepreneurship is receiving increasing attention from researchers worldwide. Regarding the financing challenges facing social enterprises, academics and practitioners are seeking ways to strengthen the financing dimension of social entrepreneurship (Parekh and Attuel-Mendès 2021). Unfortunately, one of the main barriers to the development of the activities of social enterprises in both countries remains the difficulties in obtaining external funds. In Ukraine, this creates worse conditions for developing social entrepreneurship compared to other European countries, including Poland. To develop social enterprise in Ukraine, it is necessary to develop a sustainable financing model that will create an opportunity to attract potential investors.

Financing is a driver for the development of social entrepreneurship. It will create conditions for the formation of a social finance market. The financial resources of social entrepreneurship should be allocated to replicate effective business models. On the one hand, it could influence the innovative development of the activities in social enterprises,

and on the other, it will promote financial sustainability. Based on the Polish experience, government expenditure in the social sphere should go towards organising social entrepreneurship support programmes for those social enterprises that use effective models to commercialise social impact, forcing the development of social businesses.

The governments in different countries support social enterprises in different ways, from grants to tax breaks and compensation for part of the employees' salaries. From international experience, it is obvious that the functioning of social enterprises without additional support is not possible. Without additional support, achieving financial efficiency and independence by employing people with fewer opportunities is complicated. Government policy should identify the need for social enterprises and the social problems they will solve.

Based on the research, we concluded that the development of social entrepreneurship is financially dependent on stakeholders' cooperation. Such stakeholders include state authorities and local governmental bodies (regulatory mechanism of financial support), businesses (mentoring and grant support), higher educational institutions (social entrepreneurship training) and civil society organisations (public awareness, social promotion). These stakeholders can help develop investment in social entrepreneurship. For example, the state can develop transparent legal regulations, outsourcing social services, providing social guarantees, and implementing the mechanisms for investing in projects of social enterprises. Large businesses can provide different forms of social investment, pro bono consulting, while public organisations can promote activities and share experiences. Finally, universities can be a platform to connect all stakeholders and provide relevant education.

State financial support for social entrepreneurship has begun in Ukraine. In complicated economic conditions of necessity, it is necessary to recognize the need to move to real market mechanisms for the foundation of social entrepreneurship. Limited state funding should be accompanied and supported by organisational means. Based on Polish experiences, to save budgets and to prevent bureaucratisation, it is advisable to develop a system of social order to distribute the functions of financing the social enterprises with the non-governmental sector.

In Ukrainian legislation, there is no list of characteristics of social entrepreneurship or mechanisms to regulate social entrepreneurship activity. This makes it impossible to statistically record and monitor their contribution to the socialisation of the economy. It also does not allow them to effectively solve the problems, e.g., the availability of financial sources, support personnel, the low level of state support, difficulty in scaling up best practices, the significant level of public distrust, low level of awareness and knowledge about social entrepreneurship, and excessive bureaucratisation of procedures for participation in municipal or regional development programmes. The research de-

termined the conditions that will ensure the development of social entrepreneurship and the growth of its role in the internationalisation of the national economy.

Social businesses often act as social innovators and opinion leaders, and they promote social initiatives at the state level. Therefore, the research identified the best practices of the Polish experience in supporting the development of social entrepreneurship. In particular, Polish social enterprises can be identified by their functional, social and economic contribution to the development of the national economy. In addition, they tend to create mechanisms of state incentives. Regulatory and legal support will help adapt positive experiences in Ukraine and develop a favourable financial and investment environment for social enterprises to function.

The role of social entrepreneurship in increasing the innovative potential of the national economy depends on several factors. These factors include the established institutional basis, norms and principles, how economic processes are organised and coordinated, support from the state, society, and the market, access to power, and the level of social responsibility. Equally important are society's readiness for change, behavioural attitudes and traditions, and the degree of trust of citizens. The results of the study create the basis for the development of general regulatory mechanisms and activity incentives for social entrepreneurship in Ukraine based on the experience of Poland and mechanisms of EU donor support. In the context of internationalisation, the research creates a systemic awareness of the need to form a national culture and institutional social entrepreneurship environment.

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Finansowy wymiar rozwoju przedsiębiorczości społecznej: doświadczenia polskie i ukraińskie

Artykuł wpisuje się w dyskusję na temat wymiaru finansowego przedsiębiorczości społecznej. Celem zaprezentowanych analiz jest porównanie polskich i ukraińskich doświadczeń w zakresie finansowych podstaw rozwoju przedsiębiorczości społecznej I zaproponowanie na tej podstawie rekomendacji dla rozwoju przedsiębiorczości społecznej w Ukrainie. Przegląd źródeł naukowych i podejść do rozwiązania problemu ograniczonych zasobów finansowych dla przedsiębiorstw społecznych wskazuje, że wsparcie państwa ukraińskiego ma charakter początkowy. Polityka rządu powinna identyfikować zarówno potrzeby przedsiębiorstw społecznych, jak i problemy społeczne, które mogą być przez te podmioty rozwiązywane. Istotność tych zagadnień polega na tym, że poziom zaangażowania finansowego w rozwój przedsiębiorczości społecznej jest uzależniony od współpracy różnych interesariuszy: władz państwowych i samorządowych (regulacyjny mechanizm wsparcia finansowego); biznesu (mentoring i wsparcie grantowe); uczelni wyższych (szkolenia z zakresu przedsiębiorczości społecznej) oraz organizacji obywatelskich. W celu uzyskania rekomendacji w zakresie rozwoju krajowego modelu finansowego wsparcia przedsiębiorstw społecznych w Ukrainie przeanalizowano mechanizmy finansowania przedsiębiorczości społecznej w Polsce. Z przeprowadzonych badan wynika, że wydatki rządowe w sferze społecznej powinny w większym stopniu być przeznaczone na organizowanie programów wsparcia przedsiębiorczości społecznej dla tych przedsiębiorstw społecznych, które wykorzystują efektywne modele komercjalizacji wpływu społecznego. Takie postępowanie będzie sprzyjało rozwojowi tych podmiotów.

Metodologicznie opracowanie oparto na porównawczej metodzie analizy głównych źródeł finansowania przedsiębiorstw społecznych w Polsce i na Ukrainie, w tym instytucji publicznych (pożyczki, gwarancje, dotacje i nagrody) oraz z innych funduszy międzynarodowych.

W związku z upowszechnianiem się koncepcji przedsiębiorczości społecznej w Ukrainie prowadzone badanie ma istotne znaczenie strategiczne i aplikacyjne. W wyniku przeprowadzonych badań wynika, że przedsiębiorczość społeczna w Polsce była uznawana, na poziomie państwa, za ważne narzędzie realizacji celów społecznych. Wyniki badania wydają się mieć istotne

znaczenie w kontekście współczesnych wyzwań rozwojowych Ukrainy. Ukraińscy przedsiębiorcy społeczni mogą skorzystać z europejskich wzorców mechanizmów wspierania działalności (rozpoczęcia lub rozszerzenia), także w kontekście umiędzynarodowienia własnej działalności. Instytucjonalne wsparcie procesów internacjonalizacji biznesu społecznego, nie stało się dotychczas powszechną praktyką w Ukrainie. Ukraińska ekspansja międzynarodowa może być impulsem dla rozwoju nie tylko przedsiębiorstw społecznych, ale również całego kraju. Zidentyfikowane w wyniku badania narzędzia, zasoby i mechanizmy wspierania przedsiębiorczości społecznej w Polsce potencjalnie mogą przyczynić się do pokonywania przeszkód umiędzynarodowienia ukraińskich przedsiębiorstw społecznych.

Słowa kluczowe: przedsiębiorczość społeczna, wsparcie finansowe, źródła finansowe, wsparcie rządowe, rozwój społeczności, problemy społeczne

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Food Production in the Cities of Tomorrow The Results of International Questionnaire Surveys

Małgorzata Burchard-Dziubińska https://orcid.org/0000-0001-5546-2032
Ph.D., Associate Professor at the University of Lodz, Lodz, Poland, e-mail: malgorzata.burchard@uni.lodz.pl

Abstract

The considerations in this article have three goals. The first is to obtain information on the practical experience of young urban residents who use urban horticulture and agriculture products. The second is to determine the readiness to practice such production independently in the future. The third is to identify the environmental benefits (ecosystem services) related to urban horticulture and agriculture indicated by the respondents. In this case, it was about examining the "environmental intuition" of people who are not professionally related to natural and agricultural sciences. The comparative study concerned students from Brazil, China, India, Mexico, Poland, and a group of seven countries from the European Union. In total, respondents came from 29 countries. The collected data were used to compare the approach to urban horticulture and agriculture and their produce represented by respondents from different countries and cultural circles and to formulate conclusions on how to use the related potential to support sustainable urban development.

Keywords: ecosystem services, food production, cities, society, sustainable development

JEL: Q01, Q57, R11, R14

Introduction

The ancient Romans had their *rus in urbe*, the countryside in the city. Consecutive epochs contributed to the development of urban horticulture, combining production and recreational functions in gardens designed in close connection with the aesthetics of their times. The Industrial Revolution, which began in England

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in the 18th century and quickly spread worldwide, launched urbanization on an unknown scale. It involved not only a large increase in the urban population but also concentrated various social problems related to poverty, malnutrition, poor living, and sanitary conditions, and the spread of diseases such as tuberculosis and cholera. Among the ideas for making urban life more bearable, it is certainly worth noting the vision of Ebenezer Howard's Garden City network. It was notable for its precise economic calculation of the venture and inspires to this day. This project, which dates from 1898, had a practical character as it combined the advantages of large agglomerations, which provided employment opportunities, with villages, which had strips of arable land that guaranteed access to fresh food. The proximity of greenery was also supposed to have a positive impact on the quality of life (Howard 2015). Another example of an attempt to remedy the misery of urban existence was providing workers with plots of land where they could grow their own fruit and vegetables. This is how the allotment or community gardening movement, which is still very much alive, was born in many countries. Particularly in Europe, there are examples of allotment gardens that have remained in the family for several generations (Savill 2009; Poniży et al. 2021).

Cultivation in urban areas flourishes in one form or another, from small gardens squeezed between urban buildings, through roofs, terraces, and vertical gardens, to large urban projects. Significantly, urban horticulture has become a global social movement, integrating people of different professions and social statuses. It is easiest to notice changes in cities where, until recently, this was not obvious due to relentless pressure from growing industrial districts and commercial complexes, as well as the fast pace of life and work (Stuart-Smith 2021). The scale of feeding needs in cities is constantly growing, and ensuring food security is today treated as a pressing problem (Pourias, Aubry, and Duchemin 2016, pp. 257–273). It is estimated that up to 30% of the food can be produced in urban areas (Ngiam Tong Tau 2019, pp. 9–12). The design of urban complexes, the organization of food production, and the approach to these challenges by the residents themselves require change.

The research results presented in the article concern observations between 2017 and 2021. A discussion with Polish students on the future of allotment gardens in Polish cities was the inspiration for this research. The votes "for" and "against" were distributed more or less evenly. Among the arguments "for," the prevailing opinions were that working on a plot is a healthy form of outdoor activity and that the yields please producers and make it possible to reduce expenditures on food purchases. Opponents of allotment gardens in cities drew attention to the dubious aesthetics of these places, the "retirement" nature of these activities, and that the gardens block attractive locations for new investments. The research project, which was aimed at students of economics and business in various countries, had three goals. The first was to obtain information on the practical experience of young urban residents who use urban horticulture and agriculture prod-

ucts. The second was to determine the readiness to practice such production independently in the future. The third was to identify the environmental benefits (ecosystem services) related to urban horticulture and agriculture indicated by respondents. In this case, it was about examining the "environmental intuition" of people who are not professionally related to natural and agricultural sciences. The collected data were used to compare the approaches stated by respondents from different countries and cultural circles to urban horticulture and agriculture and their produce and to formulate conclusions on how to use the related potential to support sustainable urban development.

Meeting food needs and sustainable urban development – literature review

According to World Urbanization Prospects (2018), in 2007, for the first time, more people lived in cities than in rural areas. In 2021, 4.46 billion people, or 56.61% of the world's population, were inhabitants of urban areas, and this percentage is expected to increase to 68% by 2050. However, urbanization is characterized by an uneven pace and a degree of complexity, often affecting adjacent areas that, until recently, were the base for food production and a natural receiver of pollution. For this research, several issues are particularly important: demographic change, urban living conditions, and the challenges of climate change.

The first of these issues concerns the expansion of the urban population due to the population moving from the countryside to the cities, as well as population growth, which is very characteristic, especially for developing countries. As a result, the concentration of population in cities is increasing, measured by the urbanization coefficient, which determines the percentage of urban inhabitants in the total population. This coefficient varies between continents and countries but is increasing worldwide. Currently, the most urbanized regions are North America (82.75%), Latin America and the Caribbean (81.5%), Europe (75%), and Oceania (68%). The level of urbanization in Asia is about 52%. It is expected that as much as 90% of the global urban population growth between 2021 and 2050 will occur in Asia and Africa, mainly in India, China, and Nigeria. It is estimated that 82% of Europeans will live in cities by 2050, which means a 36 million increase in the urban population. In Poland, although the urban population constitutes 61.1% of the population, the number of inhabitants of cities has been decreasing – since 2000 by 360,000. However, the area of cities is growing – it has increased by 308 sq km since 2000 (*World Urbanization Prospects 2018* 2019).

Urban living conditions are determined by economic, social, and environmental factors that affect residents' physical and mental health. Most problems concern rapidly growing cities in less developed countries, where high air pollution, noise, and lim-

ited access to excellent quality food, clean water, and sanitary facilities are a constant source of pressure. Significant threats also result from global warming, which, depending on the location of cities, affects how they function in diverse ways. In particular, there are risks to health, life, and infrastructure that result from extreme weather phenomena, such as heat waves that exacerbate urban heat islands, flash floods, and rising sea levels that threaten coastal cities (Dell, Jones, and Olken 2014, pp. 740–798; Georgescu et al. 2015).

In turn, droughts deteriorate the microclimate, vegetation and air quality. It is now widely accepted that cities, despite their attractiveness due to easy access to services and the labor market, are places where the accumulation of various social and economic problems is extremely high (Bauman 2001; Therborn 2013). The challenge has been to increase the resilience of local socio-economic and natural systems to various types of stress. Numerous studies show that solutions can be found in the development of urban horticulture and agriculture, which can not only reduce cities' dependence on external food supplies but also help to reduce the cities' carbon footprint, adapt to climate change, and strengthen social cooperation. Using Google Earth Engine, as well as data collections on population and meteorology, Clinton et al. (2018, pp. 40–60) found that if the existing potential is fully exploited, cities around the world can produce up to 180 million tons of food per year, including up to 10% of global production of legumes, roots and tubers, and vegetables. This can be seen both in the number of people involved in this type of activity and in the innovative approach to organizing the work itself, locations, and the technologies used (Guitart, Pickering, and Byrne 2012, pp. 364–373; Crawford 2018). Food production in cities can take place in various types of gardens and on farms. City gardens can be divided into individual and collective gardens. The former includes home gardens and allotment gardens, including micro gardens installed on roofs, balconies and terraces. The latter includes various community, school, therapeutic and sensory gardens. Their size varies – from cultivation in balcony pots, through small plots, to large gardens founded on old wastelands, post-industrial areas, and on the walls and roofs of various buildings (Jeavons 2002; Fabricant 2010). There is ample space for agriculture in cities and their outskirts that can serve various functions beyond food production. These functions include recreation, education, therapy, experimentation, and the preservation of cultural heritage. In the future, hydroponic, aquaponic, and aquaculture production are likely to become more widespread (MacNair 2002; Despommier 2009, pp. 80–87; Smith 2022).

Ensuring increased food security for more than half of the Earth's population is a serious challenge (de Bon, Parrot, and Moustier 2009, pp. 21–31). Food production in cities has always grown in difficult periods of history. The best-known example is victory gardens during the First and Second World Wars, founded *en masse* in many countries

affected by the conflict and cut off from natural sources of food supply. It was then that the great potential of this method of food production was revealed for the first time. Economic crises, when the scope of poverty increases as a result of the increase in unemployment, are also conducive to this type of activity, as was the case during the global financial crisis, which began in 2008. The same thing happened during the COVID–19 pandemic when there was a lack of food due to the disruption of traditional supply chains.

Due to the tendency to urbanize poverty in developing regions, urban agriculture can play a significant role in addressing urban food insecurity (Mougeot 2000; van Veenhuizen and Danso 2007; Zezza and Tasciotti 2010, pp. 265–273), increasing cities' resilience to market fluctuations and climate change (de Zeeuw, van Veenhuizen, and Dubbeling 2011, pp. 153–163), provide noticeable improvement in people's health and well-being (Ulrich 2006, pp. 38–39), and connect urban residents with the natural systems from which they have been separated (Turner, Nakamura, and Dinetti 2004, pp. 585–590; Turner 2011, pp. 509–522). There is evidence that urban agriculture influences the increase in the consumption of fresh fruit and vegetables (Alaimo et al. 2008, pp. 94–101).

Food production in the city can be a type of hobby, a way to save on shopping, but it can also fulfill other important social, economic and ecological functions (Walker and Salt 2006). Studies have shown the positive impact on local food production communities (both for their own use and for sale) in neglected neighborhoods. Collective horticulture in specially designated public places has proved to be a factor that helps people establish contacts, strengthen social bonds, improve residents' safety, and acquire new knowledge and skills (Kondo et al. 2018). All this is currently being practiced, and if monetary and organizational support is well targeted, cities are able to meet up to 30% of their food demand (Thorpe 2017).

Urban food production in light of the survey results

Research method

A pilot survey was conducted between 2017 and 2020 in Brazil, India, Mexico, and Poland with groups of international students. The study was conducted using the Pen-and-Paper Personal Interview (PAPI) method, and the results were then digitized using Excel. The choice of method was determined by the conditions in which the surveys were conducted. As some countries were represented by only individuals or small groups in the research sample, the comparative analysis was done by selecting the responses of participants from the countries with the largest sample sizes, i.e., Brazil (97), China (111), India (120), Mexico (85), and Poland (50). The questions concerned their own experiences and observations related to the production and availa-

bility of urban horticulture and agriculture products in individual countries, as well as their views on the possibility of doing these activities personally in the future. It was assumed that respondents from the countryside who studied in large academic centers were able to make observations regarding urban horticulture and agriculture and their products.

Research results

A total of 638 economics and management students from 29 countries (Algeria, Azerbaijan, Bangladesh, Belgium, Bulgaria, Brazil, China, Ecuador, France, Gambia, Greece, Georgia, India, Iran, Iraq, Italy, Qatar, Kazakhstan, Kyrgyzstan, Morocco, Mexico, Nepal, Poland, Russia, Somalia, Spain, Turkey, Ukraine, and Zimbabwe) were surveyed. The respondents were 19–30 years of age; 48.2% were women, and 51.8% were men. Respondents studying in cities with over 1 million inhabitants constituted 94% of the sample. Half of them studied in cities with a population of 5–10 million.

The respondents were asked whether they had encountered products from urban horticulture or agriculture in the cities where they lived and/or studied (production in the family household, obtaining or buying products from neighbors); 65% answered positively, 15% had no contact, and 20% had no knowledge of this. The respondents listed the following categories of products available: vegetables, fruit, milk and dairy, eggs, meat, herbs, preserves (juices, wine, jams), and grains and seeds (Figure 1). The animal products came from poultry, pigeons, rabbits, guinea pigs, goats, sheep, pigs, and cows bred in cities.

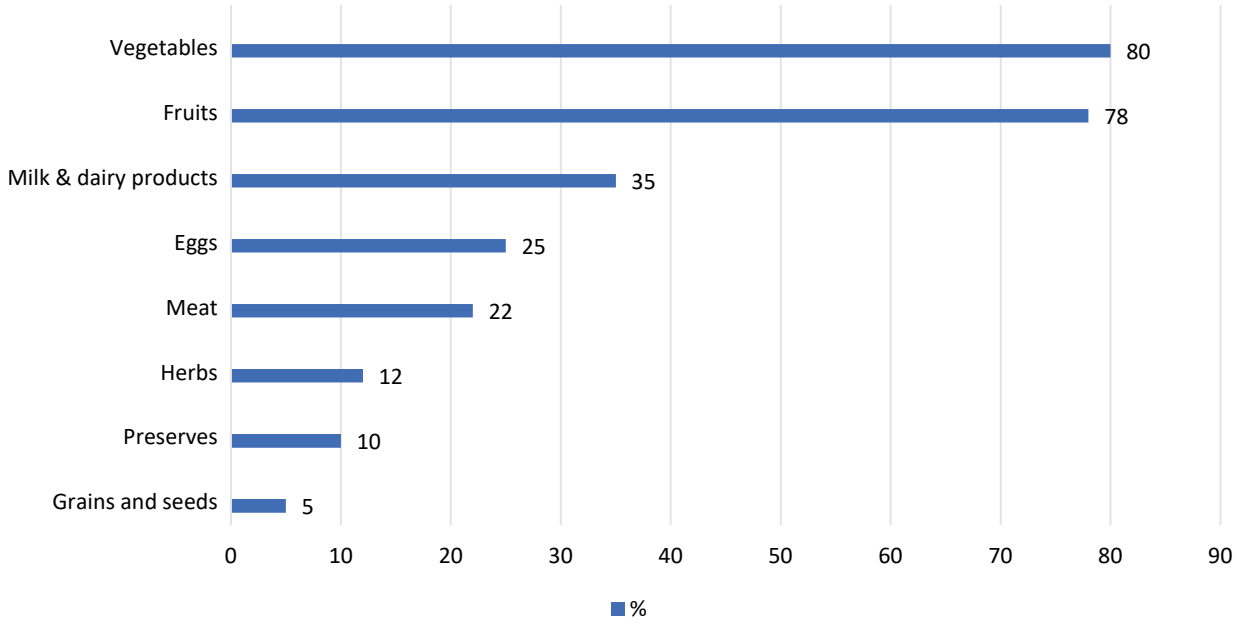

Figure 1. Types of products purchased

Source: own study.

Twenty-seven percent of respondents confirmed their personal experience of purchasing urban agricultural products, and 85% declared their willingness to do so in the future. However, when asked if they would like to produce food in a backyard garden or on a farm in the future, only 21% answered positively, 35% were negative, and 44% had no opinion.

One of the objectives of the project was to compare the approach to urban horticulture and agriculture between the countries where the research was conducted. Working in international student groups made it possible to learn about the behaviors observed in different parts of the world. As a large group of respondents came from China, it was possible to obtain data for this country. Collective data were also identified for European Union countries (Belgium, Bulgaria, France, Greece, Italy, Poland, and Spain), with students from these countries studying in Poland (EU–7).

Listing the social and economic benefits of urban horticulture and agriculture, the respondents indicated as the most important:

- Access to fresh food;
- Improving the food of the poorest citizens;
- Learning new skills;
- Creating new jobs.

Figure 2 shows the percentage distribution of indications regarding the social and economic benefits associated with the development of urban horticulture and agriculture. In all countries, the respondents appreciated access to fresh food from local production in cities. However, much higher indications were obtained in developing countries than in Poland or the EU–7. This may indicate significant differences in access to good quality, fresh produce between European cities and large, overwhelming cities in Brazil and Mexico and in the two most populous countries in Asia.

In the group of developing countries, 40% of respondents in Brazil and India, but only 5% in Mexico, believed that developing urban horticulture and agriculture could improve the food supply of the poorest inhabitants of cities. The indicators for Poland and the EU–7 were similar, at 12–15%, which may result from differences in the scale of the problem and the assessment of the possibility of starting to independently cultivate food crops. This issue requires further detailed research.

Using a Likert scale, the chances of creating new jobs due to the development of urban horticulture and agriculture were generally "very low" in India (81% of indications) and Mexico (79%). Brazil and China had slightly better ratings. Despite the dominance of "very low" (64% and 56%, respectively), a much larger number of respondents chose "low" (36% and 43%, respectively). Respondents from EU cities were much more

optimistic. They assessed the chance of creating new jobs as "high"; in Poland, it was 5% of indications and 8% in the EU–7. This may be because the EU population has gotten used to considerable subsidies for initiatives for sustainable urban development from Community funds.

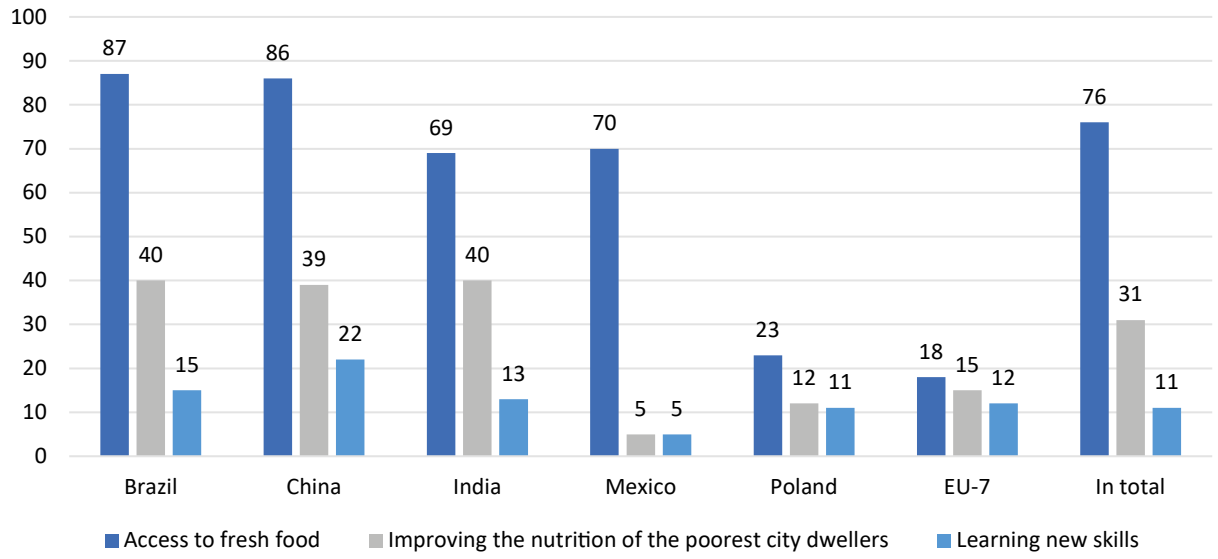

Figure 2. Assessment of the social and economic benefits of urban horticulture and agriculture [%]

Source: own study.

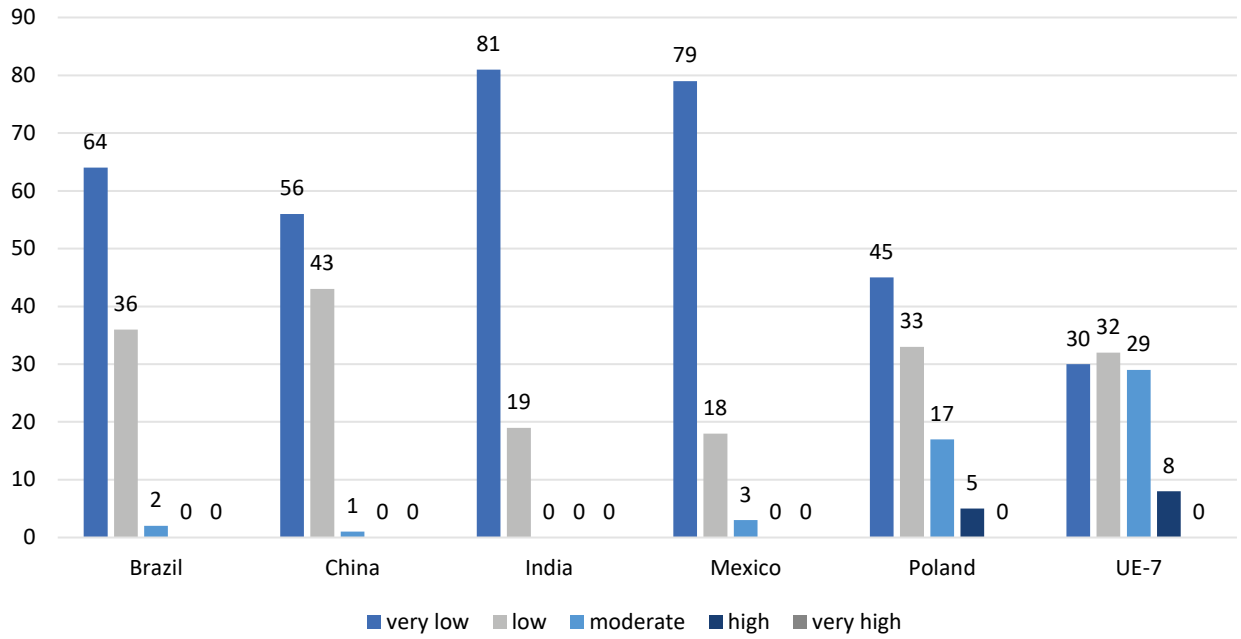

Figure 3. Opportunities for new jobs in urban horticulture and agriculture

Source: own study.

Comments about social and economic benefits included improving living conditions through income from the sale of food produced, enabling close contact with nature, education on cultivation and nutrition, and strengthening social ties. Attention was also drawn to the additional benefit of reducing air pollution emissions by shortening the distance that food is transported.

The analysis of the "environmental intuition" of the respondents (who were students of economics or management without experience in the fields of ecology, horticulture, or agriculture) was aimed at ascertaining whether they could indicate the environmental benefits associated with the production of food in urban gardens and farms. In the overall sample, the benefits were rated in the following order: improved air quality in cities (51%), the possibility to produce and use organic fertilizer (i.e., compost) (35%), and increased biodiversity in cities, including the presence of wild species (29%). In individual countries, improved air quality was also rated the highest, with indications ranging from 60% in Brazil to 46% in China. Brazilians also highly rated the production and use of compost. This type of benefit was indicated by 12% of respondents in India and 23% in Mexico. In Poland and the EU–7, it was indicated by 38 and 31% of respondents, respectively. Biodiversity enrichment was also chosen frequently by students from Brazil (Figure 4).

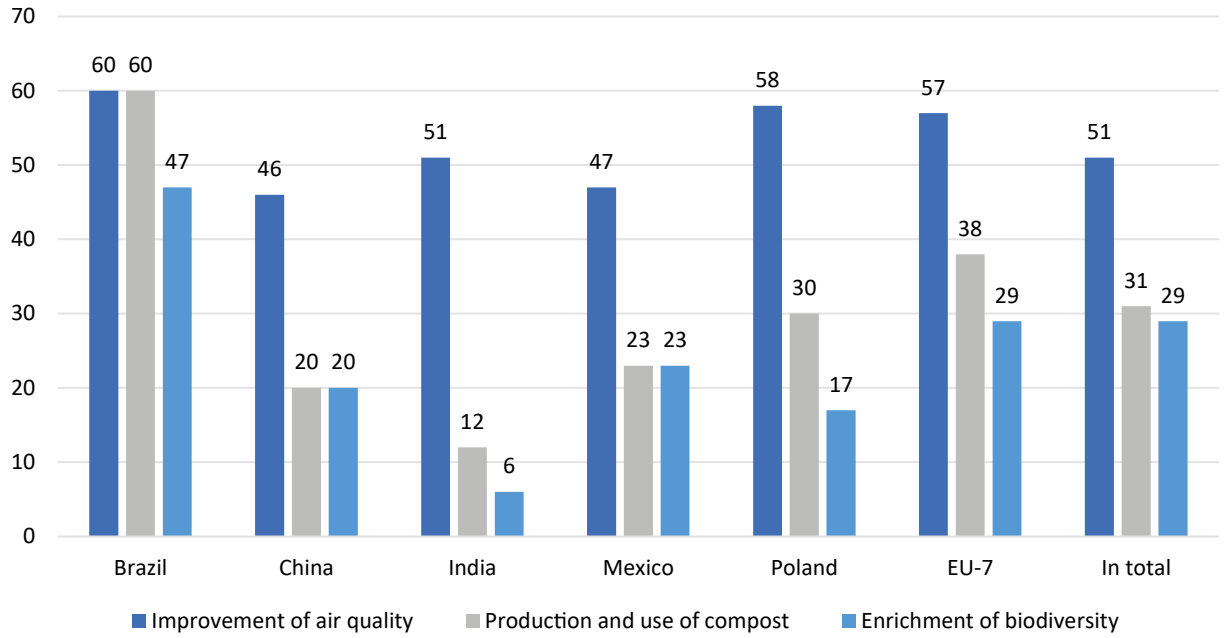

Figure 4. Environmental benefits of urban horticulture and agriculture

Source: own study.

The respondents were also asked if they perceived any risks associated with food production in cities, but as many as 80% thought that such risks did not exist. The others mentioned the following hazards: food contamination related to soil contamination

in cities (65 indications, 10% of the total research sample), hazards resulting from improper storage of waste from production, especially animal waste (37 indications, 5%), low quality of food (25 indications, 3%), issues related to the use of treated wastewater for irrigation (19, 2.9%), the possibility of the spread of zoonoses (14 indications, 2%). The respondents were allowed to provide more than one answer. Zoonoses were only noted by respondents from Asia.

Discussion

As shown in the study, the openness of young people who are not professionally involved in horticulture and agriculture to the development of food production in cities is a good sign for the future. This was confirmed by respondents from all countries covered by this pilot study. Importantly, it is not only about buying but also making products on your own. The differences between developing and EU countries in terms of access to fresh food and the assessment of opportunities for job creation in urban horticulture and agriculture are quite clear. The higher ratings for EU cities can be explained by the much easier access to good quality, fresh food in European cities and the substantial EU support for the agricultural sector and sustainable urban development (*The Economics of Ecosystems and Biodiversity* 2008). In addition, many social projects in the EU are linked to food production and acquiring new competencies in healthy eating.

Nowadays, the idea of complementary food production outside rural agriculture and distant imports still inspires new activities in both highly developed and developing countries. "Food policy matters at all levels – globally, nationally, and locally – because it affects everyone: our communities and livelihoods, our environment, ecosystems and the climate, our nutrition and health. Food policy shapes who eats what, why and at what cost." the Mayor of Milan aptly stated (Sala 2019, pp. 4–8). Considering the results of the research and the data from the literature (Fanzo et al. 2013) on attempts to meet food needs in various cities around the world, apart from the traditional approach to horticulture for own use, two promising trends can be distinguished (Figure 5).

The first trend is related to urban policy aimed at increasing, in a broad sense, the resilience of cities. In this case, it is not only about food security but also about adapting cities to climate change, mitigating the negative effects of extreme weather phenomena, and obtaining positive social effects. This is necessary to define the tasks and scope of activities and use appropriately selected legal, planning, economic and educational instruments. Experts from various fields dealing with urban issues emphasize the need to change the approach to the design of cities and their districts to make them more functional and friendly to residents and resistant to various external shocks, including climate change.

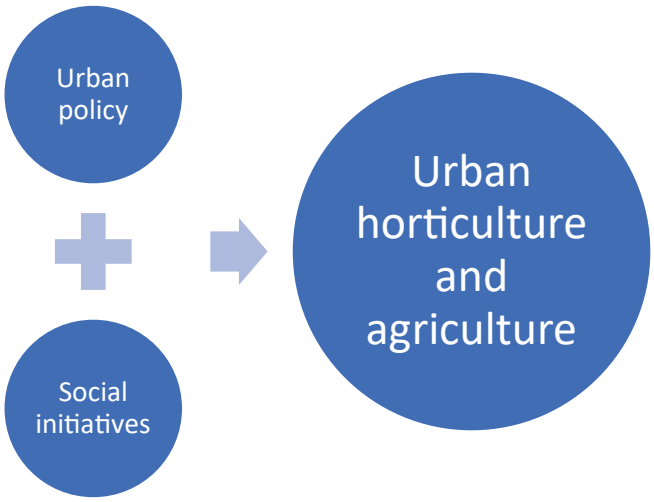

Figure 5. Development trends in modern urban horticulture and agriculture

Source: own study.

Urban planners and landscape architects support the introduction of agricultural land into cities. This requires hiding transport infrastructure underground and leaving areas on the surface for various crops and water retention, as well as using roofs (Food System Planning Case No. 2, 2021). An example is the green roof on Thammasat University's Rangsit campus, about 40 miles north of downtown Bangkok. It offers many modern solutions simultaneously, e.g., fresh products, flood protection, use of solar energy, green space for residents, workplaces, and the opportunity to learn how to solve the most pressing problems in cities. Landscape architect Kotchakorn Voraakhom (*Kotchakorn Voraakhom – 15 Iconic Projects* n.d.) invented and designed the project, inspired by the tradition of terraced rice cultivation in Thailand (Eng 2020). This example is a model approach to food production based on urban agriculture.

Singapore and New York also have their own financial support programs for installing green roofs. In 2020, the Singapore Food Agency awarded the tender for farms on public car park rooftops. Attention is drawn to the sustainable cultivation of crops without the use of pesticides or chemicals, as well as the creation of jobs involving seniors. The project, which received US $21 million in support, is part of a strategy to have 30% of food consumed in Singapore produced locally by 2030. New York is actively supporting the city's adaptation to climate change by increasing water retention through green rooftops that are converted into sites with fast-growing vegetables and herbs (The Green Roof Tax Abatement Program and Green Infrastructure Grant Program, New York). In the United States, special programs are aimed at the poorest inhabitants of cities, mainly Latinos and African Americans, among whom aggregate poverty and unemployment have remained extremely high for years. In cooperation with local gardening centers, botanical gardens, and scientific institutions, many cities also offer composting opportunities, free seedlings, and courses on growing and selling food.

The second trend involves the increasingly important bottom-up social movement to increase food production in the public space of cities. One of the best-known examples is Todmorden, the deprived West Yorkshire town of 15,000 in England, where Pam Warhurst and Mary Clear initiated the *Incredible Edible Todmorden* (IET) project in 2008. Permission gardens and guerrilla gardens with strawberries, cabbage and carrots, rhubarb and radishes, chard and chives appeared in the city and its outskirts. Herbs, trees, and fruit bushes were also planted. In total, 70 plots were intended for cultivation in the city. These gardens have become "propaganda gardens" – their very presence in public space was intended to provoke discussion about food, its quality, and accessibility. They were used to "smuggle" food issues into public awareness. The inscription on the IET boards reads: "Go on, take some. It's all free." The concept of open-source food, collecting, and eating something that someone else planted and nurtured, was both revolutionary and contagious. Undoubtedly, it represents a cultural change, and not only in Todmorden. This social movement is not dependent on any external financing; it takes place with the knowledge of the authorities, although without formal consent. The number of similar initiatives in the United Kingdom has increased to over 120, and there are already over a thousand non-profit organizations in the world under the name *Incredible Edible* translated into local languages (Paull 2013, pp. 336–345; Stuart-Smith 2021, pp. 214–248).

Urban food production is currently both a bottom-up and a top-down venture.

Among the former, several types of activities can be distinguished, such as

- food production carried out within one's own household, also as a hobby;
- neighborhood initiatives and activities of social groups conducted jointly, also in the public space;
- initiating food production by local leaders, especially in deprived neighborhoods affected by unemployment, malnutrition, or problems resulting from a lack of access to healthy food;
- activities of non-governmental organizations that support education, the preservation of cultural and natural heritage, social integration, and combating exclusion or malnutrition.

Top-down activities related to urban policy comprise spatial planning, including land for cultivation, preserving the heritage of allotment movement, and supporting the establishment of various types of gardens, including school gardens, botanical gardens, and sensory gardens. More and more cities are also starting to make land available for agricultural production. The summary of benefits from urban horticulture and agriculture is presented in Table 1.

Table 1. Benefits of urban horticulture and agriculture

Ecological	Economic	Social
Enlargement of urban green areas Reducing cities' carbon footprints Improved air quality Noise attenuation Increased rainwater harvesting and infiltration Flooding and flash floods protection The beneficial effect of composting on organic matter circulation Reducing the use of pesticides and fertilizers through cultivation in a controlled environment Increasing and protecting biodiversity	Shortening the road „from field to plate", which means lower transport costs and transport emissions Access to fresh food free of charge or at a low price Reducing family maintenance costs Increasing the value of real estate Reducing the cost of maintaining the city through ecosystem services provided by gardens and farmland	Building social capital The emergence of social activism Improving food security Improving the quality of life Mitigating urban heat islands Positive impact on physical and mental health Increasing ecological and environmental justice Education in horticulture/agriculture and climate Easier access to culturally relevant food

Source: own study.

Conclusion

Considering the findings of the research, the lessons learned from the COVID–19 pandemic, and the impact of the Russian attack on Ukraine in February 2022, which resulted in the disruption of traditional supply chains, the need to strengthen the resilience of cities to shocks on the food products market becomes increasingly obvious. Cities implement their food system activities in different ways. Some develop comprehensive documents and long-term plans, while others work on sectoral policies and projects. Recommended is to have a comprehensive and sustainable food strategy. This can be fostered by urban horticulture and agriculture, which are enjoying great public interest and support worldwide. Crucially, this includes the younger generation, who value access to fresh food and the positive impact of urban crops on quality of life. Importantly, it is evident both in highly developed and developing countries and in various cultural circles.

In urban horticulture and agriculture, two trends can be distinguished:

- traditional – based on conventional cultivation techniques, related to the use of various available free spaces, engaging people of various professions and with different material statuses, and social activists, for both hobby and production purposes for their own needs and for sale;
- modern – using new technologies, unconventional cultivation and breeding locations, usually requiring the involvement of investment funds for the construction of spe-

cial infrastructure, e.g., structures supporting vertical gardens, roof gardens, roof greenhouses, or installations for hydroponic, aquaculture and aquaponic cultivation, in which waste produced by fish is used as a source of nutrients for plants, which allows a healthy environment for fish to be maintained.

Although production varies in scale and objectives, it is becoming an increasingly appreciated source of ecosystem benefits and an element of sustainable urban development.

Food production should become an important element of urban policy to meet the challenges of increasingly growing cities. The benefits of making wastelands, post-industrial areas, roofs and walls of buildings, and even places in public parks and around residential houses available for urban residents for cultivation are multiple and allow social, economic and ecological goals to be achieved. Strengthening cities' resilience to climate change does not have to solely involve local authorities in developing grey infrastructure. It can include the prudent use of what is offered by gardens and fields, so enthusiastically nurtured by the inhabitants. One of the advantages of urban horticulture and agriculture, in all their forms, is that they engage residents in activities that generate external benefits. Through their work and money spent on setting up and maintaining gardens, urban dwellers contribute to positive externalities that are important for protecting land and adapting to climate change. Horticulture and urban farming projects, which reflect and stem from the cultural values of the local community and the vision of the future, are more likely to exert a sustainable impact and lead to more environmentally sustainable ways of delivering food. In many cases, they do not even need outside support. This is also confirmed by the research conducted among students from various countries around the world. Despite some differences, respondents from all countries supported the development of urban gardening and farming.

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Produkcja żywności w miastach jutra
Wyniki międzynarodowych badań ankietowych

Rozważania zawarte w artykule mają trzy cele. Pierwszym z nich jest uzyskanie informacji na temat praktycznych doświadczeń młodych mieszkańców miast w zakresie użytkowania produktów miejskiego ogrodnictwa i rolnictwa. Drugim jest określenie gotowości do samodzielnego zajmowania się taką produkcją w przyszłości. Trzecim jest określenie, na jakie korzyści środowiskowe (usługi ekosystemowe) związane z miejskim ogrodnictwem i rolnictwem wskażą respondenci. W tym przypadku chodziło o zbadanie „intuicji środowiskowej" osób niezwiązanych zawodowo z naukami przyrodniczymi i rolniczymi. Badanie porównawcze dotyczyło studentów z Brazylii, Chin, Indii, Meksyku, Polski oraz grupy 7 krajów Unii Europejskiej. Ogółem respondenci pochodzili z 29 krajów. Zebrane dane posłużyły do porównania podejścia reprezentowanego przez respondentów z różnych krajów i kręgów kulturowych do miejskiego ogrodnictwa i rolnictwa oraz ich produktów, a także do sformułowania wniosków na temat wykorzystania związanego z nimi potencjału do wspierania zrównoważonego rozwoju obszarów miejskich.

Słowa kluczowe: usługi ekosystemowe, produkcja żywności, miasta, społeczeństwo, zrównoważony rozwój

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Does the Pan-European Personal Pension Product Suit All? Its Perspectives in the EU Member and Candidate Countries

Katarzyna Kochaniak https://orcid.org/0000-0002-0680-9922
Ph.D., Associate Professor at the Krakow University of Economics, Krakow, Poland
e-mail: katarzyna.kochaniak@uek.krakow.pl

Anna Magdalena Korzeniowska https://orcid.org/0000-0001-9809-5260
Ph.D. Associate Professor at the Maria-Curie-Skłodowska University in Lublin, Lublin, Poland
e-mail: anna.korzeniowska@mail.umcs.pl

Agnieszka Anna Huterska https://orcid.org/0000-0002-4722-2853
Ph.D., Nicolaus Copernicus University in Toruń, Toruń, Poland, e-mail: agnieszka.huterska@umk.pl

Dilek Demirhan https://orcid.org/0000-0001-6507-2927
Prof. of Finance and Accounting, Ege University, Izmir, Turkey, e-mail: dilek.demirhan@ege.edu.tr

Türker Susmuş https://orcid.org/0000-0002-7068-6576
Prof. of Finance and Accounting, Ege University, Izmir, Turkey, e-mail: turker.susmus@ege.edu.tr

Abstract

This article aims to verify the development prospects of the Pan-European Personal Pension Product (PEPP) in the European Union (EU). It focuses on the relationship between the quality of domestic public pension schemes and household savings for old age in the EU member and candidate countries. The study was conducted in two stages. The first stage examined the interrelationship between public pension schemes and household savings based on Pearson's correlation coefficients. In the second stage, sub-samples of countries with high and low-quality public pension schemes were identified using hierarchical cluster analysis. The results showed significant links between households' obligatory and voluntary saving for retirement in both samples. However, the study recognised the internal diversity of countries in terms of households'

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preferences for the types of financial assets. Based on these findings, conclusions about the development potential of PEPP are drawn. The best prospects are identified for Croatia, Cyprus, France, Greece, Hungary, Poland, Portugal, Romania, Slovenia, Spain, and Turkey. In most of these countries (except for France, Hungary, Romania, and Spain), the PEPP could serve as an alternative to household liquid assets. However, in Croatia, France and Italy, it was recognised as competing with existing domestic retirement and life insurance products, which may negatively impact its development. This is the first comprehensive study of the prospects of PEPP in a large group of countries. The results provide socially essential knowledge as they address the role of private savings in supplementing households' future income from public pension schemes, considering the availability of a new product such as PEPP.

Keywords: Pan-European Personal Pension Product, public pension schemes, saving for old age, household, retirement

JEL: D14, H55, J32

Introduction

According to the Charter of Fundamental Rights of the EU (2012), pensions should ensure a dignified and independent life for the elderly, as they are the main source of their income. In the member states, a significant proportion of these benefits come from public schemes, which are shaped by a variety of factors, including economic, social, demographic, cultural, political or historical.

The specific role of pensions draws attention to the quality of public pension schemes (Mikulec 2010; Allianz 2020; Mercer 2021). However, the ongoing demographic changes in the European Union (EU) negatively influence the adequacy of the benefits relative to the cost of living. For this reason, particular importance is attached to households' allocation of savings to private pension products. The dysfunctionality of the internal market for these products means that, in some EU countries, households hold excess liquid financial assets, such as cash and bank deposits, which are thus of low yields and changeable purpose (Regulation (EU) 2019/1238 of the European Parliament and of the Council 2019; Korzeniowska 2021).

In 2019, the European Parliament and the Council responded to demographic concerns by regulating voluntary pension schemes across the EU with the introduction of the Pan-European Personal Pension Product (PEPP). The transparency of its terms is intended to make it easier for consumers to invest for their old age in the long term. In turn, the limited possibility of early redemption of the PEPP is expected to ensure that its income will effectively complement pensions from public schemes (Regulation (EU) 2019/1238 of the European Parliament and of the Council 2019). Due to the mobility of EU citizens, the ease of transferring this product between countries has been ensured.

The aim of this study is to assess the validity of the PEPP as a universal solution to ensure a dignified and independent life for the elderly throughout the EU. In particular, it aims to assess the development prospects of PEPP in individual countries, considering the quality of their public pension schemes and the existing activity of households in accumulating savings for old age. The long-term social consequences of pension provision mean that not only EU countries but also Turkey, with its status as a candidate country, are included in the study. Its inclusion also makes it possible to verify how and to what extent its situation differs from that of the member states. The following research questions will be answered.

1. In the sample of countries, is saving for old age related to the quality of public pension schemes?
2. Which countries show similarities in terms of the quality of public pension schemes and household retirement saving activities, including preferred financial assets?
3. In which countries are the quality of public pension schemes and household attitudes towards saving for old age conducive to the development of PEPP? In particular, in which countries is it likely to become a product:
   - that is an alternative to liquid financial assets held by households?
   - that competes with domestic retirement and life insurance products already owned by households?

The validity and timeliness of the research problem we address are confirmed by public debates on the right policy mix and the roles of public and private pension providers. The paper contributes to the nascent literature on PEPP. The studies so far have mainly focused on the organisational and legal aspects of PEPP (Borg, Minto, and van Meerten 2019; Dieleman 2020; Butler 2021; Bär 2022), while those related to the role of voluntary pension funds and the readiness to implement PEPP were limited to selected countries (Hadad, Dimitrov, and Stoilova-Nikolova 2022). To the best of our knowledge, this study is the first to comprehensively investigate the quality of existing pension systems and verify the usefulness of PEPP in improving the financial situation of seniors in a large group of European countries, including not only the EU but also Turkey, which has candidate status. Thus, the results provide socially important knowledge as they address the role of private savings in supplementing households' future income from public pension schemes, given the availability of a new product such as PEPP.

The article consists of four parts. Section 2 contains a literature review focused on the quality of public pension schemes and their relationship with household savings. Section 3 presents the method and data applied. Section 4 contains the results of the study related to the correlation between the quality of public pension schemes and household saving activity in the countries studied, as well as their grouping into subsets due to specific conditions in the above area. Finally, conclusions are drawn.

Theoretical background & literature review

The theoretical background regarding household savings dates back to Keynes (1936), who proposed a consumption function that implies that households save a constant proportion of their income (Browning and Lusardi 1996). Subsequent researchers have expanded the theory of savings. One of the best-regarded theories was developed by Modigliani and Brumberg (1954). According to their "Life Cycle Hypothesis", the main objective of saving is to build a buffer against the significant variations in household incomes during their life. This hypothesis also argues that household provisions must be proportional to their basic earning capacities (Modigliani and Brumberg 1954). Another theory that describes household saving and consumption patterns is Friedman's (1957) "Permanent Income Hypothesis". It argues that individuals consume a portion of their permanent income in each period, resulting in the equivalence of the average and marginal propensity to consume (Meghir 2004). There are also theoretical approaches that support the notion that government saving is a substitute for household saving. One strand of the literature bases its discussion on crowding out the effect of government savings on household savings. Another strand is gathered around the "Ricardian Equivalence Hypothesis", which argues that households see themselves as responsible for government debt, so they adjust their savings to reflect government saving or dissaving (Cohn and Kolluri 2003).

Based on those theories, there have been a significant number of empirical studies analysing the determinants of household savings in different contexts. Other studies have focused on the effects of social security and pension systems on household savings. One early study that pioneered this research stream was conducted by Feldstein (1974), who found evidence that social security programmes approximately halve the personal savings rate. Modigliani and Sterling (1983) argued that the basic life cycle hypothesis framework can explain most of the variations of savings behaviour across different countries. Their study also suggests a saving-reducing replacement effect and a saving-raising retirement effect.

More recently, Disney (2006) explored how differences in public pension designs across countries and time affect household savings using data from OECD countries. He found that the substitutability of pension designs, which are closer to actuarial-based programs, is higher for private retirement savings. Meanwhile, using the Survey of Health, Ageing, and Retirement in Europe, Alessie, Angelini, and Santen (2011) investigated whether pension wealth is offset by decreases in private savings of European households and to what extent. They argued that reductions in pensions increase private savings, but this increase is not enough to smooth consumption over the life cycle. Amaglobeli et al. (2019) argued that a high level of generosity in the pension system design negatively affects aggregate saving. Thus, the generosity of public pensions may be reduced to lower long-term fiscal vulnerabilities and mitigate the fall in aggregate saving. In turn, d'Addio,

Roger, and Savignac (2020) used the European harmonised wealth survey and OECD data to determine whether the reason for variations in levels of European countries' household savings is different levels of pension wealth across countries. Their analysis revealed a negative relationship between pension wealth and financial wealth.

Some researchers have examined the effects of pension system reforms on household savings rates. Attanasio and Brugiavini (2003) investigated the effects of the 1992 Italian pension reform on individual saving rates and found that a reduction in pension wealth positively affects saving rates. Lachowska and Myck (2018) studied the effects of Poland's 1999 pension reform to determine the relationship between public pensions and private household savings. Their findings revealed an increase in household savings and a decrease in expenditure following the reform. Halvorsen et al. (2022) used the pension reform of 2011 in Norway to examine the influence of accumulated social security pension wealth on private savings. They found a strong substitution between the social security pension wealth and private savings, and a decrease in expected lifetime pensions was found to increase households' savings over the rest of their lives.

Pensions are the main income source for about one-quarter of the EU population. Pension policy in EU countries is implemented predominantly at a national level, but EU legislation supports national efforts to ensure a high level of social protection, including pension adequacy. Although EU legislation stipulates the main principles that a pension system should have, the structure of pension systems in member countries is different because of traditionally divergent approaches on how to provide retirement income (EC 2021). Although all public pension systems in member countries have a pay-as-you-go (PAYG) component and are predominantly defined benefit (DB) schemes, some countries, such as Sweden, Bulgaria, Estonia, Latvia, Lithuania, Hungary, Poland, and Slovakia, have transformed part of their public pension schemes into privately funded schemes. Most member countries' pension systems rely on statutory earnings-related old-age pension schemes. Moreover, a minimum-guaranteed pension is also provided by a public pension scheme to those who do not qualify for the earnings-related scheme. Public pension systems in Denmark, the Netherlands, and Ireland provide a flat-rate pension at the outset (EC 2009).

Most countries in Europe have implemented pension reforms, usually increasing or equalising the retirement age, or even removing the default retirement age altogether. The increase in retirement age in Finland, Slovakia, and Spain is made automatic by linking it to life expectancy. Some countries, like Austria, Belgium, Greece, and Poland, have introduced early retirement limits or have abandoned early retirement schemes altogether. Compared to public pension reforms, fewer changes were attempted in occupational pension schemes in EU member countries (Lannoo et al. 2014). Occupational schemes in most EU countries are often paired with annuities that grant the recipient a lifelong income after retirement. However, the demographic shift is decreasing

the number of participants in the system, putting the scheme's funding under pressure (van Meerten and van Zanden 2021), and motivating member states to reinforce their pension system with the support of third pillar/tier pensions. Thus, demographic, economic, and political developments over the past two decades have impelled countries to create and/or maintain hybrid pension systems in which private pensions play an important role alongside public pensions (Fornero and Wilke 2020).

As an EU candidate country, Turkey's pension system is based on three pillars. The public pension system is structured as a PAYG social security program. Under the social security program, the state pension has an earnings-related DM scheme supported by a means-tested safety net and a flat rate. The second pillar is an occupational pension scheme with two mandatory occupational plans, one developed for military personnel and the other for the personnel of state-owned coal mining companies. The voluntary private pension system, introduced in 2003, constitutes the third pillar.

In the EU, a new Pan-European Personal Pension Product was introduced to increase the number of people saving in personal retirement products (Dimitrov 2021). The PEPP was legislated in 2019 and became applicable in March 2022. It was developed as a complementary and voluntary scheme to existing national pension schemes, offering EU citizens a new alternative to saving for retirement (Regulation (EU) 2019/1238 of the European Parliament and of the Council 2019). However, most publications on PEPP thus far focus on describing it and the legal framework, paying little attention to its impact on the pension product market and populations. Bär (2022) reviewed the process towards the current, finalised state of PEPP, exploring its features, regulatory requirements and challenges. Borg, Minto, and van Meerten (2019) presented the regulatory efforts that make PEPP applicable to the EU's personal pension market, while Dieleman (2020) focused on the tax aspects. Butler (2021) discussed the private pension market's positive and negative integration aspects. Finally, D'Amato et al. (2017), based on an alternative variable annuity program, demonstrated the attractiveness of non-traditional life insurance products for Europeans under low-interest rates and continuous demographic changes. Finally, Hadad, Dimitrov, and Stoilova-Nikolova (2022) examined the role of voluntary pension funds and the readiness to implement PEPP in the EU, but limited to Czechia and Bulgaria. The literature still lacks an extensive analysis of the potential demand for PEPPs in the EU and candidate countries.

Method and data

The study was conducted in two stages. Stage 1 assessed the interrelationship between the quality of public pension schemes and households' saving for old age, in a set of EU member and candidate countries. For the dependency between indicators of pension programme quality and other variables, Pearson's correlation coefficients were calculated.

The significance of the correlation was tested by determining the test probability p (empirical significance level $\hat{\alpha}$ or p-value) and comparing it with the nominal significance level α (Piłatowska 2006, p. 75). The critical value with a two-sided 5% critical area is 0.3809 for n = 28. The limited range of cross-sectional data made it impossible to verify causality and, therefore, the direction of the interaction of the variables (Gómez-Puig and Sosvilla-Rivero 2015). Therefore, the regression analysis was abandoned.

Stage 2 identifies countries with high- and low-quality public pension schemes. The results are used to identify countries in which:

- the low quality of public pension schemes is compensated for by the active saving of households for old age, whereby:
  - their holdings of liquid assets and lack of exposure to individual pension products create favourable conditions for the development of PEPP,
  - having individual pension products and a lack of commitment to liquid assets mean that PEPP will have to compete in the domestic market with products already available and chosen by households. It must be assumed that this situation may significantly hinder its development;
- low-quality public pension schemes are accompanied by a low proportion of households saving for old age. In these countries, the later financial well-being of households is most at risk. The development of PEPP is therefore particularly welcome, but it requires a significant change in attitudes towards self-insuring;
- high-quality public pension schemes are accompanied by actively saving for old age. These are countries where a dignified and independent life for seniors is achieved through complementary public and individual (private) pension provisions. In particular, it is necessary to identify countries where:
  - households' holdings of liquid assets and a lack of exposure to individual pension products create favourable conditions for the development of PEPP. The introduction of a new product, different from existing products in the domestic market, may encourage the reallocation of savings from liquid assets into PEPP;
  - the individual pension products already in place and the lack of exposure to liquid assets limit the possibilities for PEPP development. Thus, the introduction of PEPP will not significantly affect the financial situation of seniors, which is currently good;
- high-quality public pension schemes are accompanied by a low proportion of households saving for old age. Thus, people rely primarily on income from public schemes. In the absence of an incentive to self-insure, the development of PEPP should be assessed as difficult.

Stage 2 used country clustering to identify the extent of their similarities and differences based on the variables analysed. For this purpose, hierarchical cluster analysis was used. Ward's Method (Ward Jr. 1963) with Euclidean distances (Murtagh and Contreras 2011) was used to extract clusters. The optimal number of clusters was determined using scree diagrams and the Pseudo *F* test (Bock 1985).

Due to the high heterogeneity of countries in terms of all variables analysed and the low number of countries relative to the number of variables, further analysis was conducted in two Steps. In Step 1, countries were grouped according to indicators of pension system quality. In Step 2, countries were grouped within the groups from Step 1 regarding the level of financial assets and propensity to save for old age. The internal similarity of the groups formed in each step was assessed using the Silhouette coefficient (Frigui 2008). For a Silhouette coefficient higher than 0.51, the existence of adequate within-group similarity was assumed, and for values above 0.71, the existence of high within-group similarity was assumed (Kaufman and Rousseeuw 2005).

The countries surveyed are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and Turkey. Data concerning the quality of public pension schemes, household attitudes towards self-directed voluntary saving for old age, and previous involvement in specific financial assets were used (Table 1). All data relate to 2019. Data related to the quality of public pension schemes are taken from Allianz (2020) and refer to the Allianz Pension Index (API) 2020 index. In turn, data on households saving for old age, including the shares of liquid assets, private pension and life insurance products in their total financial assets for 2019, are taken from the Eurostat and World Bank FINDEX databases.

The countries are characterised by differences not only in the quality of public pension schemes but also in households' attitudes towards saving for old age, including its forms (Table 2). The results, therefore, confirm the relevance of this study.

A significant area of variation in the quality of public schemes was signalled by the minimum and maximum values of the API 2020 (x_1). The variation in programme quality among countries was also confirmed by the high coefficients of variation (*CV*), which ranged from 12.3% to 18.6%.

Table 1. Definitions of the variables used in the study

Variable	Variable description
API 2020 (x_1)	The API comprehensively analyses pension systems in terms of sustainability and adequacy. The index considers 30 parameters relating to, among other things: the financing gap as defined by the current government gross debt; current public pension expenditure as a percentage of GDP; dependency ratios and their percentage change; the retirement age and minimum contribution period, funding method and pension formula; the scale of participation in the first pension pillar and the level of future pension coverage from it; how the second pension pillar is funded and its mandatory nature; the level and type of household assets; the Gini coefficient and the labour force participation of people over 65; the other forms of pension provision. The API index is a weighted sum of all parameters; its value ranges from 1 to 7, with 1 being the best score. The lower the value, the better a country's pension system is rated. Data source: Allianz 2020.
Saved for old age (%) (x_2)	The percentage of respondents who report saving or setting aside any money in the past year for old age. (Demirgüç-Kunt et al. 2022) Data source: Demirgüç-Kunt et al. 2022.
Currency & deposits (x_3)	Percentage share of financial assets calculated from nominal data. Data source: Eurostat n.d.
Insurance & pensions (x_4)	Percentage share of financial assets calculated from nominal data. Data source: Eurostat n.d.

Source: authors' own elaboration.

The heterogeneity of the countries was also evident in households' attitudes towards self-saving financial provision for old age (CV = 35.7%). The percentage who saved for this purpose (x_2) ranged from 9.0% to 74.6%. Similar findings applied to preferences for holding selected financial assets. There were clear differences between countries in both the share of liquid assets (x_3) – cash and bank deposits (important for PEPP growth opportunities) and pre–2019 available pension and life insurance products (*x4*; substitutable to PEPP), in total financial assets; the range was, respectively, 62 p.p. and 63 p.p. There was also a strong variation between countries regarding the importance of pension and life insurance products (x_4; CV = 68.7%).

Table 2. Descriptive statistics (N=27)

Variable	Average	Median	Min.	Max.	Coefficient of variation (CV; in %)
API 2020 (x_1)	3.6537	3.5700	2.9100	4.4300	12.39
Saved for old age (x_2)	0.4712	0.4714	0.0904	0.7464	35.74
Currency & deposits (x_3)	0.3885	0.3779	0.1299	0.7506	36.88
Insurance & pensions (x_4)	0.2156	0.1665	0.0483	0.6761	68.66

Source: authors' own elaboration.

Results

Quality of public pension schemes and household attitudes towards saving

The study confirms statistically significant relationships between the quality of public pension schemes, as expressed by the API 2020 Index, and household saving activity, including preferences for forms of financial assets, relevant to the development of PEPP (Table 3). The quality of public pension schemes (x_1) was most strongly and negatively correlated with the proportion of households who declared they saved for old age (x_2). Considering the design of the API 2020 Index, it must therefore be concluded that countries with low-quality public pension schemes had a clear gap in old-age provision, as a relatively small proportion of households in those countries save individually for this purpose. Households also showed a relatively low share of pension and life insurance products in their financial asset portfolios (x_4) and an increased propensity to invest savings in liquid assets, such as cash and bank deposits (x_3). Thus, there is a need for them to introduce and promote private pension products such as PEPP.

Table 3. Values of correlation coefficients (N = 27)

Variable	API 2020 (x_1)	Saved for old age (x_2)	Currency & deposits (x_3)	Insurance & pensions (x_4)
Saved for old age (x_2)	−0.5813 p = 0.001	1.000 p = ---	−0.5665 p = 0.002	0.4636 p = 0.015
Currency & deposits (x_3)	0.5797 p = 0.002	−0.5665 p = 0.002	1.000 p = ---	−0.5899 p = 0.001
Insurance & pensions (x_4)	−0.4961 p = 0.009	0.4636 p = 0.015	−0.5899 p = 0.001	1.000 p = ---

Source: authors' own elaboration.

The results above indicate the relevance of continuing to investigate the relationship between the quality of public pension schemes (x_1) and household saving ($x_2 - x_4$).

Country grouping results

As explained in Section 3, the study in Stage 2 was conducted in two steps, using hierarchical cluster analysis. Step 1 made it possible to identify the countries distinguished by public pension schemes whose quality, as expressed by the variable x_1, was low and high. Step 2, on the other hand, made it possible to refer to the conditions of PEPP implementation (favourable or hindering its development) in countries with a given quality of public schemes.

It is particularly important to assess the development prospects of PEPP in countries distinguished by the low quality of public pension schemes, as only responsible saving decisions will allow households there to improve their quality of life in old age. Assessing the possibilities of developing PEPP is therefore important for social reasons. Furthermore, it is important in our assessment to know the development prospects of PEPP in countries with high-quality public pension schemes, as the conditions there mean that households may or may not be particularly active in saving for old age themselves.

Step 1 results of country grouping

The hierarchical cluster analysis identified three subsets of countries with similar quality of public pension schemes (x_1). Two groups are of particular interest (Figure 1):

1) low-quality group (x_1), which included Croatia, Cyprus, France, Greece, Hungary, Poland, Portugal, Romania, Slovenia, Spain, and Turkey;

2) high-quality group (x_1), which included Belgium, Bulgaria, Czechia, Denmark, Ireland, Italy, Latvia, Luxemburg, the Netherlands, Slovakia, and Sweden.

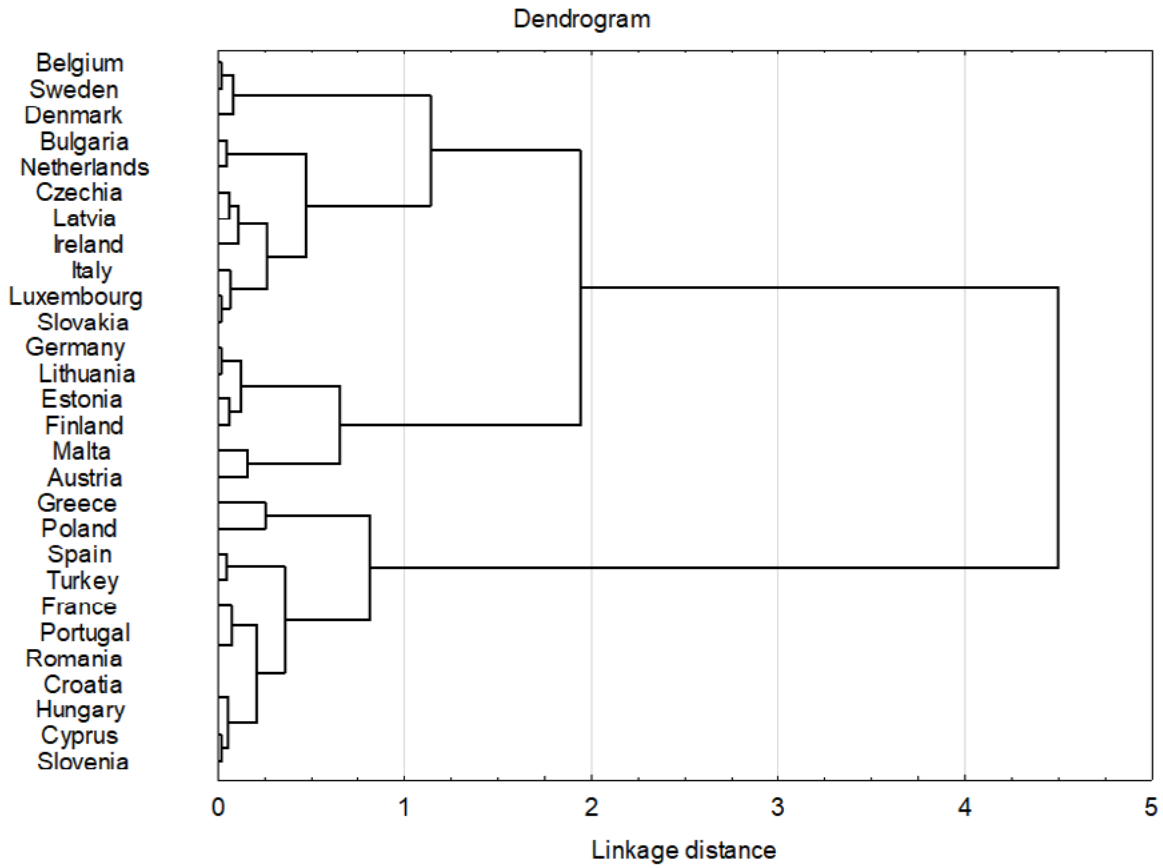

Figure 1. Results of country grouping by API 2020 value

Source: authors' own elaboration.

Step 2 results of country grouping

This part of the study focuses on households' self-provisioning for old age in the subsets identified in Step 1.

The subset of countries with low-quality public pension schemes

The subset of countries characterised by **low-quality pension schemes** (x_1) was internally diverse in terms of household attitudes towards saving for old age (Figure 2). However, it was possible to identify countries with similar rates of households engaged in reaching financial well-being in later life (x_2), such as Croatia, France, Hungary, Poland, Portugal, Slovenia, and Spain (ranging from 35.2% to 47.1%). These rates should be assessed as too low compared to the average of all 28 countries. Croatia, Poland, Portugal, and Slovenia stood out for having similar, relatively high shares of liquid assets (between 44.7% and 50.7%) in their financial asset portfolios (x_3; Figure 3). Moreover, with the exception of Croatia, those countries showed similarity in terms of the relatively low importance of private pension products and life insurance (x_4; Figure 4 and Ap-

pendix 1). The above conditions should be considered favourable for the development of PEPP, including the conversion of liquid assets held by households. However, due to the moderate proportion of old-age savers, it is advisable to continue building financial literacy in their populations.

In Cyprus, Greece, Romania, and Turkey, 75.6% to 91.0% of households remained passive about their financial situation in old age (x_2; Figure 2). In Turkey, Cyprus and Greece, the bulk of household financial assets consisted of cash and bank deposits (x_3; Figure 3 and Appendix 1). Moreover, in Turkey and Greece, there was little exposure to pension and life insurance products (x_4; Figure 4 and Appendix 1). Given these circumstances, Turkey's situation should be seen as exceptional, as only 9% of its households were saving for old age, with cash and deposits accounting for as much as 75% of their financial assets, while pension and life insurance products comprised only 8%. It can therefore be concluded that Cyprus, Greece, Romania, and Turkey stood out in the analysed subset, as well as in the full set of countries, as having an exceptionally high risk of poverty in later life due to both low-quality public pension schemes and passivity of households regarding individual saving. The introduction of PEPP would be desirable, but its development may be hampered by households' apparent reluctance to secure old age. Thus, building household financial awareness of saving for later life, including its forms, is a priority.

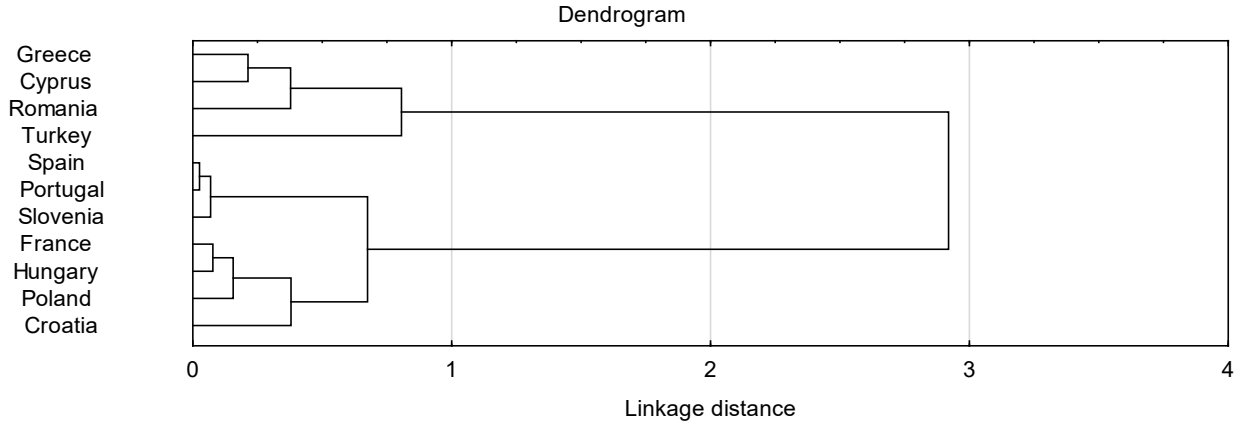

Figure 2. Results of grouping low API 2020 countries by percentage of households saving for old age in 2019

Source: authors' own elaboration.

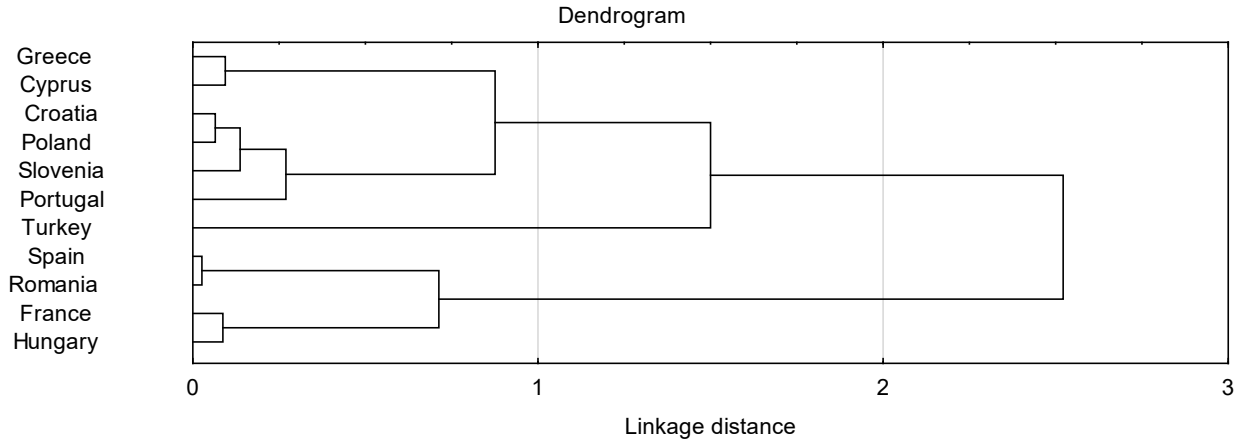

Figure 3. Results of grouping low API 2020 countries by share of liquid assets in household financial assets in 2019

Source: authors' own elaboration.

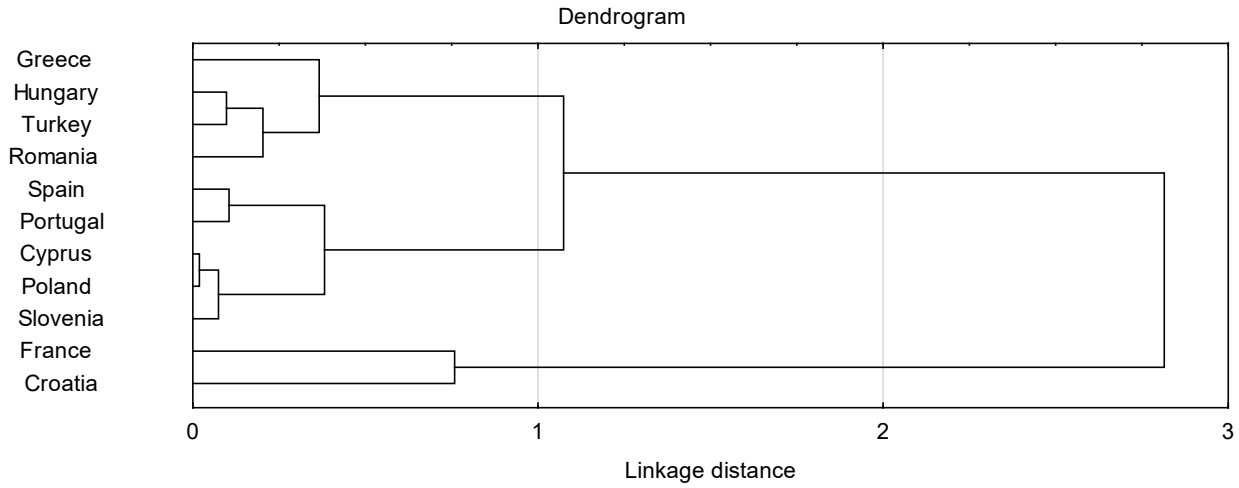

Figure 4. Results of grouping low API 2020 countries by share of pension and life insurance products in household financial assets in 2019

Source: authors' own elaboration.

The subset of countries with high-quality public pension schemes

The second subset of countries was characterised by the high quality of public pension schemes. In most of them (Belgium, Czechia, Denmark, Ireland, Netherlands, Slovakia, and Sweden), the relatively attractive conditions of public pension provision were accompanied by a high proportion (above 50%) of households who additionally saved for old age (x_2; Figure 5). It can therefore be inferred that demand for PEPP in these countries should be low. In turn, in Czechia and Slovakia, around half of the house-

holds' financial assets were liquid (x_3; Figure 6), pointing to the possibility of developing PEPP by converting the forms of savings they held.

In contrast, in Denmark, Sweden, and Netherlands, the possibility of developing PEPP should be considered particularly limited, as their households kept a small proportion of savings (up to 16.2%) in cash and bank deposits (x_3). Furthermore, in the Netherlands, pension and life insurance products (x_4) accounted for as much as 67.6% of their financial assets, and in Denmark and Sweden, 46.6% and 36.9%, respectively (Figure 7). Thus, in these three countries, PEPP would have to develop at the expense of households' existing commitment to long-term financial assets dedicated to saving for old age.

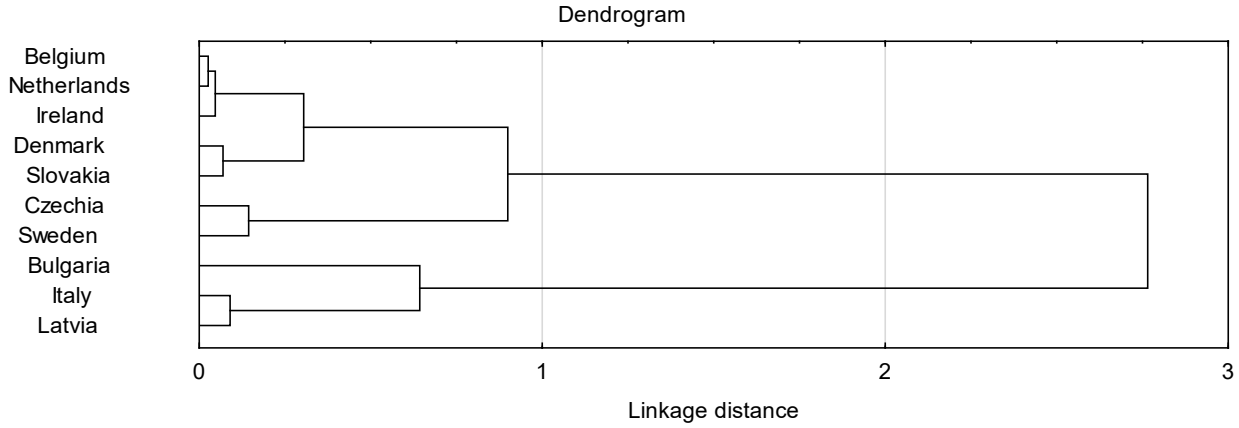

Figure 5. Results of grouping high API 2020 countries by percentage of households saving for old age in 2019

Source: authors' own elaboration.

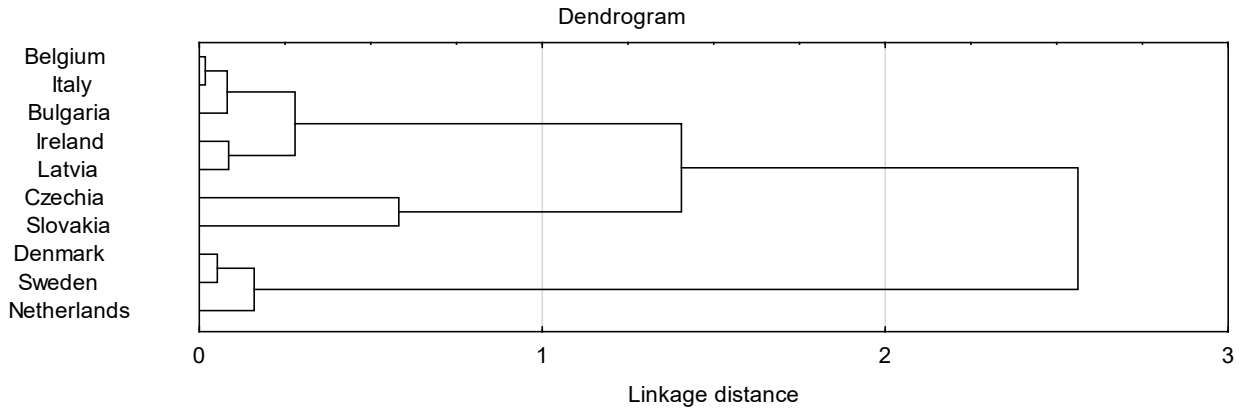

Figure 6. Results of grouping high API 2020 countries by share of liquid assets in household financial assets in 2019

Source: authors' own elaboration.

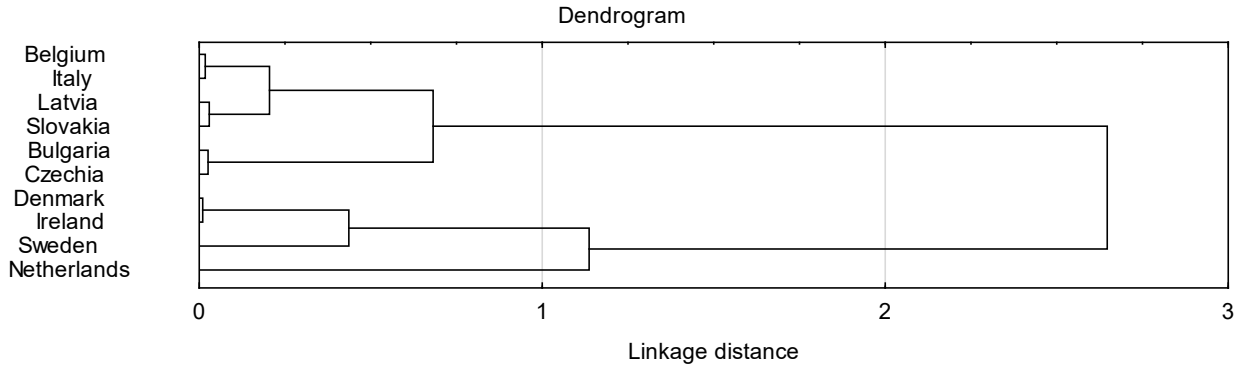

Figure 7. Results of grouping high API 2020 countries by share of pension and life insurance products in household financial assets in 2019

Source: authors' own elaboration.

Conclusion

The results of the study confirmed that within the set of EU member and candidate countries, there were statistically significant linkages between the quality of public pension schemes and households' activities in saving for old age. However, households' preferences regarding financial assets varied within the subsets of countries with a given quality of public schemes. The study confirmed the potentially positive role of PEPP in incentivising households for voluntary retirement savings only in selected countries.

The subset of countries with relatively low-quality public pension schemes consisted of Croatia, Cyprus, France, Greece, Hungary, Poland, Portugal, Romania, Slovenia, Spain, and Turkey. In their case, dignified later life for households would not be ensured by public pension schemes or individual savings. Thus, PEPP should be considered a desired solution in those countries. However, in Cyprus, Greece, Romania, and Turkey, where the lowest fractions of households actively saved for later life, the development of PEPP was primarily conditioned by an increase in their financial literacy. Therefore, in their case, the spread of PEPP may require an extended period. Moreover, in selected countries with relatively low-quality public pension schemes, like Croatia, Poland, Portugal, and Slovenia, PEPP could become an alternative to households' liquid assets in their portfolios. However, in Croatia and France, it would have to compete with households' existing domestic retirement and life insurance products.

The subset of countries with relatively high-quality public pension schemes was formed by Belgium, Bulgaria, Czechia, Denmark, Ireland, Italy, Latvia, the Netherlands, Slovakia, and Sweden. Except for Bulgaria, Italy and Latvia, a dignified later life has been supported by both public pension schemes and individual savings for retirement. Therefore, the development of PEPP would be limited the most, par-

ticularly in Denmark, the Netherlands, and Sweden, where competitive domestic voluntary pension products already constitute a large portion of households' financial assets instead of liquid assets. In Czechia and Slovakia, PEPP should be recognised as an alternative to liquid assets, which still play an important role in households' portfolios. On the other hand, in Bulgaria, Latvia and Italy, households' later life has mainly been supported by robust public pension schemes. However, the prospects for PEPP development in these countries were not as promising due to the low shares of liquid assets in household financial asset portfolios. Additionally, there is likely to be competition between PEPP and voluntary pension products held by households, mainly in Italy.

Summing up, PEPP could be a desired solution, mainly in countries with low-quality public pension schemes and low personal involvement in voluntary savings for old age and a focus on liquid assets. On the other hand, countries like Denmark, the Netherlands and Sweden were recognised as the least favourable for PEPP due to their rich public pension schemes, which are among the best in Europe, and the significant shares of household saving for retirement in domestic retirement and life insurance products. Among all the countries analysed, the highest risk of poverty in later life should be assigned to households in Turkey, an EU candidate country. This risk was not only attributed to the poor public pension scheme but also to households' marginal interest in saving for old age. Significant problems in this regard were also identified in selected EU member countries, such as Cyprus, Greece, and Romania.

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Czy Ogólnoeuropejski Indywidualny Produkt Emerytalny jest odpowiedni dla wszystkich? Perspektywy jego rozwoju w krajach członkowskich i kandydujących UE

Celem niniejszego artykułu jest ocena perspektyw rozwojowych Ogólnoeuropejskiego Indywidualnego Produktu Emerytalnego (OIPE), mającego na celu poprawę życia rezydentów UE na emeryturze. Uwagę skoncentrowano na związkach pomiędzy jakością krajowych publicznych systemów emerytalnych a oszczędnościami gospodarstw domowych na starość, w zbiorowości krajów członkowskich UE i krajów kandydujących. Badanie przeprowadzono w dwóch etapach. W pierwszym etapie, na podstawie współczynników korelacji Pearsona, ocenie poddano współzależności pomiędzy publicznymi programami emerytalnymi i postawami gospodarstw domowych względem indywidualnego oszczędzania na starość. W drugim etapie hierarchiczna analiza skupień pozwoliła zidentyfikować podzbiory krajów o wysokiej oraz o niskiej jakości publicznych systemów emerytalnych. Wyniki badania wskazały przy tym na istotne związki pomiędzy obowiązkowym i dobrowolnym oszczędzaniem gospodarstw domowych na emeryturę w obu powyższych podzbiorach. Ponadto podzbiory te cechowały się wewnętrznym zróżnicowaniem pod względem preferowanych aktywów finansowych przez gospodarstwa domowe. Powyższe wyniki pozwoliły odnieść się do potencjału rozwojowego OIPE. Najlepsze warunki do jego upowszechnienia zidentyfikowano w Chorwacji, na Cyprze, we Francji, w Grecji, na Węgrzech, a także w Polsce, Portugalii, Rumunii, Słowenii, Hiszpanii oraz Turcji. W większości tych krajów (z wyjątkiem Francji, Węgier, Rumunii i Hiszpanii) rozwój OIPE mógłby odbywać się poprzez konwersję płynnych aktywów, którymi dysponowały dotąd tamtejsze gospodarstwa domowe. Jednak w Chorwacji, Francji i we Włoszech PEPP został uznany za konkurencyjny względem istniejących produktów emerytalnych i ubezpieczeń na życie, co mogłoby negatywnie wpływać na jego rozwój. Niniejsze opracowanie jest pierwszym kompleksowym badaniem dotyczącym perspektyw rozwojowych OIPE w tak dużej grupie krajów. Jego wyniki dostarczają wiedzy ważnej społecznie, dotyczącej znaczenia prywatnych oszczędności, w tym PEPP, w uzupełnianiu dochodów emerytalnych, pochodzących z programów publicznych.

Słowa kluczowe: Ogólnoeuropejski Indywidualny Produkt Emerytalny, publiczne systemy emerytalne, oszczędności na starość, gospodarstwo domowe, emerytura

APPENDIX 1

Data used in the study

Country	API 2020 (x_1)	Saving for old age (25+) (x_2)	Share in HHs financial assets		
			Currency & deposits (x_3)	Insurance & pensions (x_4)	Equity & investment fund shares (*not applied*)
Austria	3.84	74.64%	40.17%	20.01%	34.06%
Belgium	2.92	57.60%	31.91%	23.33%	41.02%
Bulgaria	3.16	28.74%	33.45%	11.14%	47.10%

Country	API 2020 (x_1)	Saving for old age (25+) (x_2)	Share in HHs financial assets		
			Currency & deposits (x_3)	Insurance & pensions (x_4)	Equity & investment fund shares (*not applied*)
Croatia	4.05	35.22%	49.41%	27.07%	20.51%
Cyprus	4.08	21.32%	60.01%	12.81%	20.29%
Czechia	3.23	68.75%	44.37%	10.47%	39.96%
Denmark	2.96	62.69%	14.00%	46.60%	34.94%
Estonia	3.53	58.69%	25.20%	14.97%	57.10%
Finland	3.49	53.98%	30.74%	16.65%	49.71%
France	4.16	42.59%	28.17%	37.10%	27.76%
Germany	3.56	65.66%	39.58%	35.51%	22.19%
Greece	4.43	17.32%	58.09%	4.83%	31.87%
Hungary	4.05	41.14%	26.39%	7.36%	41.00%
Ireland	3.31	58.66%	35.19%	46.87%	15.70%
Italy	3.39	40.62%	32.25%	23.80%	37.00%
Latvia	3.27	38.84%	36.85%	20.17%	34.86%
Lithuania	3.57	48.99%	38.26%	11.37%	38.78%
Malta	3.74	52.69%	46.89%	9.30%	26.83%
Netherlands	3.13	58.12%	16.17%	67.61%	14.19%
Poland	4.27	39.33%	50.74%	13.06%	24.72%
Portugal	4.12	45.78%	44.79%	17.17%	28.82%
Romania	4.12	25.44%	37.25%	10.33%	26.27%
Slovakia	3.36	61.32%	55.60%	19.41%	18.83%
Slovenia	4.07	47.14%	47.66%	13.79%	30.63%
Spain	3.98	46.27%	37.79%	15.78%	43.48%
Sweden	2.91	71.60%	12.99%	36.90%	47.45%
Turkey	3.95	9.04%	75.06%	8.65%	11.75%

Note: all data relate to 2019.
Source: authors' own elaboration, based on data derived from Allianz Pension Report 2000; Eurostat, World Bank FINDEX (see Table 1).

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Economic Drivers of Consumer Price Growth in the EU–27 Service Industry during the Post-pandemic Period

Ričardas Mileris https://orcid.org/0009-0000-6936-1267
Doctor of Economic Sciences, Associate Professor, Kaunas University of Technology, Technology and Entrepreneurship Competence Centre, Panevėžys, Lithuania, e-mail: ricardas.mileris@ktu.lt

Abstract

The post-pandemic period in the European Union is distinguished by the growth of business economic activity after two years of restrictions, growing debts and money supply, and extremely high inflation. This research analyses the Harmonised Index of Consumer Prices (HICP) in the service industries of the EU–27, comparing it to overall inflation and price growth in consumer goods markets. It also highlights the economic factors that contribute to the differences between service price growth in the EU–27. The results make it possible to classify the EU–27 countries according to the differences in service price changes. Consistent patterns of service HICP are highlighted, and the economic factors considering their relative importance to service HICP are ranked. Since 2022, public and governmental discussions concerning the post-pandemic inflationary shock have become prevalent, so this research allows us to understand the economic factors that caused such huge inflation and substantiates the need for monetary policy measures to slow down inflation.

Keywords: economics, inflation, consumer prices, services

JEL: C13, E31, E51, F44, L80, O52

Introduction

The COVID–19 pandemic has affected European Union (EU) society, not only in terms of medical consequences but also through enduring social and economic consequences. Stukalo, Simakhova, and Baltgailis (2022, p. 122) expect that during the post-pandemic

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period, there will be a major redistribution of markets, a deepening of social inequalities, increased governmental intervention, and global problems in developing countries. Additionally, the return of rapid inflation to the core countries of the world economy occurred (Lapavitsas 2022, p. 149). The global economic lockdown slowed economic activities, so governments had to stimulate their economies by borrowing and spending large amounts of money, thereby stimulating inflation. According to Ho, Nguyen, and Nguyen (2021, p. 1), fiscal deficits are inflationary, and increased public debt can leave a country insolvent and make it default.

However, a sudden increase in public debt is justifiable to neutralise the pandemic economic losses, i.e., reduced GDP and tax revenues and increased bankruptcies, unemployment, and social support (Bresser-Pereira 2020, p. 241). According to monetary theory and the modern economic literature analysed by Sisay, Atilaw, and Adisu (2022, p. 1), the price level is one of the most important macroeconomic variables, and it remains the primary goal of macroeconomic policies to achieve sustainable growth while maintaining price stability. Nevertheless, the measures taken to manage COVID–19 raised inflation significantly when the prices of consumer goods and services started to climb rapidly. Boaretto and Da Silva (2019, p. 1450) argued that in the scientific literature, there are no strict determinations about the relative price growth rates in service industries compared to product markets. There is much evidence that the price of services tends to exhibit a high degree of inertia or persistence. In contrast, when comparing it to goods inflation, services inflation often exhibits less persistence. Counter-intuitively, this phenomenon is called the Services Inflation Persistence Puzzle. Therefore, this research aims to analyse the inflationary processes in EU–27 service industries during the post-pandemic period and reveal the economic factors that cause the differences in service inflation in different countries.

Literature review

Skare and Soriano (2022, pp. 303–304) analysed the COVID–19 shock wave mechanism in the European service industry. They applied monthly data from January 2015 to January 2021 from 16 European economies and concluded that the effect of the pandemic on the service industry in Europe differs across countries and sub-sectors. They also found that COVID–19's impact on the service industry was different in Western European economies compared to Central and Eastern European (ex-socialist) economies. Estrada (2021, p. 210) applied a developed simulator and found differences in developed, developing, and least-developed countries regarding how COVID–19 affected the inflation and unemployment in each type of country. Charalampidis and Guillochon (2022, p. 1093) compared the pandemic to the Great Recession, analysing the consumption, inflation, wages, and labour hours in services and nondurables. During the pan-

demic, a reduction in the consumption of services was far deeper than the reduction in the consumption of nondurables. This demand shock brought down the economic activity in services, inflation, interest rates, and employment. However, Charalampidis and Guillochon did not analyse the post-pandemic period.

Kim (2022, pp. 79–80) adapted Minsky's Inflation Theory, which holds that inflation is equal to the rate of increase of wages minus the rate of increase of labour productivity plus the rate of increase of the markup. At the end of the pandemic, household spending returned to its pre-pandemic level, together with growing income and correspondingly high levels of household debts. However, the productivity of the service industry (as the efficiency), turning inputs into outputs (Amirul et al. 2022, p. 2854), grew insufficiently.

An important driver of low productivity was the strong wage growth led by governmental policies to deal with the COVID–19-related lockdowns, e.g., furloughing workers and income support, which enhanced unemployment benefits. Nickel, Koester, and Lis (2022, p. 72) also agreed that wage growth is a major driver of services inflation in the euro area. Important measures of wage growth (compensation per employee or per hour worked) were heavily affected by the changing impact of government support measures related to job retention schemes. According to Ubide (2022, p. 96), in an environment where all labour inputs are increasing and all companies are raising prices, markups may no longer behave in a countercyclical manner, thus increasing the probability of a wage-price spiral in the economy. Conflitti and Zizza (2021, p. 2474) found that firms' inflation expectations are significantly affected by wage increases, which are set by contract renewals and the prices of raw materials. Meanwhile, Lieb and Schuffels' (2022, p. 2482) high inflation expectations were related to increased economic uncertainty.

In the current inflationary period, Urquhart (2022, p. 246) mentioned the Fiscal Theory of Price Level, which posits that fiscal components (debt, spending, revenues, and deficit) are keys that determine the economy's price level. As these components and inflation suffered significant imbalances between 2020 and 2022, inflation targeting and adjusting of interest rates (Altunbaş and Thornton 2022, p. 560) became more important as a monetary policy instrument of central banks. Gong and Qian (2022, p. 4783) found evidence that inflation targeting reduces the probability of an internal debt crisis in a country, a risk that has increased in many countries worldwide after the pandemic. Batayneh, Salamat, and Momani (2021, p. 2), who focused on the financial sector, mentioned that higher inflation implies less long-run financial activity. In economies with high inflation, intermediaries will lend less and allocate capital less effectively, and equity markets will be smaller and less liquid.

The Harmonised Index of Consumer Prices in the EU–27's service industry

During the period 2016M01–2022M09, the prices of services in the EU–27 increased by 15.91%, on average, compared to 2015. However, the inflation growth rate was not constant in EU service industries. Until the end of 2018, the inflation in services did not exceed the European Central Bank's target to keep the annual price between 0% and 2%. Between 2016 and 2018, service prices grew by 1.42%, 1.39% and 1.43%, respectively. In 2019, the economy reached its peak in the business cycle in the decade after the economic crisis of 2009; the HICP of services increased to 2.16%. COVID–19 and the global economic lockdown reduced the inflation of services to 1.31%. Afterwards, inflation in the EU–27 service sectors accelerated significantly. In 2021, the HICP of services was 3.07%, while at the end of the 3rd quarter of 2022, it reached 5.13%.

Analysing the main service industry sub-sectors, the most significant price growth was observed in restaurants and hotels, where the HICP reached 125.05% in 2022M09 compared to 2015. The second is transport services, where prices increased by 14.95% during the same period. Other miscellaneous services, including personal care, hairdressing, electric appliance repair, child-care services, and counselling, became more expensive by an average of 14.84%. The HICP of recreation and culture in 2022M09 reached 111.85%, insurance services – 110.99%, and health services – 109.29%. The average spending on education for EU citizens increased by 7.26%. There was a decline in consumer prices in communication services, where the HICP was 94.12% compared to the 2015 baseline.

Comparing the EU–27 service markets to the consumer products markets, inflation in services was lower. The all-items HICP in 2022M09 was 121.56%, so the average price growth of services was 5.65% smaller. The highest price growth was observed in energy resources. Housing, water, electricity, gas, and other fuels were 36.13% more expensive compared to 2015. The price growth of energy in 2021 was 10.37%, and 19.91% during the first three quarters of 2022. In the consumer goods markets, the 2022M09 HICP of food and non-alcoholic beverages was 128.29%, alcoholic beverages and tobacco – 125.62%, furnishings, household equipment and routine household maintenance – 113.34%, and clothing and footwear – 108.35%.

The HICP in services during the period 2016M01–2022M09 varies significantly across the EU–27 countries. For some, this indicator has a cyclical pattern (Figure 1).

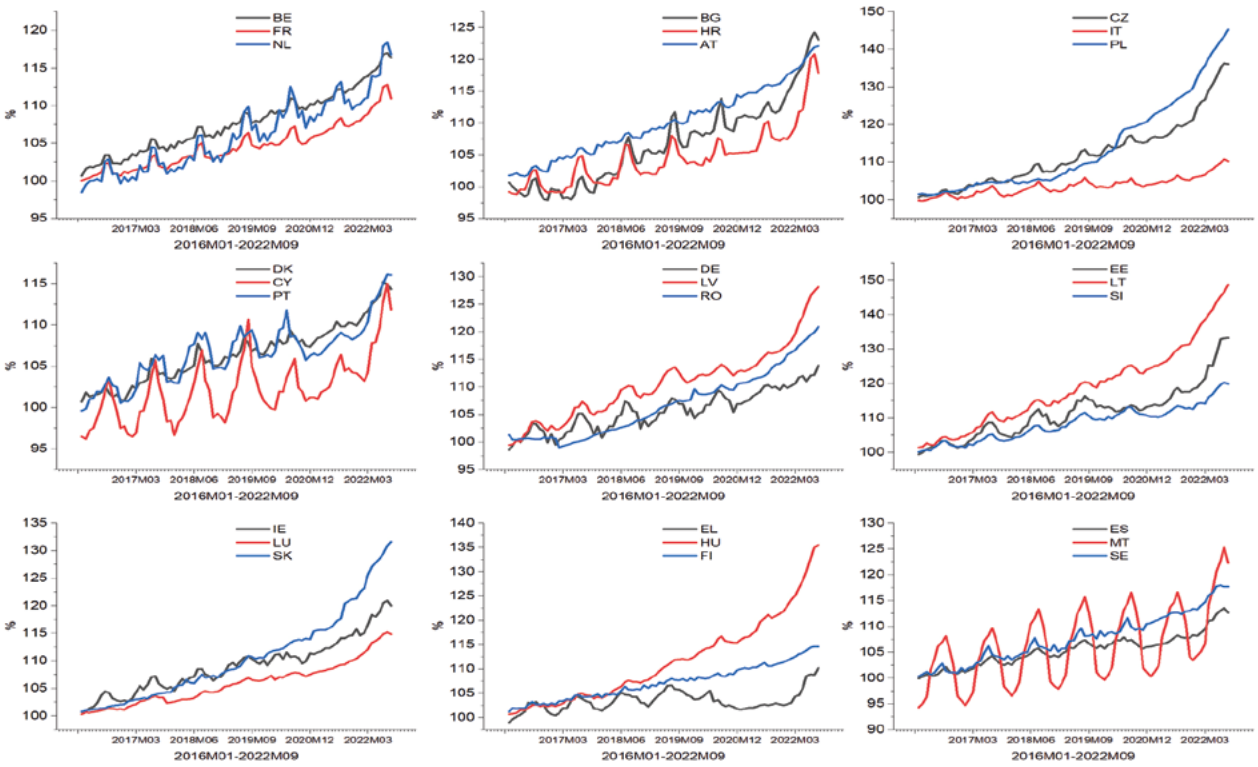

Figure 1. 2016M01 – 2022M09 HICP of services in EU–27 countries (2015 = 100%)

Source: author's visualisation based on Eurostat 2022e [PRC_HICP_MIDX].

A descriptive statistical analysis was conducted in the HICP of services in the EU using annual data, as well as the average monthly HICP growth rate from 2016M01–2022M09 (Δ_{Month}) in Table 1. The unweighted average and median of services' HICP grew constantly during the analysed period, especially accelerating in 2022. The statistical indicators of variance (standard deviation, inter-quartile range (IQR), and overall range) also constantly obtained higher values. A minimum HICP below 100% indicates that a decline in service prices was observed in some EU countries in 2018 compared to 2015. However, after 2019, inflation was typical for the overall EU service industry. Italy had the lowest inflation in service prices (110.20% HICP in 2022M09), while the highest was in Lithuania (148.72%). Since 2016M01, the average monthly growth rate of service prices in Lithuania was 0.591%. For comparison, the EU–27 monthly average was 0.273%. The least growth was in Italy (0.130%). After Lithuania, the countries with some of the highest average monthly growth rates of service prices were Poland, Czechia, Hungary, and Estonia. Their monthly growth values varied from 0.422%–0.548%.

Table 1. Descriptive statistics of services' HICP (%) in the EU–27 (2015 = 100%)

	2016M12	2017M12	2018M12	2019M12	2020M12	2021M12	2022M09	Δ_{Month}
Mean	101.36	103.30	105.40	108.12	109.81	113.42	121.66	0.273
Median	101.46	103.50	105.58	108.09	110.23	112.52	117.82	0.234
Std. Deviation	1.83	2.51	3.19	4.21	5.47	7.41	10.46	0.126
IQR	1.78	3.13	3.31	4.63	6.84	8.56	11.17	0.167
Range	8.93	12.44	16.34	20.42	22.85	30.59	38.52	0.461
Minimum	95.68	97.65	98.54	100.25	101.17	102.45	110.20	0.130
Maximum	104.61	110.09	114.88	120.67	124.02	133.04	148.72	0.591
25th percentile	100.75	101.66	103.67	106.14	106.11	108.43	114.46	0.186
75th percentile	102.53	104.79	106.97	110.76	112.94	116.98	125.62	0.354
33.33rd percentile	100.83	102.35	104.33	106.29	107.23	109.99	115.63	0.195
66.67th percentile	102.15	104.44	106.57	109.81	110.98	115.03	122.15	0.264

Source: author's calculations based on Eurostat 2022b.

The structural averages (median, 33.33rd and 66.67th percentiles) of Table 1 were used to classify the EU–27 countries into two or three groups according to their HICP of services in 2022M09 (Table 2). To classify them into two groups, the criteria were selected as not exceeding the 2022M09 HICP median (low HICP group) and above this median (high HICP group). The extraction of three classes is based on 33.33rd and 66.67th percentiles, dividing the EU–27 countries into low, medium, and high HICP groups.

Table 2. Classification of EU–27 countries according to services' HICP in 2022M09

	Below median (HICP < 117.82%)	Median (HICP = 117.82%)	Above median (HICP > 117.82%)
Classification into two groups	**IT, EL, FR, CY, ES, DE, DK, FI, LU, PT, BE, NL, SE**	**HR**	**SI, IE, RO, AT, MT, BG, LV, SK, EE, HU, CZ, PL, LT**
Classification into three groups	Below 33.33rd percentile (HICP < 115.63%)	Between 33.33rd and 66.67th percentiles	Above 66.67th percentile (HICP > 122.15%)
	IT, EL, FR, CY, ES, DE, DK, FI, LU	PT, BE, NL, SE, HR, SI, IE, RO, AT	MT, BG, LV, SK, EE, HU, CZ, PL, LT

Source: author's calculations based on Eurostat 2022b.

Spectral analysis was employed to estimate the periodicity of service price changes in the EU–27. The peak frequency, period, peak power, and statistical significance at $p < 0.05$ and $p < 0.01$ levels were analysed. The aggregated spectral analysis results

are given in Figure 2 as Kernel density and bee-swarm plots. In the periodograms, 16 countries (59.3%) obtained the peak frequency values in the range 0.08281–0.08437 and the service HICP periods of 11.85–12.08 months. These countries are Belgium, Denmark, Germany, Estonia, Ireland, Spain, France, Croatia, Italy, Cyprus, Latvia, Malta, Netherlands, Portugal, Slovenia, and Sweden. However, most had a spectral analysis power below 20, demonstrating the weak seasonality of service price changes, despite the sufficient statistical significance.

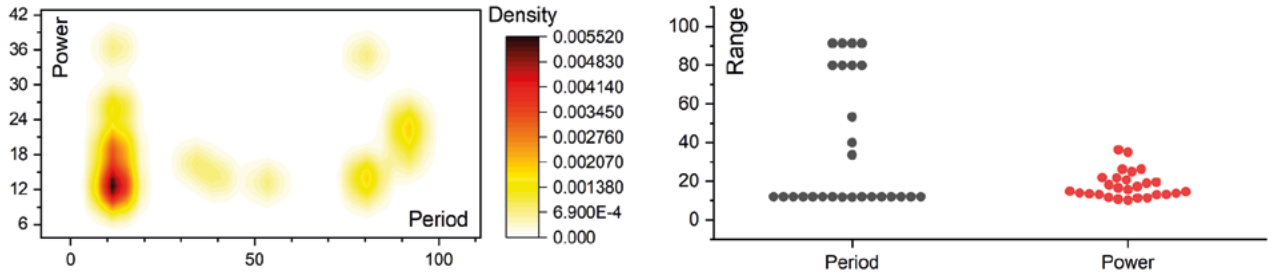

Figure 2. Kernel density and bee-swarm plots of spectral analysis results

Source: author's visualisation based on Eurostat 2022e [PRC_HICP_MIDX].

Malta, Germany, Cyprus, and the Netherlands obtained the highest peak power in the spectral analysis within the range of 20.78 to 36.36. Therefore, the seasonality of service price fluctuations within a year is most pronounced in these countries. Their Lomb periodograms are given in Figure 3, with the power significance at 8.058 ($p < 0.05$) and 9.693 ($p < 0.01$) levels.

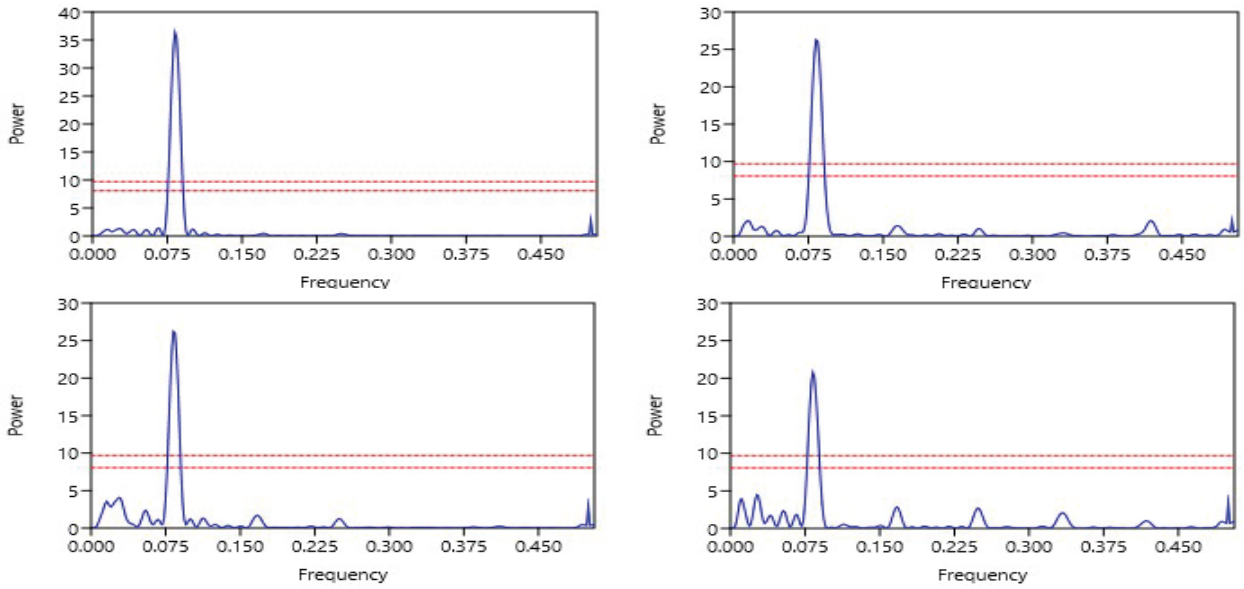

Figure 3. Service HICP Lomb periodograms of Malta (top-left), Germany (top-right), Cyprus (bottom-left), and the Netherlands (bottom-right)

Source: author's visualisation based on Eurostat 2022e [PRC_HICP_MIDX].

Consumption and international trade of services in EU–27

The turnover of service enterprises in the EU at the beginning of the COVID–19 pandemic in 2020Q2 declined by 19.3%. Following the restricted demand during the economic lockdown, the prices of services tended to decline until 2020Q4, when the HICP of services was 107.71%. By 2022Q2, the overall turnover in service sectors had reached 144.0% compared to 2015. The overall price index in 2022Q2 was 114.2%, so real growth of service consumption in the EU was observed during the high inflation period (Figure 4).

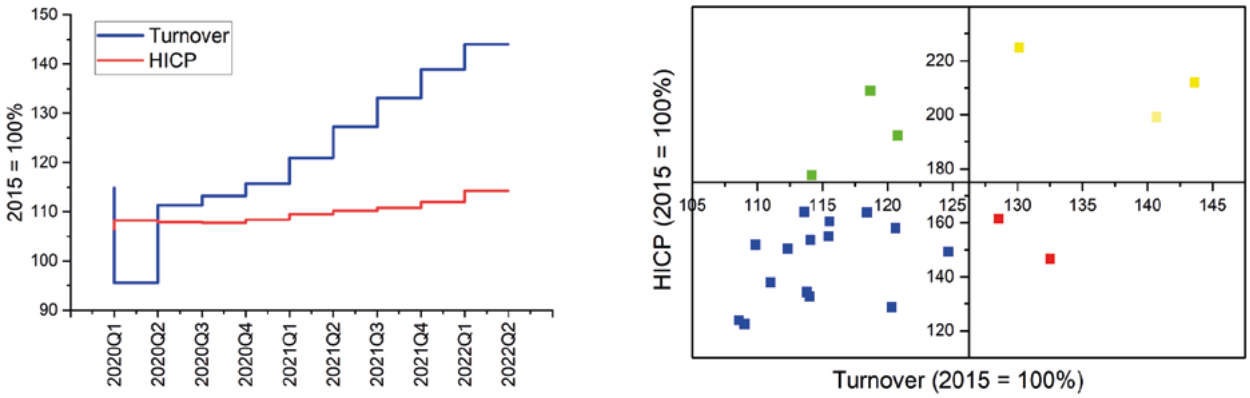

Figure 4. Service HICP and turnover indices in overall EU–27 2020Q1 – 2022Q2 (left chart) and each member state in 2022Q2 (right chart)

Source: author's visualisation based on Eurostat 2022e [PRC_HICP_MIDX]; 2022k [STS_SETU_Q].

Until 2022Q2, Luxembourg, Romania, and Bulgaria experienced the highest service turnover growth (177.6% to 208.9%) and the lowest service inflation (114.2% to 120.8% HICP) relative to other countries. The consumers of these countries experienced the highest growth in purchasing power considering the proportions of service HICP and turnover increase in service enterprises (the green sector in Figure 4). Similarly, the highest service turnover growth was in Hungary, Lithuania, and Poland (199.1%–224.9%); however, the prices of services were higher by 30.1 to 43.6% (the yellow sector in Figure 4). Czechia and Slovakia had the least growth in service purchasing power relative to other countries, with the 2022Q2 HICP of services ranging from 128.6% to 132.5%, while the turnover grew only by 146.7% to 161.5% (the red sector in Figure 4). The other EU countries, except for Estonia, France, Ireland, and Sweden, whose turnover statistics were unavailable, had moderate service turnover growth (below 165% compared to 2015); the HICP of services did not exceed 125%.

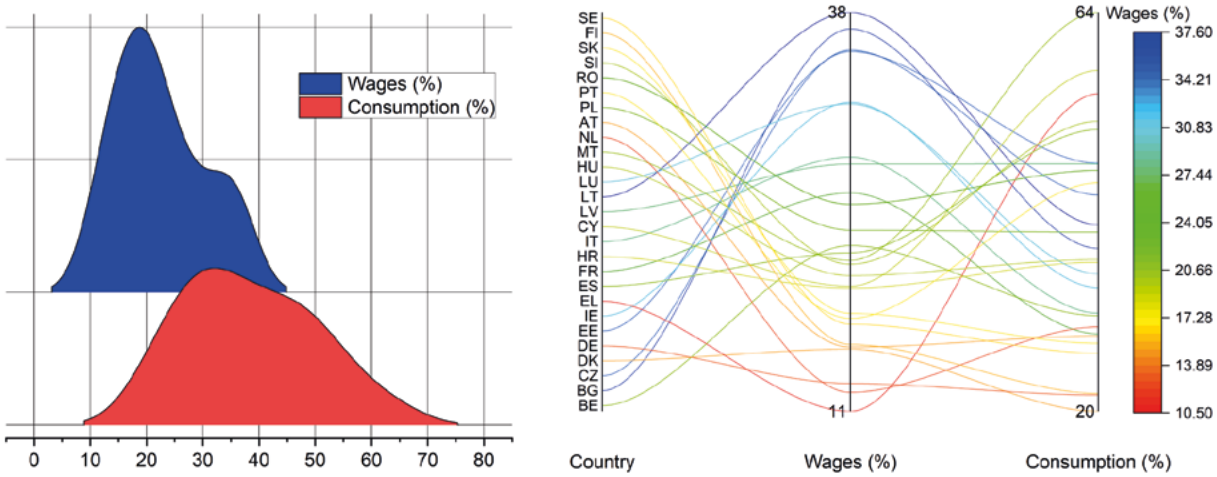

Figure 5. Ridgeline and parallel plots of EU–27 wages and household final consumption expenditure growth rates in 2020Q2–2022Q2

Source: author's visualisation based on Eurostat 2022c – wages and salaries and final consumption expenditures of households statistical databases.

The final consumption expenditures of households in the EU–27 during the inflation growth period of 2020Q2–2022Q2 increased significantly more than wages and salaries. This disproportion can be seen in the ridgeline distribution plot (Figure 5). The unweighted average wage growth during this period was 22.4%, while household consumption expenditures increased by 38.4%. In 12 countries, wage growth did not exceed 19.7%, but overall, EU consumption grew more than 19.9%. This indicates that, on average, inflation was stimulated by more spending on consumer goods and services compared to the income growth in EU households. The parallel plot (Figure 5) indicates that Lithuania, Bulgaria, Czechia, and Estonia had the highest wage growth (34.9% to 37.5%). All these countries also belong to the highest services' price growth group (HICP is above the 66.67 percentile).

Malta, Cyprus, Greece, Slovenia, and Spain had the most significant consumption increase (more than 50%). Simultaneously, these five countries had the highest difference between household consumption expenditures and wage growth rates, in the range of 30.1% to 44.8%.

Analysis of international trade of services in 2021's balance of payments shows that most EU–27 countries are net service exporters (Figure 6). Extra-EU trade exhibits a particularly positive balance, except for Ireland and Malta, which are net importers of services (–€52.2 billion and –€140.2 million, respectively). Belgium, Denmark, Germany, France, Italy, Slovakia, Finland, and Sweden had a negative intra-EU trade balance (from –€183.8 million to –€36.2 billion). The most active international trading and money flows in the service industry are in Germany, Ireland, France, Netherlands, Luxembourg, and Belgium.

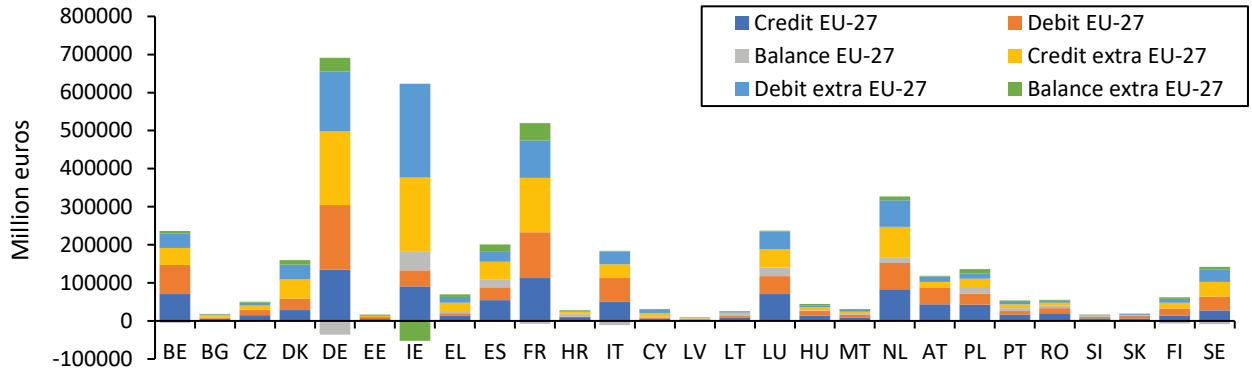

Figure 6. Balance of payments for services in the EU–27 (year 2021)

Source: author's visualisation based on Eurostat 2022f.

Economic factors of service price growth in the post-pandemic recovery

After the COVID–19 restrictive measures were lifted, Europe faced a new economic problem related to electricity price volatility and the rapid price growth of other energy resources. The internal energy markets of most EU–27 countries became locked in a relentless upward climb from the beginning of 2022. On average, electricity prices in 2022M09 had increased by 61.7% compared to 2015. The highest HICP of electricity was in Estonia (384.1%), Belgium (282.6%), and the Netherlands (246.9%). This indicator also exceeded 200% in Italy, Sweden, Latvia, Lithuania, and Denmark. The smallest growth was in Slovenia, Croatia, and Luxembourg. In Malta, the price has not changed at all since 2016 (Figure 7).

The growth in electricity prices in the EU is related to declining internal generation and the increasing disproportion between energy supply and demand. The EU–27's electricity generation has a cyclical pattern; however, in general, the generation amounts since 2017 have declined (the negative linear trend in Figure 8).

Overall electric power generation from 2017–2021 declined by 9.8%, from 2.748 million GWh to 2.721 million GWh. The reduction in the supply of natural gas from Russia to Europe in 2022 was another factor in the growth of electric energy prices. Although European countries use several ways to generate electric power, such as nuclear, hydroelectric, coal, wind, and solar, the price of natural gas is hugely influential in setting electricity prices because gas-burning generators are most often switched on when the power grids need more electricity. The prices of gas and liquid fuels started to climb rapidly in the EU, undoubtedly stimulating the growth of inflation, includ-

ing the prices of services. The HICP of gas in 2022M09 was 186.6%, while liquid fuels reached 197.6% (Figure 8).

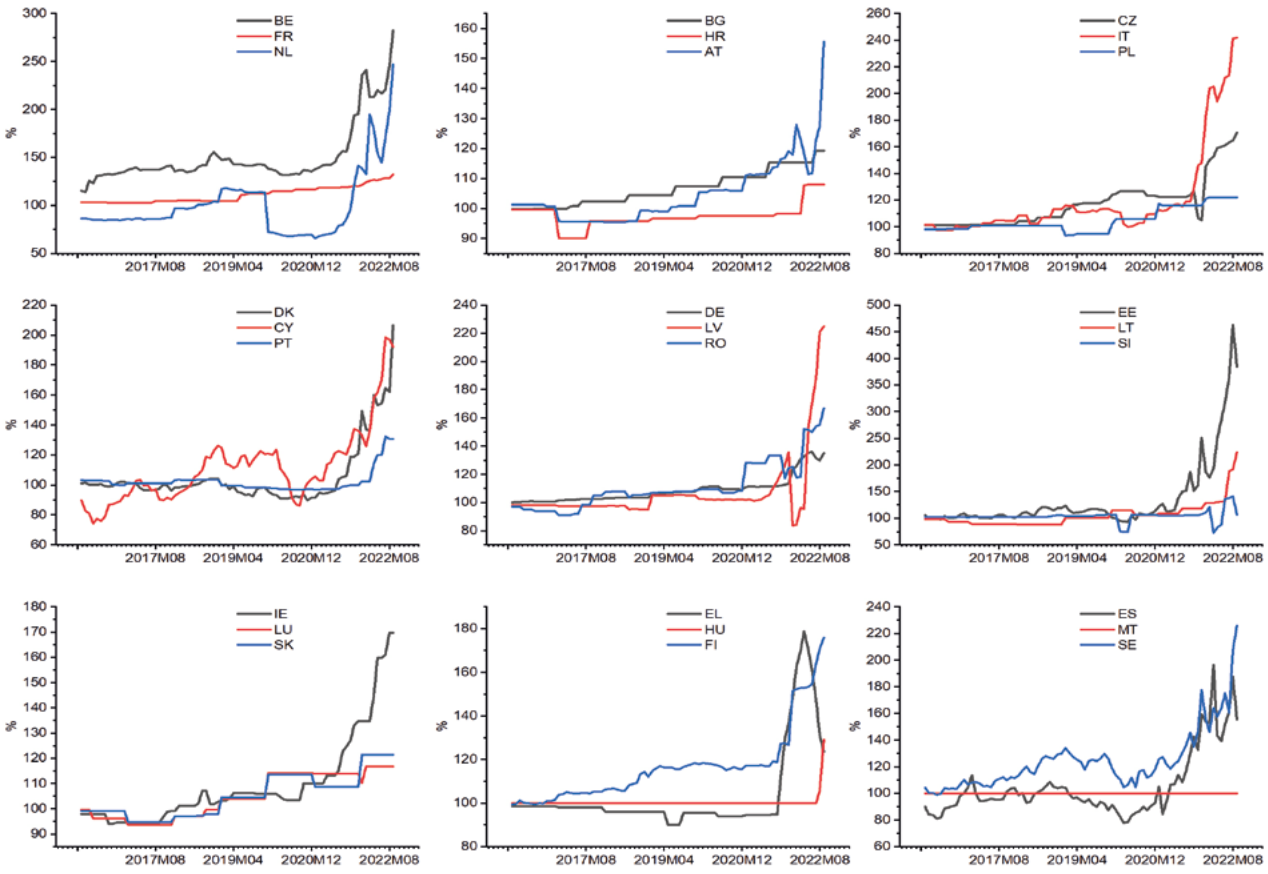

Figure 7. 2016M01–2022M09 electricity price index in the EU–27 (2015 = 100%)

Source: author's visualisation based on Eurostat 2022e – electricity HICP monthly data (index) [CP0451] statistical database.

Recently, a larger proportion of the EU–27 (63%) became net importers of electricity. The negative international trade balance has increased the statistical value of gross available energy in the EU, which is calculated by subtracting the energy exports from imports. In 2020, the indicator reached a maximum of 13,834 GWh (Figure 9). Conversely, net exporters of electricity remain Belgium, Bulgaria, Czechia, Germany, Ireland, France, Netherlands, Slovenia, and Sweden. Cyprus has an electricity trade balance of 0.

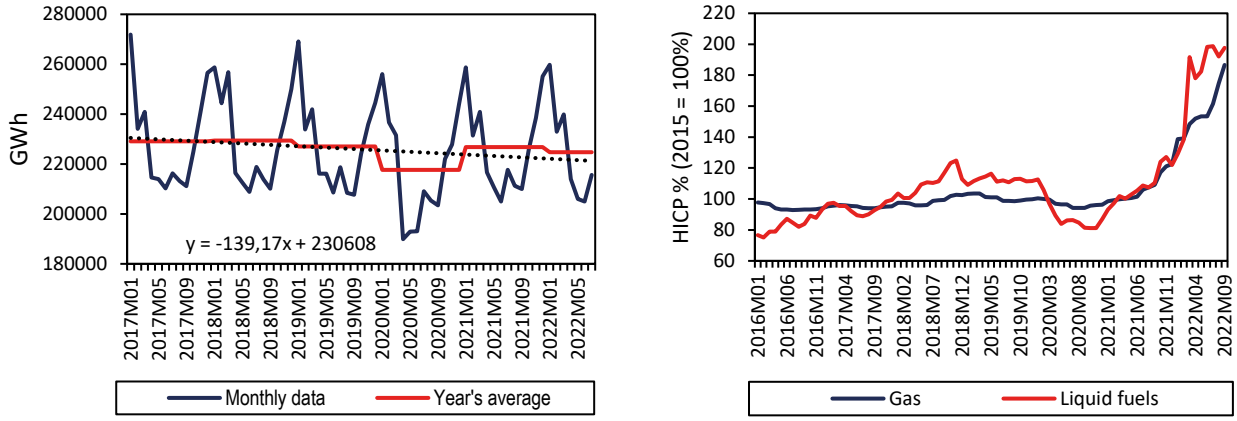

Figure 8. 2017M01–2022M07 net electricity generation (left chart) and 2016M01–2022M09 HICP of gas and liquid fuels (right chart) in the EU–27

Source: author's visualisation based on Eurostat 2022h – gas [CP0452], and liquid fuels [CP0453] statistical databases; 2022e.

As the service industry has an intangible character, energy costs, labour expenses and productivity have a significant impact on service prices. Figure 10 compares total hours worked and wage growth in the service industry of 25 EU countries (statistical data from the Netherlands and Germany were unavailable). The comparative basis is 2015, with an index equal to 100%. On average, the number of hours worked in services increased by 13.5% between 2015 and 2022Q2, while salaries grew by 65.7%. Romania, Hungary, and Lithuania had the highest growth in service industry labour costs.

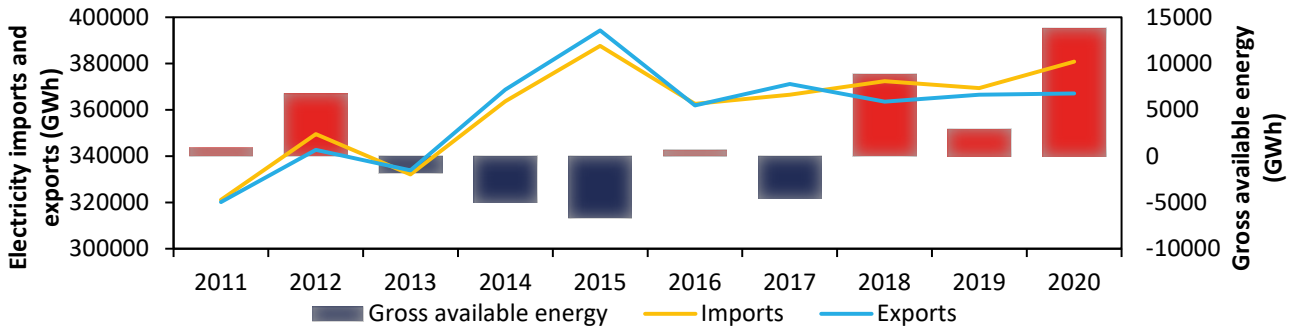

Figure 9. 2011–2020 electricity imports, exports, and gross available energy in the EU–27

Source: author's visualisation based on Eurostat 2022k – electrical energy imports [B_190300] and exports [B_190500] statistical database.

As expected, the volume index of production in services significantly declined during the beginning of the COVID–19 pandemic in 2020 compared to the previous year. However, there was also a decline in the growth rate in the first half-year of 2022 (Figure 10). However, this analysis included only a sample of eight EU countries for which recent statistics were available: Germany, France, Latvia, Lithuania, Hungary, Roma-

nia, Finland, and Sweden. Thus, the calculated means of every period were supplemented by ±1.96 standard errors, creating intervals for the expected overall EU–27 means with 95% probability. The statistical characteristics of service production volume indices are given in Table 3. The inflationary shock, slowing real service production growth, and a two-decade-low unemployment rate of 6.0% in 2022M07–2022M08, indicate a possible peak point of the business cycle.

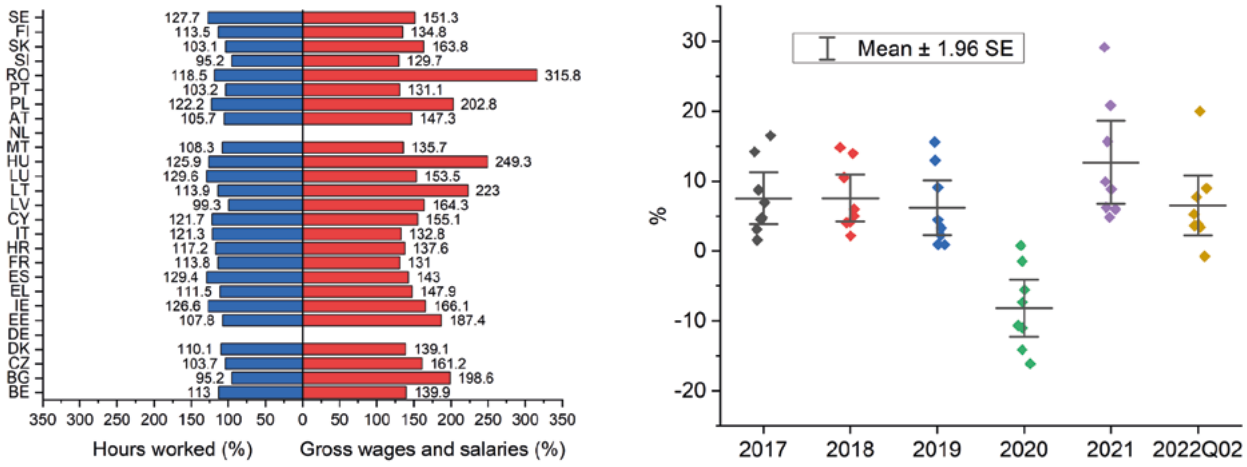

Figure 10. 2022Q2 volume of work done (hours worked), gross wages and salaries (left chart), and volume index of production in services (right chart) of EU countries

Source: author's visualisation based on Eurostat 2022g; 2022j.

Table 3. Sample statistics of services production volume index (%)

Period	Mean	Standard error	Confidence –95%	Confidence +95%
2017	7.53750	1.881008	3.0896	11.98538
2018	7.58750	1.712396	3.5383	11.63667
2019	6.18750	2.007970	1.4394	10.93559
2020	– 8.20000	2.089942	– 13.1419	– 3.25807
2021	12.65000	3.034210	5.4752	19.82477
2022Q02	6.48750	2.193695	1.3002	11.67477

Source: author's calculations based on Eurostat 2022b.

The profitability of the service industry is usually higher than in manufacturing due to the use of fewer materials and their related expenses. The intangible manner of services makes it possible to set higher profit margins, which makes it possible to absorb the cost growth in energy and labour markets, resulting in minimal price changes in the commodities market. Figure 11 compares the average gross operating rate, calculated as the ratio of gross operating surplus to turnover, between the EU–27 service in-

dustry and manufacturing. The comparative datum lines of manufacturing indicate that this real economy had average gross operating rates of 9.5% and 9.4% in 2019 and 2020, respectively. The highest profitability of services is in real estate activities, where these values exceed 40%. Information and communication services, professional, scientific, and technical activities, together with administrative and support services, are also at high levels. COVID–19 positively impacted these sectors as their profit margins increased slightly. Transportation and storage, together with accommodation and food service activities, have relatively lower gross operating rates (6.6%–13.1%). These sectors were more sensitive to the COVID–19 pandemic, as their profitability declined.

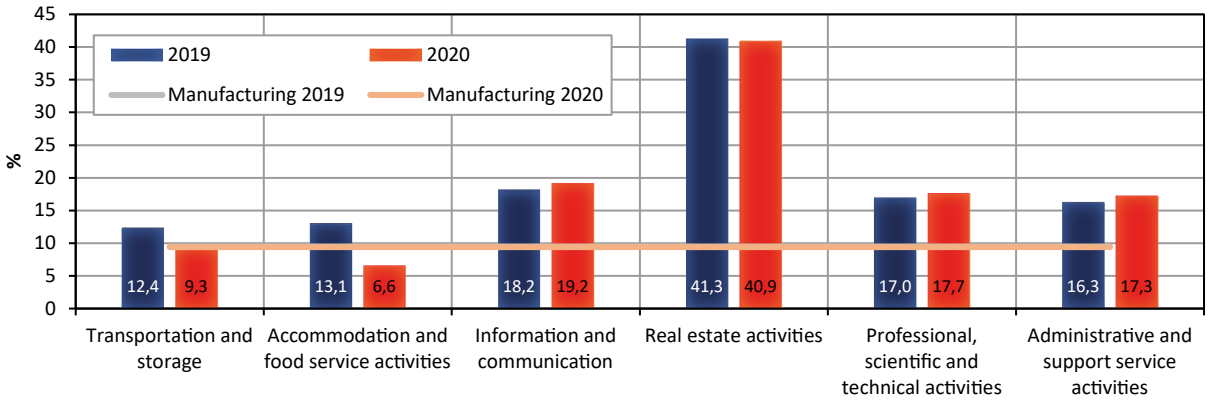

Figure 11. Average gross operating rate of the service industry compared to manufacturing in the EU–27

Source: author's visualisation based on Eurostat 2022a [TIN00155].

The outbreak of COVID–19 and the global economic lockdown triggered a rapid increase in public and private indebtedness in the EU. The overall consolidated gross debt of the EU–27 governments between 2020Q1 and 2022Q2 increased by 18.3%, from €11.1 to 13.1 trillion. The leader of public debt growth was Estonia (+127.3%), although it has the lowest indebtedness, At €5.7 billion (Figure 12). The other countries where debt grew were Czechia, Romania, and Lithuania (from +49.2% to +63.3%). The aggregated loan portfolio of credit institutions mostly grew in Slovakia, Ireland, and Belgium (from +31.6% to +35.0%).

Based on government consolidated gross debt and loans of credit institution indices (2020Q1 = 100%), four sectors were aggregated, setting the limit of the indebtedness growth indices to 120%. Slovakia, Romania, Estonia, Czechia, Luxembourg, Bulgaria, Lithuania, Austria, and Germany exceeded this value in both indebtedness indicators and are concentrated in the red sector of Figure 12. Slovenia, Hungary, Latvia, Malta, and Poland were the countries where public debt grew significantly while maintaining a moderate bank loan portfolio growth (blue dots in Figure 12). Contrasting trends were observed in Ireland, Belgium, Finland, Portugal, and France

(yellow dots in Figure 12). The other eight countries increased their public and private indebtedness by less than 20%.

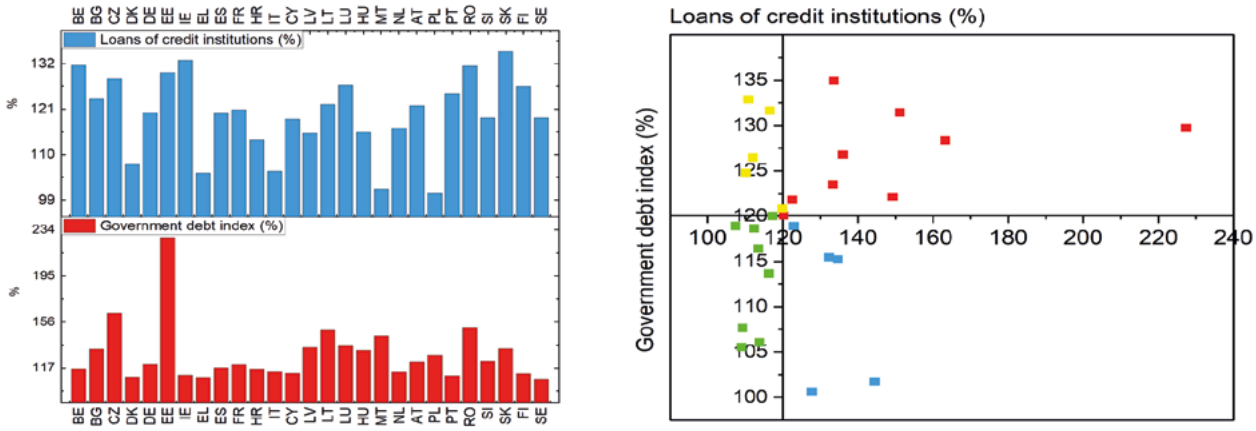

Figure 12. Government consolidated gross debt and loans of credit institution indices of period 2020Q1–2022Q2 in the EU–27

Source: author's visualisation based on Eurostat 2022d; 2022i.

The sudden increase in money supply in the financial system could not keep inflation low. The prices of services and consumer goods began to climb rapidly in 2022. These inflationary processes were caused by extremely low central bank interest rates until 2022, stimulating borrowing and surplus demand for goods and services (Figure 13).

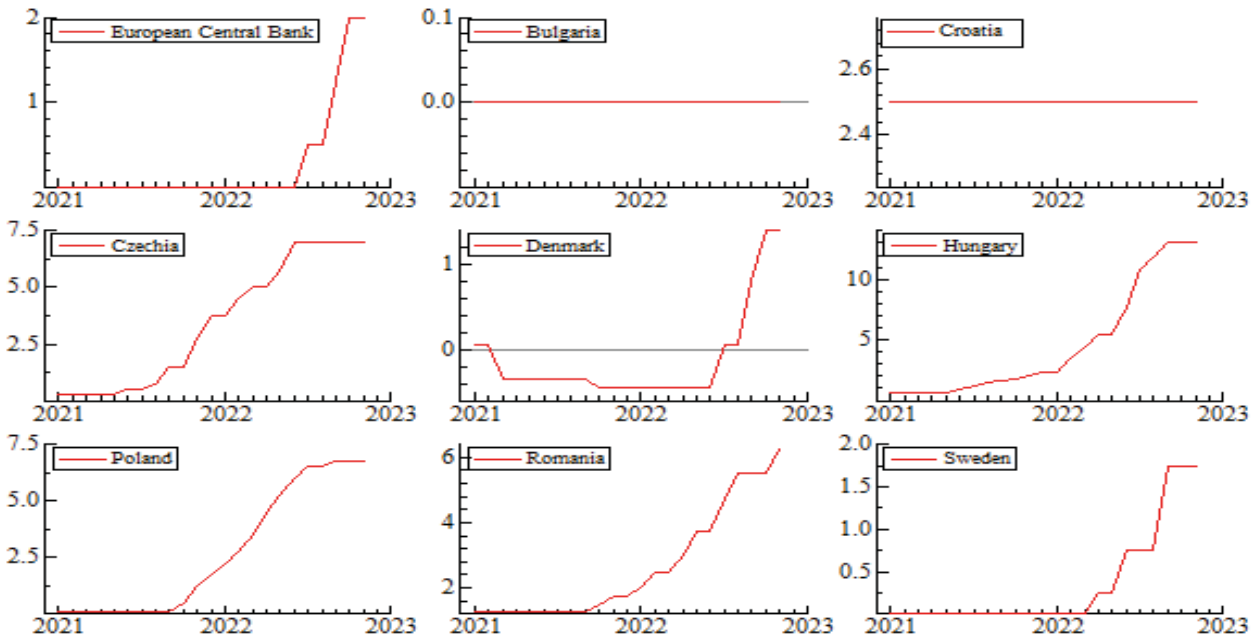

Figure 13. Central bank interest rates from 2021M01–2022M11 in the EU–27 (%)

Source: processed by author according to key ECB interest rates – European Cenral Bank n.d. and non-EMU central banks' – *Central banks – summary of current interest rates* n.d.

Reacting to the growing inflation, most central banks of non-euro countries began to raise interest rates in the second half-year of 2021. The European Central Bank followed in the summer of 2022 to reduce the price shock in the product and service markets of the euro area.

Statistical dependencies between service price growth and economic factors

Statistical analysis was conducted to model the dependencies between economic factors and the HICP of services. The data sample comprises 11 indices (the first 11 items in Table 4) and seven indicators (the last seven items in Table 4) as independent variables.

Table 4. Data sample characteristics

Abbreviation	Indicator	Period
WSA	Wages and salaries in service industry (%)	2020Q2–2022Q2
FCH	Final consumption expenditures of households (%)	2020Q2–2022Q2
AIC	Actual individual consumption (%)	2020Q2–2022Q2
CGD	General government consolidated gross debt (%)	2020Q1–2022Q2
LCI	Loans of credit institutions (%)	2020Q1–2022Q2
LCC	Labour cost in the whole economy (%)	2021Q2–2022Q2
ENH	Electricity, gas, and other fuels HICP (%)	2015–2022M09
ELP	Electricity HICP (%)	2015–2022M09
ENT	Number of enterprises (%)	2019–2020
GOS	Enterprise gross operating surplus (%)	2019–2020
GRE	Employment in the whole economy (%)	2019–2020
TPP	Turnover per person employed (thousand euros)	2020
GVV	Gross value added per employee (thousand euros)	2020
IPP	Investments per person employed (thousand euros)	2020
ETB	Electricity imports to exports ratio (%)	2020
BPI	Debit to credit ratio of services in the balance of payments intra-EU (%)	2021
BPE	Debit to credit ratio of services in the balance of payments extra-EU (%)	2021
UNE	Unemployment rate (%)	2022M09

Source: author's methodology.

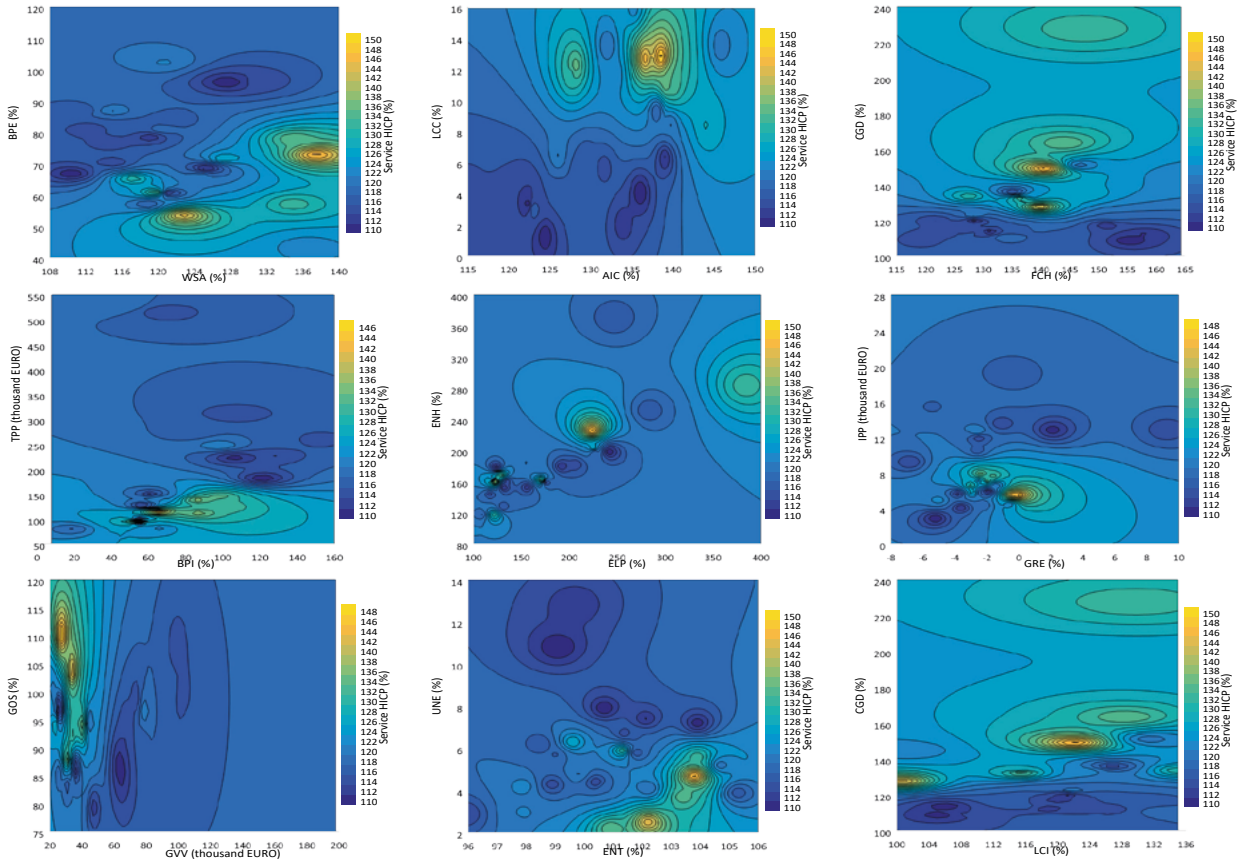

Figure 14. Economic factors of service HICP in the EU–27

Source: author's calculations based on Eurostat 2022b.

The spectral analysis of contour charts in Figure 14 identified the main common factors of high service HICP values. A relatively higher increase in service prices is typical in countries with high wage growth wages in the service industry, labour cost in the whole economy, and general government consolidated gross debt; net extra-EU and intra-EU exporters of services with lower turnover per person employed; electricity, gas, and other fuels HICP more than 200%; stagnating or declining employment in the whole economy during the COVID–19 pandemic and low investments per person employed; low gross value added per employee and a higher enterprise gross operating surplus; a growing number of enterprises and unemployment rate during the post-pandemic recovery, regardless of their reliance on credit institutions for loans.

The univariate Fisher's ANOVA ranking, employed as a supervised feature selection algorithm, was used to rank the input attributes according to their relevance. The discrete target attribute was set as the three-group clustering of EU–27 countries in Table 2 depending on services' HICP in 2022M09.

Table 5. The univariate Fisher's ANOVA ranking results

N	Attribute	F	F (max normalized)	p-value	N	Attribute	F	F (max normalized)	p-value	N	Attribute	F	F (max normalized)	p-value
1	LCC	21.87		0.000004	7	IPP	3.24		0.057018	13	ETB	0.95		0.400291
2	CGD	7.49		0.002970	8	TPP	3.13		0.062045	14	ENT	0.77		0.475029
3	UNE	4.58		0.020666	9	BPE	2.23		0.129450	15	GOS	0.55		0.581532
4	WSA	4.07		0.030050	10	BPI	1.31		0.287602	16	ENH	0.53		0.594691
5	GVV	3.54		0.044784	11	LCI	1.10		0.348346	17	GRE	0.45		0.640732
6	AIC	3.28		0.054901	12	FCH	0.98		0.390122	18	ELP	0.11		0.900254

Source: author's calculations based on Eurostat 2022b.

Analysing Table 5 allows us to classify the service price growth factors into three importance levels. LCC, CGD, UNE, WSA, GVV, and AIC had the highest impact on inflation. IPP, TPP, BPE, BPI, LCI, and FCH had an intermediate impact on service prices. The least important factors are ETB, ENT, GOS, ENH, GRE, and ELP.

The average values of service HICP factors in the two-group clustering of EU–27 countries (below (1) and above (2) the HICP 2022M09 median) according to Table 2 are given in Table 6. The indicators are separated into three table sectors according to the results of the univariate Fisher's ANOVA ranking.

Table 6. Average values of service HICP factors in two groups of EU–27 countries

Indicator	LCC (%)	CGD (%)	UNE (%)	WSA (%)	GVV (€)[1]	AIC (%)
Group 1	4.4	115.2	6.6	118.8	65.2	127.8
Group 2	11.5	142.5	4.3	126.4	48.7	135.8
Difference	7.1	27.3	– 2.3	7.6	– 16.5	8.0
Indicator	**IPP (€)[1]**	**TPP (€)[1]**	**BPE (%)**	**BPI (%)**	**LCI (%)**	**FCH (%)**
Group 1	9.6	225.3	77.5	89.2	118.4	135.0
Group 2	8.3	157.4	74.4	73.5	121.3	142.1
Difference	– 1.3	– 67.8	– 3.1	– 15.7	2.9	7.0
Indicator	**ETB (%)**	**ENT (%)**	**GOS (%)**	**ENH (%)**	**GRE (%)**	**ELP (%)**
Group 1	241.2	100.6	92.1	183.7	– 1.9	176.7
Group 2	903.9	101.4	98.5	174.4	– 2.4	168.7
Difference	662.7	0.8	6.5	– 9.3	– 0.5	– 8.0

[1]Thousand euros
Source: author's calculations based on Eurostat 2022b.

The top sector of Table 6 contains the differences in the highly impactful inflation factors. The cost of labour in the whole economy (2021Q2–2022Q2) index is 7.1% higher in the group of high-service HICP countries. The general government consolidated

gross debt (2020Q1–2022Q2) index is 27.3% higher. The EU–27 encountered the challenge of a significant increase in service prices, despite having lower total unemployment (–2.3%) and higher wage and salary growth (7.6%). This was accompanied by lower productivity, as measured by a –16.5% decrease in gross value added per employee, and a growing trend in actual individual consumption. Following the intermediate importance factors, lower investments and turnover per person employed are typical for high-service HICP countries. The lower intra-EU and extra-EU debit-to-credit ratios of services in the balance of payments indicate that inflation is typical for more service-exporting countries. Inflation is driven by the relatively high growth in money supply due to loans of credit institutions and increasing final consumption expenditures of households. The least important factors (the bottom sector of Table 6) also showed the differences between the EU–27. In electricity-importing countries with higher levels of business activity and profitability, there was higher price growth in the service industry. Interestingly, despite this, the energy price growth in these countries remained relatively lower. The more significant decline in employment during the beginning of the COVID–19 pandemic was also in the group of high inflation countries.

The classification and regression tree (CRT) was developed to classify the EU–27 countries into three service HICP groups based on the Table 2 classes (Figure 15). The classification accuracy is 100%.

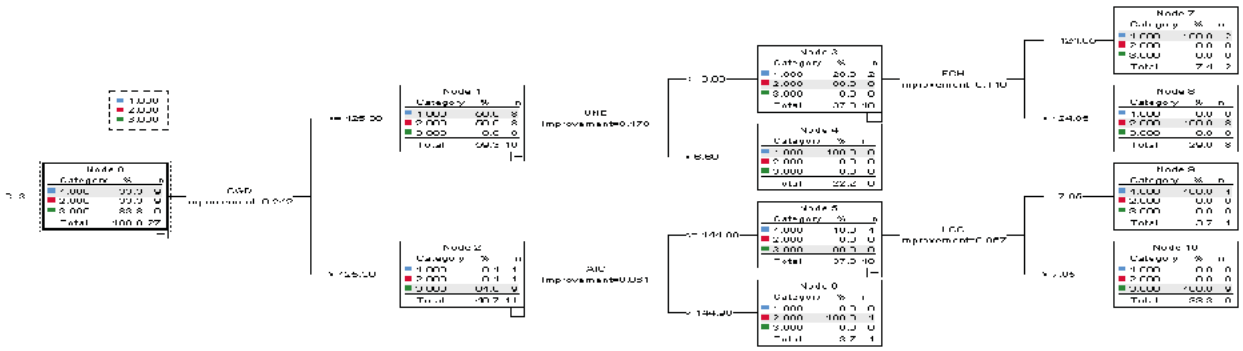

Figure 15. Classification and regression tree for the prediction of service HICP class

Source: author's calculations based on Eurostat 2022b.

When classifying the EU–27 countries into three service HICP groups, the first criterion is the general government consolidated gross debt index. During the COVID–19 pandemic period from 2020Q1 to 2022Q2, none of the countries with the highest service HICP growth had an indicator equal to or lower than 125.3%. In 2022M09, the EU–27 countries in group 3 of Figure 15 demonstrated the highest service HICP growth. This was attributed to their labour costs in the whole economy growing by more than 7.05% during the COVID–19 pandemic period from 2021Q2 to 2022Q2, in addition to their actu-

al individual consumption being equal to or lower than 144.9% during the same period, exceeding this threshold. The least service HICP growth (group 1 in Figure 15) was observed in countries with a general government consolidated gross debt index lower than or equal to 125.3% and an unemployment rate higher than 6.6% in 2022M09. If unemployment was lower than or equal to this value, countries with the index of final consumption expenditures of households lower than or equal to 124.05% in 2020Q2–2022Q2 also avoided the intermediate or highest service HICP growth.

Conclusion

The results of the analysis of post-pandemic inflationary processes have shown that they were typical for the overall EU service industry. Italy had the lowest inflation in service prices, while Lithuania had the highest. The other countries with the highest average monthly growth rates of service prices were Poland, Czechia, Hungary, and Estonia. Additionally, the spectral analysis of this research revealed the typical seasonality of service price fluctuations within a year in Malta, Germany, Cyprus, and the Netherlands.

The comparative analysis revealed that Luxembourg, Romania, and Bulgaria had the highest service turnover growth and the lowest service inflation. Thus, the consumers in these countries experienced the highest growth of purchasing power considering the proportions of service HICP and turnover increase in service enterprises. Similarly, Hungary, Lithuania, and Poland also had the highest service turnover growth; however, the prices of services in these countries were significantly higher. Czech and Slovak consumers suffered from the smallest growth in service purchasing power.

According to the cost structure and profitability analysis, because the service industry mainly has an intangible character, labour expenses, energy, and productivity significantly impact service prices. In addition, after the COVID–19 pandemic restrictive measures were lifted, Europe faced a new economic problem related to electricity price volatility and the rapid price growth of other energy resources, which undoubtedly increased service prices. The profitability of the service industry is higher than in manufacturing, making it possible to set higher profit margins and absorb the cost growth in energy and labour markets.

The COVID–19 pandemic period and global economic lockdown triggered the sudden growth of public and private indebtedness in the EU. The empirical findings on the interrelation between government finance and service prices indicated that the leaders in terms of public debt growth were Estonia, Czechia, Romania, and Lithuania. The aggregated loan portfolio of credit institutions mostly grew in Slovakia, Ireland, and Belgium. The sudden increase in money supply in the financial system could not

keep inflation low. The prices of services began to climb rapidly in 2022. These inflationary trends in the EU economies were caused by extremely low central bank interest rates until 2022, which stimulated borrowing and generated surplus aggregated demand in the EU–27.

The detailed spectral analysis that modelled the dependencies between 18 economic factors and the HICP of services identified the main common factors of high service HICP values. A relatively higher increase in service prices is typical in countries with high wage growth in the service industry, labour costs in the whole economy, and general government consolidated gross debt. These countries are net extra-EU and intra-EU exporters of services with lower turnover per person employed, with the HICP of electricity, gas, and other fuels more than 200%. The stagnating or declining employment in the overall economy during COVID–19 and low investments per person employed were typical. During the post-pandemic recovery, high service price growth countries exhibited a combination of low gross value added per employee, higher enterprise gross operating surplus, a growing number of enterprises, and an increased unemployment rate. In addition, the univariate Fisher's ANOVA ranking indicated that the factors with the highest impact on service inflation were the labour cost in the whole economy, general government consolidated gross debt, unemployment rate, wages and salaries in the service industry, gross value added per employee, and actual individual consumption. The developed classification and regression tree confirmed that it is possible to classify the EU–27 countries correctly according to the analysed macroeconomic factors that impact service prices.

Reacting to growing inflation, most central banks of non-euro countries began to raise their interest rates in the second half-year of 2021. The European Central Bank followed in the summer of 2022 and also started to increase the interest rates to reduce the price shock in the product and service markets of the euro area. The increase in the price level of money is expected to lead to a reduction in the money supply from 2023, which may result in decreased demand for services and increased competition among service providers. The increased competition should reduce prices because the profitability of the service industry is very high (in some sub-sectors exceeding 40%). The increasing of prices based on the profit maximisation principle of service enterprises will be restricted due to declining demand, and it will positively affect customers' purchasing power without the risk of bankrupting service enterprises. An increased demonstration of customer market power is also necessary to reduce the detrimental inflationary processes that have been observed since 2022 in the EU. The prolonged inflation reflects the surplus demand; therefore, customers' attitudes should be changed, promoting more reasonable consumption. The growing deposit interest rates should stimulate savings after the sudden injections of borrowed money into the financial systems during the COVID–19 pandemic. Central banks, governments, and individuals should target inflation and limit the decline of the purchasing power of money. A reasonably slowed turnover of money should reduce the economic imbalances between supply and demand, leading to a decline in inflation.

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Ekonomiczne czynniki wzrostu cen konsumpcyjnych w sektorze usługowym w UE–27 w okresie postpandemicznym

Okres postpandemiczny w Unii Europejskiej wyróżnia się wzrostem aktywności gospodarczej przedsiębiorstw po dwóch latach obostrzeń, wzrostu zadłużenia i podaży pieniądza oraz niezwykle wysokiej inflacji. W niniejszym badaniu przedstawiono wyniki analizy zharmonizowanego wskaźnika cen konsumpcyjnych (HICP) w sektorach usługowych w UE–27, porównując go z ogólnym poziomem inflacji i wzrostem cen na rynkach dóbr konsumpcyjnych. Wskazano również czynniki ekonomiczne, które przyczyniają się do występowania różnic między poziomami wzrostu cen usług w krajach UE–27. Wyniki umożliwiają klasyfikację krajów UE–27 ze względu na różnice w zmianach cen usług. Wskazano ustalone wzorce HICP usług i uszeregowano czynniki ekonomiczne, biorąc pod uwagę ich względne znaczenie dla HICP usług. Od 2022 roku powszechne stały się publiczne i rządowe dyskusje dotyczące postpandemicznego szoku inflacyjnego, niniejsze badania pozwalają zatem zrozumieć czynniki ekonomiczne, które spowodowały tak ogromną inflację i uzasadniają potrzebę zastosowania środków polityki pieniężnej w celu spowolnienia inflacji.

Słowa kluczowe: ekonomia, inflacja, ceny konsumpcyjne, usługi

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Measuring and Assessing Sick Absence from Work: a European Cross-sectional Study

Elżbieta Antczak https://orcid.org/0000-0002-9695-6300
Ph.D., Associate Professor at the University of Lodz, Department of Spatial Econometrics, Faculty of Economics and Sociology, Lodz, Poland, e-mail: elzbieta.antczak@uni.lodz.pl

Katarzyna M. Miszczyńska https://orcid.org/0000-0003-4924-7605
Ph.D., University of Lodz, Faculty of Economics and Sociology, Department of Public Finance, Lodz, Poland
e-mail: katarzyna.miszczynska@uni.lodz.pl

Abstract

This study analyses sickness absence in selected European countries. We suggested and applied three sick-leave measures: global sickness absence rate, frequency rate, and absolute crude absence rate. To calculate the rates, open access data from Eurostat, the OECD, and the WHO were used. On the one hand, assessing sickness absence is a challenge in spite of accessible numbers of people and days of absence in public and employer registers. Simultaneously, a detailed understanding of sickness benefits and sick-pay schemes is needed to elucidate cross-country differences in sick-leave rates. The long-term dynamic trajectory (1970–2020) and regional differentiation effects on absenteeism among countries were considered. Using correlation coefficients and one-way analysis of variance, a robustness check was performed, and the limitations of the proposed approach to measuring absenteeism were presented. The results evidence that the aforementioned indices present a unique and valid approximation to evaluate and monitor the state of sick absence and inequality in national policies.

Keywords: sickness absence, sick-leave measures, compensated absent workdays, European comparisons, regionality

JEL: C12, F66, J24

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Introduction

Sickness absence entails a work disability that arises from one's own illness or injury (Mekonnen, Lamessa, and Wami 2018). It is high on government agendas, as sickness benefit systems have been reformed in almost all European countries over the past 20 years. However, benefit schemes vary considerably between countries, both in terms of measurable elements (such as the level of remuneration) and non-measurable features that concern the actual implementation of the schemes (Whitaker 2001, pp. 420–410). Assessing sickness absence is a challenge in spite of the accessible numbers of people and days of absence in public and employer registers (Sumanen et al. 2017). Despite this, there is an increasing understanding of sickness absence as a process, which contributes to a growing awareness that it is closely linked to overall economic development and can therefore be used to predict other outcomes.

A detailed understanding of sickness benefits and sick-pay schemes is needed to elucidate cross-country differences in sick-leave rates (Ose et al. 2022, pp. 619–631). Thus, cross-national comparative and collaborative research on sickness absence systems and statistics in Europe is desirable, not only to advance knowledge about return-to-work policies and practices, but also to improve them (Gimeno et al. 2014, pp. 663–666). Sickness absence has been analysed from a number of angles. It covers several different issues: the indirect cost of illness and injury, lost productivity, and the rate of social disengagement (Hill et al. 2008, pp. 840–851).

Scoppa and Vuri (2014) studied sickness absence in Italy. They modelled absenteeism by defining it as the fraction of weeks of sickness absences (over the total number of weeks worked) of individual i in period t (Scoppa and Vuri 2014). They found that unemployment can play a role as a means of disciplining employees because a higher sick-related working absence was related to a higher risk of becoming unemployed. Chimed-Ochir et al. (2019) analysed absenteeism and presenteeism in Japan through worktime lost rates and average working days lost per employee per annum (Chimed-Ochir et al. 2019, pp. 682–688). The worktime lost rate was calculated as the number of workdays lost to sickness absence/presence per year divided by the total number of available workdays and expressed as a percentage. Meanwhile, the average working days lost per employee per annum was calculated as the total number of days with sickness absence/presence divided by the total number of employees. The results revealed that the sick leave rate among Japanese workers is quite lower compared to other countries. However, the authors did not find any statistically significant difference between the work type and presence rates.

Fischer et al. (2020) estimated the potential reduction in future sickness absence in Germany by absence rate (*SAR*). They suggest that the psychosocial characteristics of work may explain a significant portion of future sickness absence rates at the workgroup level. The Insti-

tute for Employment Studies uses the crude absence rate (*ACR*) for measuring the sickness absence (IES 2022). The report points out the advantages of this measure, citing the simplicity of the calculation and its ability to calculate both the percentage of absences by employee group and the sickness absence costs themselves, which are so important from a company's management perspective. Both the frequency absence rate (*FQR*) and *ACR* were used by Lar, Ogbeyi, and Wudiri (2019, pp. 67–74), who examined absenteeism among hospital staff. They confirmed a statistically significant relationship between low wages and absenteeism.

Measures of sickness absence are valuable indicators of employee health and their ability to perform their jobs (Prasad and Puttaswamy 2017). Therefore, they are also an important public health issue in several respects. Lusinyan and Bonato (2004) report on the loss of labour supply (i.e., lost output) and spending pressures resulting from sickness absence. They also provide evidence on employees' health status, job satisfaction and integration in the workplace (Lusinyan and Bonato 2004, pp. 475–538). Another recent study revealed that sickness absence is a risk marker for all-cause mortality (Ropponen et al. 2021). Sickness absences and withdrawals from the labour market also represent a burden on public finances and business costs, a waste of human resources and a burden on those affected.

There is no internationally agreed definition of sickness absence or a specific data source for international comparisons of sickness absence. There are divergent definitions of absence, different inclusion and exclusion criteria, and differences in the populations being compared and in the accuracy of the data collected on sickness absence. Therefore, policymakers and politicians must be careful when interpreting absence data available at national and international levels. For example, social insurance in Poland is universal and compulsory, and therefore covers all employees. Insurance contributions are set in proportion to the salary of the insured. The principle of proportionality is also reflected in the amount of benefits paid out (Garbiec 2019, pp. 7–14). Contributions are charged to employees and employers. Social insurance in Poland includes pension insurance, disability insurance, sickness insurance (insurance in case of illness and maternity), and accident insurance (insurance against accidents at work and occupational diseases) (The Ministry of Familiy, Labour and Social Policy 1998).

By contrast, in the UK, the hours lost due to maternity leave are often not recorded as sickness absence. The contracted hours for those on maternity leave are often still included in the denominator, which could have a significant effect when calculating the rate in working populations with a high female population (Bevan and Hayday 2001). Within the European Union (EU), some countries exclude groups such as all public sector or self-employed workers from the national figures. Others include those on permanent disability benefits or maternity leave in the sickness absence figures, and one cannot separate absence due to illness from other reasons for absence (Whitaker 2001, pp. 420–410).

In this study, we analyse and explain the results of sickness absence in selected European countries by applying three sick-leave measures. We contribute to the very limited empirical literature in several ways. First of all, there is no unique data source to be used for international comparisons. Data availability differs across countries and programmes, and some types of information may be more difficult to obtain than others. Therefore, we ensure consistency and comparability across countries by keeping data collection efforts at a reasonable level. We use free and open access data from Eurostat, the OECD's Social Benefit Recipients Database, the WHO European Data Warehouse, and national administrative sources responsible for compensating absence from work due to illness. Thus, this analysis provides a degree of flexibility to take into account the data situation in each country.

To get the fullest possible picture of European sickness absence, the perspective was extended to Norway and the UK, and we considered the long-term dynamic trajectory of absenteeism in Europe (1970–2020). Using correlation coefficients and one-way analysis of variance, some limitations, a robustness check, and national implications of the proposed approach to measuring absenteeism were performed. The end of 2019 and the beginning of 2020 were marked by the outbreak of the COVID–19 pandemic, which led almost all governments around the globe to take restrictive measures; social distancing had a pivotal role. In this study, we provide findings that the pandemic might have increased rates of health-related workplace absenteeism during this period. The implications of this study also indicate an important contribution to the theory of investigating the economic impact of employee sickness absence. The measures proposed in the article are universally applicable. They can be used not only to look for causes of sickness absenteeism but also for differences in the pattern of absenteeism by gender, age, or disease. Importantly, they can also be used to calculate the indirect costs of lost productivity. A strength of the proposed measures is that they can be employed to study regional similarities and differences in patterns of absenteeism and its costs in different countries. Indirectly, this also identifies worker presenteeism. The presented measurements may also provide an important source of information about employee health and the consequences of illness in epidemiological studies.

The structure of the article is as follows. Section 2 presents the data set across time and countries and characterises the methods of analysis. Section 3 contains the results of international comparisons of sickness absence patterns, economic implications, and robustness check analysis. In Section 4, we present results that show the development of our proposed measures of sick-related absenteeism in 25 European countries. In section 5, we conclude the article by characterising the usefulness of our proposed measures in international comparisons. In addition, we also point out the study's limitations and suggest directions for further research.

Data and methodology

Data

As the work sickness absence measure has been defined in various ways, this section presents three indicators of sick-related absences based on openly available data from European Health for All database, from World Health Organization (2022), the European Labour Force Survey for European countries and national surveys for other countries, Eurostat (2022), National Central Banks (Working Group on General Economic Statistics), the European Commission (Havik et al. 2014; European Commission 2022), Health Statistics from Organisation for Economic Co-operation and Development (OECD 2022), and national administrative sources responsible for compensating absence from work due to illness (e.g., social security, public or private insurance agencies).

To calculate the global sickness absence rate, *SAR* (1) for working populations, we used the European Labour Force Survey for European countries and Eurostat's database for national surveys for other countries (Eurostat 2021):

$$SAR = \frac{\text{absences from work due to own illness or disability}}{\text{employed aged } \ 20-64} \cdot 100\% . \qquad (1)$$

This SAR (1) includes the seasonally adjusted number of employed people who were absent from work due to their own illness or disability and the number of employed people aged 20–64. It excludes maternity leave. The SAR index refers to the share of the population indicating "sickness and disability" as the main reason for their inactivity. This annual rate can be calculated among the majority of European countries, i.e. Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, the United Kingdom, Liechtenstein, Norway, Switzerland and Turkey, three EFTA countries (Iceland, Norway and Switzerland), one candidate country (Serbia) and the South-eastern Europe Health Network members of Montenegro and North Macedonia. The available period for this measure is 2006–2020.

The frequency rate (*FQR*) refers to the average number of compensated absent workdays (number of days covered and compensated by social insurance) per employed person lost due to sickness or injury per year:

$$FQR = \frac{\text{Average number of working days lost due to own illness}}{\text{employed aged } \ 20-64} \qquad (2)$$

Maternity leave is not included. The Labour Force Survey (LFS) defines an employee as an individual who works for a public or private employer and who, in return, receives compensation in the form of wages, salaries, fees, gratuities, payment by results, or payment in kind. Professional military staff are included here (Eurostat 2022). The values of this measure could be extracted from the openly available European Health for All database for 53 countries (World Health Organization 2022): Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, the Netherlands, North Macedonia, Norway, Poland, Portugal, the Republic of Moldova, Romania, the Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Turkmenistan, Ukraine, the United Kingdom, and Uzbekistan. These countries are also divided into the following groups: WHO European Region, Members of the EU, Members of the EU before May 2004 (EU15), Members of the EU after May 2004 (EU13), the Commonwealth of Independent States, Central Asian Republics Information Network members (CARINFONET), South-eastern Europe Health Network members (SEEHN), Nordic countries, and small countries. We conducted the preliminary analysis for the period 1970–2020.

The third indicator (*ACR*) is the absolute crude absence rate (Ropponen et al. 2021; IES 2022). It is usually calculated as the time lost due to, or ascribed to, sickness absence as a percentage of contracted working time in a defined period. To calculate the total national number of available workdays, the number of employees was multiplied by the number of rostered workdays per year for each country (3):

$$ACR = \frac{\begin{array}{c}number\ of\ workdays\\ lost\ to\ sickness\ absence\end{array}}{\begin{array}{c}number\ of\ available\ workdays\\ *employed\ aged\ 20-64\end{array}} \cdot 100 \tag{3}$$

We obtain the total number of available rostered workdays per year for each of the 28 European countries (Austria, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom) from National Central Banks (the Working Group on General Economic Statistics) as a monthly number of working days (Monday to Friday), excluding public holidays (European Commission 2022). The number of compensated workdays (number of days covered and compensated by social insurance) lost per employed person due to sickness or injury per year and the number of employees was extracted from European Health for All database (HFA-DB, WHO). To calculate the *ACR* (3), we provided the data on the number of employed people aged 20–64 from European LFS (Eurostat 2021).

Methods of checking robustness

The collected data were checked and analysed by SPSS v. 20 and ArcGIS v. 10.6. Descriptive analyses, e.g., the mean, coefficient of variation, annual growth rate, and data visualisation, were calculated to provide the most complete picture of European sickness absence. To find, analyse, and compare trends in the data, we applied average annual least-squares growth rate (4), (5). It is estimated by fitting a linear regression trend line to the logarithmic annual values of the variable in the relevant period. The regression equation is of the form:

$$\ln xt = a + bt, \tag{4}$$

which is equivalent to the logarithmic transformation of the compound growth equation:

$$xt = x0\left(1 + r\right)t. \tag{5}$$

In this equation, x is the variable, t is time, and $a = \ln x0$ and $b = \ln (1 + r)$ are the parameters to be estimated. If $b^{\star}$ is the least-squares estimate of b, the average annual growth rate, r, is obtained as –1 and is multiplied by 100 for expression as a percentage. The calculated growth rate is an average rate that is representative of the available observations over the entire period. This approximation is appropriate for large percentage time changes. This approximation is appropriate for large percentage time changes (World Bank 2022).

To consider the uncertainty and sensitivity inherent in the suggested measures of sick-related absences from work (1)–(3), we performed a robustness check using Spearman's rank correlation (6), (7) and one-way analysis of variance (8). We tested the similarity (and the association) of measurements. We also examined the explanatory power of indices by linking these sickness absence rates with the unemployment rate, labour costs, labour productivity, and mortality.

Our data are not normally distributed; thus, we applied the non-parametric Spearman correlation (6). As our data include outliers, it necessitates the use of Spearman's correlation coefficient (Gauthier 2001, pp. 359–362):

$$r_s = 1 - \frac{6 \cdot \sum_{i=1}^{n} d_i^2}{n(n^2 - 1)}. \tag{6}$$

To test the significance of correlations, we employed the *t*-distribution formula to compute the appropriate *t*-value methods in this paper (Bishara and Hittner 2012, pp. 399–417):

$$t = \frac{r_s}{\sqrt{1 - r_s^2}} \cdot \sqrt{n-2}\,, \tag{7}$$

where: t – *t*-value required for the test of significance of the correlation coefficient, and r – the computed correlation coefficient being tested for significance. The null hypothesis is that there is no significant relationship between variables (i.e., $rs = 0$). This is a two-tailed statistical test of significance, which is used when the null hypothesis is non-directional (Kpolovie 2011).

Finally, by applying the Kruskal–Wallis (H) technique (8), we tested the significance of the difference between year-wise and cross-country mean sickness absence rates for the respective period and country. The H test is a non-parametric test, which means that it does not assume the data come from a distribution that can be completely described by two parameters, mean and standard deviation (the way a normal distribution can) (McDonald, Verrelli, and Geyer 1996, pp. 1114–1118). The formula for the Kruskal–Wallis (H) test is:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3(n+1), \tag{8}$$

where: Ri – the different ranks for each of the different groups, n – the number of observations in all samples.

The Kruskal–Wallis statistic is approximately a chi-square distribution, with $k - 1$ degrees of freedom, where ni should be greater than 5 (Hecke 2012, pp. 241–247). The uncertainty and sensitivity analysis helped gauge the robustness of the indicators and improve the transparency of sickness absenteeism rates (OECD 2008).

Results

Data analysis

To provide the most comparable picture of European sickness absenteeism, the cross-country perspective was limited to 25 European countries: Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), the Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Italy (IT), Latvia (LV),

Lithuania (LT), Luxembourg (LU), the Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), the United Kingdom (UK), and Norway (NO). Moreover, because the data set was not a complete panel due to the gaps in some variables during the analysed period, we conducted the preliminary data analysis in various time spans, i.e., 2006–2020 for *SAR*, 1970/1995–2020 for *FQR*, and 1995–2020 for *ACR*. To overcome the panel-unbalanced problem, the main comparative study and robustness check were conducted for the 2006–2020 period. Table 1 displays the summary statistics of the sickness absence, frequency, and absolute crude absence rate.

Table 1. Statistics of *SAR*, *FQR*, and *ACR* (averaged over the years)

Measure	Mean	Std. Dev.	Min	Max	Median	CV in %
Time span 1970/1995–2020						
SAR	1.8	0.9	0.07	4.1	1.8	51.4
FQR	12.1	4.8	1.7	26	11.6	40.0
ACR	4.5	1.6	0.7	9.9	4.3	35.7
Time span 2006–2020						
SAR	1.8	0.9	0.07	4.1	1.8	51.4
FQR	10.8	3.6	1.7	21.2	10.8	33.7
ACR	4.3	1.5	0.7	8.5	4.2	34.2

Note: n = 25, data for 1970–2020 are only available for AT, BE, CZ, DE, FR, GR, HU, IT, LU, NL, NO, PT, and SE. CV – coefficient of variation; Std. Dev. – Standard deviation. For *SAR*, the data were only available for 2006–2020. We used non-parametric statistics because the test of normality carried out (the Shapiro-Wilk test) rejected the null hypothesis of normality at the significance level of 0.05. The results are available from the author on request.
Source: own elaboration.

The average rate of absence due to own illness or disability (*SAR*) corresponded to 1.8% of employed people in the 2006–2020 period. The statistics show that *SAR* values vary considerably across the countries (CV = 51.4%). Norway had the highest share of employed people who were absent from work due to their own illness or disability (4.1% in 2009). Romania and Greece, on the other hand, had the lowest *SAR* in this timeframe (0.07%). Between 1970 and 2020, and between 2006 and 2020, the average number of workdays lost per employee due to sick leave and sickness presence was calculated to be 12.1 and 10.8 days, respectively. The *FQR* values vary widely across the countries (CV = 40%), from 1.7 in Greece to 26 in Sweden (and in the period 2006–2020, from 1.7 in Greece to 21.2 in the Czech Republic, respectively). The countries lost an average of 4.5% and 4.3% of their workers' total working days due to illness or disability during the 1970–2020 and 2006–2020 periods, respectively. In general, the *ACR* values revealed

strong cross-country variation, from 0.7% in Greece to 9.9% in the Czech Republic between 1970 to 2020, and from 0.7% in Greece to 8.5% in the Czech Republic between 2006 and 2020 (CV = 35%).

As shown in Figure 1, sickness-related absenteeism in Europe peaked in the period 2006–2020. Germany, Latvia, Portugal, and Slovakia saw the largest *SAR* increases, by more than 100 percentage points (pp.). For example, in Germany, the *SAR* increased by 125 pp., in Latvia by 112 pp., in Portugal by 147 pp., and in Slovakia by 142 pp. A decrease in *SAR* was recorded only in nine countries (Denmark, Finland, Italy, Lithuania, the Netherlands, Romania, Sweden, and the United Kingdom). On the other hand, the highest decline was observed in Romania – more than 30 pp. The share of employed people who were absent from work due to their own illness or disability in 2006 was highest in Norway, Finland, Sweden, Slovenia, and Spain (ranging from 2.6% in Finland to 3.6 in Norway).

The Netherlands (81.7%), Sweden (80.7%) and the Czech Republic (80.0%) had the highest employment rates in the EU, with more than 8 out of 10 people aged 20 to 64 in employment in 2021. Norway (3.9%), Spain (3.7%), Slovenia (3.2%), France (3.4%), Belgium (3.4%), and Germany (3.0%) had the highest *SAR* rates in 2020. In 2006, Norway (17.2) and the Czech Republic (21.2) had the largest average number of workdays lost per employee due to sick leave and sickness presence (*FQR*). By contrast, *FQR* was the lowest in Greece (3.4) and the United Kingdom (5.5). In 2020, the *FQR* was the highest in the Czech Republic (21), Denmark (19.5), Spain (17.4), Slovakia (16.9), Norway (16.8), and Luxemburg (16.2). As shown in Figure 1, in 2020, the average number of workdays lost due to sickness per employee was the lowest in Greece (3.4) and the UK (3.6). The largest increases in *FQR* between 2006 and 2020 were recorded in Lithuania (85%) and Luxemburg (67%). By contrast, in 2020, seven countries recorded a frequency rate lower than in 2006. The largest declines compared to 2019 were reported in the UK (–35%) and Romania (–28%). In 2006, the highest absolute crude absence rate (*ACR*) was in the Czech Republic (8.7%) and Norway (6.7%), while in 2020, it was in the Czech Republic (8.4%), Germany (7.8%), and Slovakia (6.6%). Between 2006 and 2020, the highest increases in the proportion of days lost due to illness or disability were recorded in Lithuania (80 pp.), Luxemburg (64 pp.), Germany (46 pp.), and Slovakia (41 pp.). The largest declines compared to 2006 were reported in the UK (–35 pp), Romania (–27 pp.), Sweden (–25 pp.), and Italy (–22 pp.).

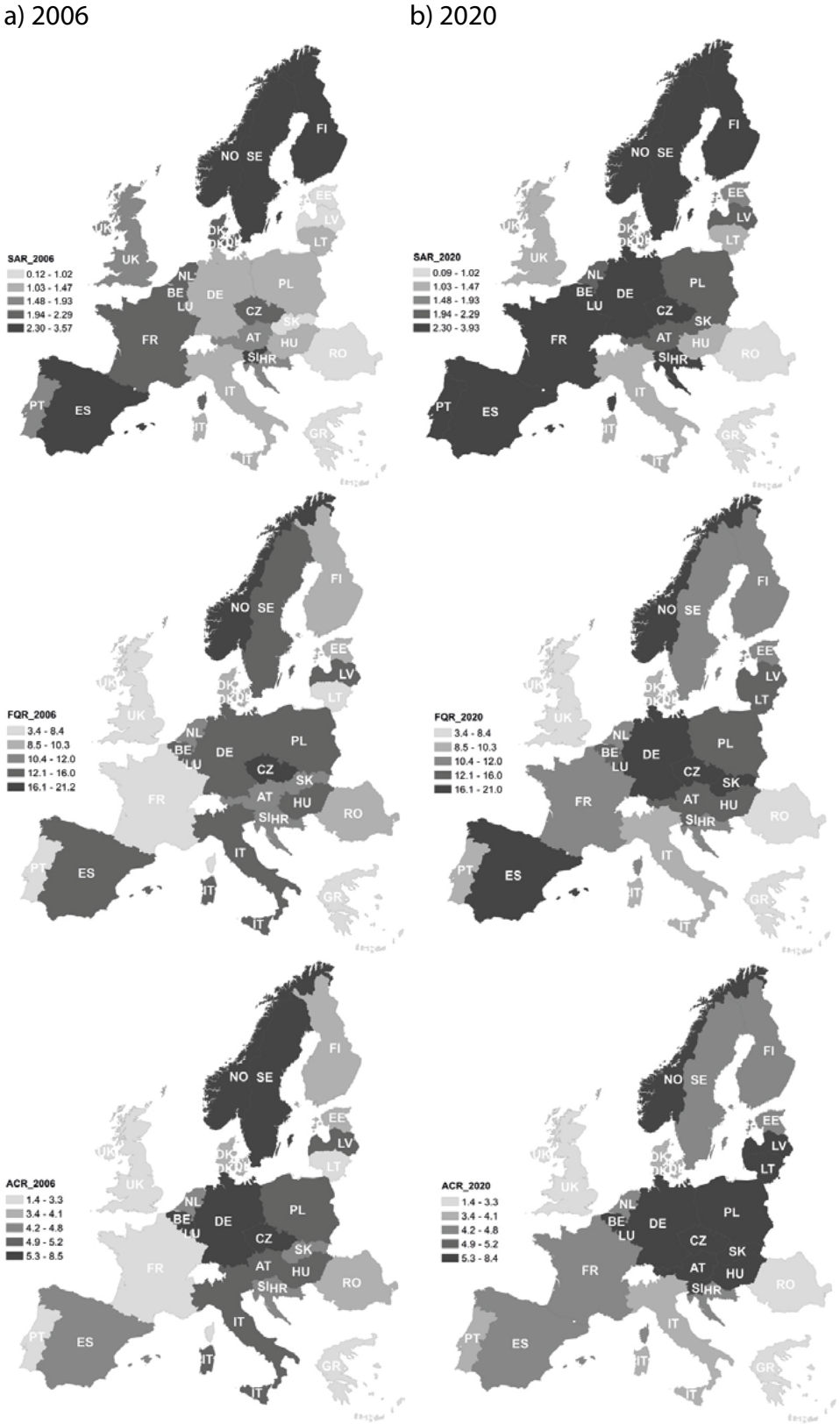

Figure 1. *SAR*, *FQR* and *ACR* for European countries in selected years

Source: own elaboration.

To examine trends in *SAR*, *FQR* and *ACR* assets, we applied an average annual least-squares growth rate (4), (5). The annual average percentage change in the mean volume of sickness absence, frequency, and absolute crude absence rates was 1.17 pp., 0.19% and 0.12 pp., respectively (Figure 2). It implies a yearly increase of 1.17 pp. of the share of employed people who were absent from work due to their own illness or disability, 0.19% of the number of workdays lost per employee due to sick leave and sickness presence, and 0.12 pp. of the proportion of days lost of workers' total working days due to illness or disability in 2020 compared to 2006. The fastest *SAR* growth rates were in Portugal (7.6 pp.), Slovakia (5.5 pp.), and Germany (5.4 pp.). However, 11 countries noted a yearly decrease in the sickness absence rate (from –3.1 pp. in Romania to –0.2 in Slovenia pp.). Similarities in time change patterns can be detected when comparing the year-on-year growth rate of *FQR* and *ACR*. Seven EU Member States registered a decrease in the share of employed people who were sick-absent from work and the proportion of lost days due to illness or disability (the UK stood out with the highest decline, of –2.98 % in *FQR* and –3.04 pp. in *ACR*). In contrast, Lithuania and Luxemburg experienced the largest increases in the yearly growth rate (+4.51 %. and 3.73 pp. in *FQR*, +4.30 % and +3.61 pp. in *ACR*, respectively).

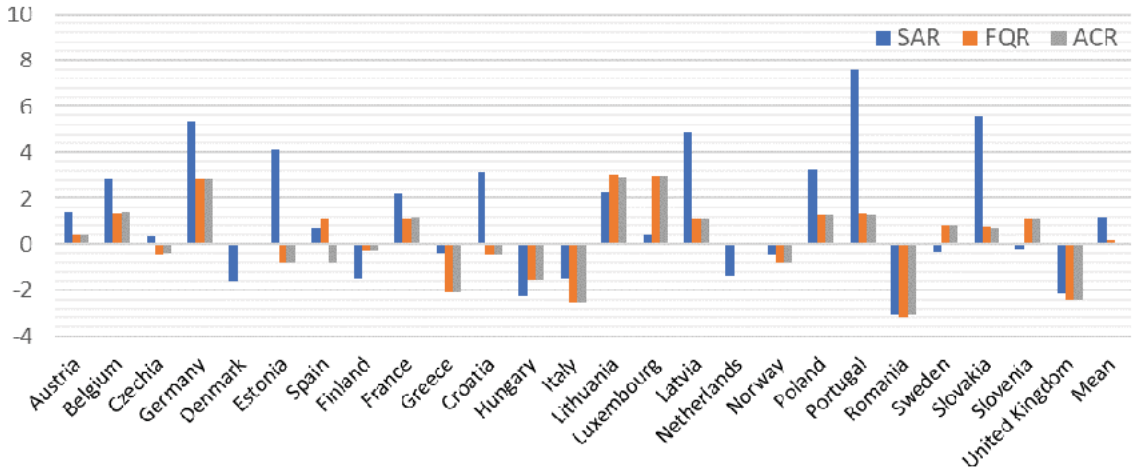

Figure 2. Annual average growth rate during the period analysed

Note: for *SAR* and *ACR* time-changes are noted in pp., and for *FQR* in %.
Source: own elaboration.

From 2019 to 2020, when the COVID–19 pandemic started, most countries registered an increase in all sickness-related absence rates. As shown in Figure 3, on average, the highest increase was observed in the sickness absence rate, *SAR* (21.1 pp.). However, the European average hides many differences among countries, with the highest increase in rates observed in Greece (over 100 pp.), Hungary (over 50 pp.), and Lithuania and Italy (over 40 pp.). Indeed, when comparing 2020 with 2019, only six countries saw a decrease. This was true for Germany, Croatia, and the UK for all measurements, Sweden and Latvia for *FQR* and *ACR*, and Slovenia for *ACR*.

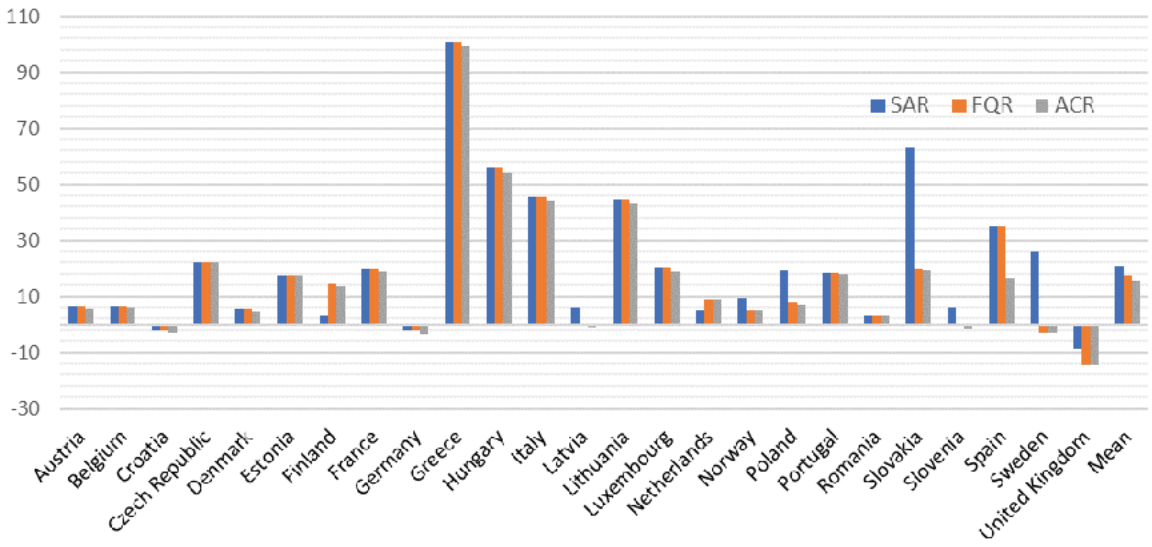

Figure 3. Changes in the absent rates (2020 versus 2019)

Note: for *SAR* and *ACR*, time changes are noted in pp., and for *FQR*, in %.
Source: own elaboration.

European economies and trends in sickness absence – implication analysis

Our data shows that the unemployment rate in most countries was negatively correlated with sickness absence measurements at the national level: the higher the unemployment, the lower the sickness absence. The strongest association was noticed for Denmark, Spain, Croatia, and Poland (from –0.60 to –0.98). Even though the correlation coefficients in some countries were somewhat modest, they were statistically significant during the 2006–2020 period. The measurements of sickness absence were also predictive of deaths for most countries. The strongest positive correlations were observed in Denmark, France, Poland, and Portugal (from 0.50 to 0.93). By contrast, in Romania, Finland, Italy, and the UK, the rise in absence rates decreased the death rate. In general, sickness absenteeism substantially dampens labour productivity (e.g. in Austria, Spain, and Romania), but for some countries, this association was the opposite (e.g., Poland, Finland, and Italy). These findings can help to value the burden of illness-related absenteeism. Finally, in many countries, higher sickness absence (regardless of the method of measurement) involves greater costs for society and for the entire economy (through the loss of working hours and production). The highest correlation values between sickness absence rates and labour costs (from 0.61 to 0.99) were particularly noted in Central and Eastern Europe, i.e., in Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia (Tab. 2).

Table 2. Spearman's rank correlations on the absenteeism-unemployment relationship calculated for each country, 2006–2020

	Spearman's rank correlations											
	UE			PD			RD			LC		
	SAR	*FQR*	*ACR*	*SAR*	*FQR*	*ACR*	*SAR*	*FQR*	*ACR*	*SAR*	*FQR*	*ACR*
AT	−0.07	−0.47*	−0.46*	−0.69**	−0.64**	−0.65**	0.74***	0.68**	0.71**	0.69**	0.71**	0.73**
BE	−0.46*	−0.52**	−0.52**	−0.12	−0.13	−0.12	0.44*	0.52*	0.51*	0.93***	0.99***	0.99***
CZ	−0.39*	−0.44*	−0.44*	0.15	0.20	0.21	0.68**	0.39*	0.40*	0.77**	0.87***	0.88***
DE	−0.98***	−0.96***	−0.95***	−0.61**	−0.60**	−0.59**	0.91***	0.93***	0.92***	0.85***	0.77**	0.71**
DK	−0.51*	−0.78***	−0.79***	−0.75***	−0.34*	−0.37*	0.82***	0.50*	0.49*	0.43*	0.67**	0.58**
EE	−0.42*	−0.63**	−0.61**	0.35	−0.29	−0.29	−0.20	0.78***	0.78***	0.90***	0.81***	0.80***
ES	−0.93***	−0.93***	−0.91***	−0.83***	−0.85***	−0.83***	0.68**	0.73**	0.20	0.79**	0.84***	0.80***
FI	−0.34	−0.55*	−0.79***	0.76***	0.59**	0.58**	0.79***	−0.12	−0.11	−0.13	0.73**	0.73**
FR	−0.13	−0.07	−0.04	−0.62**	−0.41*	−0.4*	0.91***	0.87***	0.87***	0.76**	0.82***	0.82***
GR	−0.39*	−0.54**	−0.53**	0.03	0.49*	0.48*	0.02	−0.3	−0.3	0.22	−0.13	−0.15
HR	−0.72***	−0.86***	−0.85***	0.16	−0.32	−0.31	0.59**	0.01	−0.01	0.81***	0.56*	0.54*
HU	−0.07	−0.35	−0.36*	−0.04	−0.17	−0.19	0.40*	0.48*	0.49*	0.61**	0.76**	0.78**
IT	−0.33	−0.53**	−0.54**	0.44*	0.65**	0.65**	−0.16	−0.32	−0.34	−0.35*	−0.35*	−0.35*
LT	−0.69***	−0.54**	−0.58**	0.15	0.68**	0.67**	0.49*	0.84***	0.84***	0.80***	0.83***	0.83***
LU	0.16	0.74***	0.74***	−0.17	−0.82***	−0.82***	0.14	−0.5*	−0.5*	−0.06	0.72**	0.72**
LV	−0.12	−0.48*	−0.47*	0.73***	0.21	0.21	0.44*	0.47*	0.47*	0.85***	0.88***	0.89***
NL	−0.54**	−0.77***	−0.75***	0.64**	0.08	0.08	−0.31	0.25	0.26	0.78**	0.83***	0.81***
NO	−0.49	−0.73***	−0.72***	0.14	0.50**	0.53**	0.41*	0.74**	0.75**	0.58**	0.25	0.11

	Spearman's rank correlations											
	UE			PD			RD			LC		
	SAR	*FQR*	*ACR*	*SAR*	*FQR*	*ACR*	*SAR*	*FQR*	*ACR*	*SAR*	*FQR*	*ACR*
PL	−0.60**	−0.89***	−0.89***	0.88***	0.71***	0.71***	0.88***	0.76**	0.73**	0.79**	0.85***	0.85***
PT	−0.23	−0.89***	−0.89***	−0.69***	−0.67***	−0.68***	0.85***	0.77**	0.75**	0.93***	0.94***	0.94***
RO	0.50*	0.48*	0.47*	−0.71***	−0.74***	−0.73***	−0.53*	−0.57*	−0.56*	−0.37*	−0.37*	−0.36*
SE	−0.32	−0.62**	−0.63**	0.16	−0.26	−0.25	0.36*	−0.01	−0.02	0.30	−0.24	−0.30
SK	−0.54**	0.06	0.05	−0.45**	0.05	0.04	0.65**	0.44*	0.44*	0.80***	0.73**	0.74**
SI	−0.92***	−0.31	−0.36*	0.15	−0.01	0.05	0.28	0.74**	0.70*	0.99***	0.94***	0.90***
UK	0.59**	0.55**	0.54**	−0.29	−0.2	−0.19	−0.17	−0.15	−0.16	−0.35*	−0.06	−0.06

Note: significance levels: α = 0.10*, 0.05**, 0.01***; UE – unemployment rate as a percentage of the population in the labour force, aged 15 to 74 years; PD – nominal labour productivity per person; DR – death rate, crude (per 1,000 people); LC – hourly labour cost per employee in PPP.
Source: own elaboration. Robustness check of outcomes

As Table 3 below shows, the results of the Spearman's rank correlation confirmed for most countries that the frequency rate and absolute crude absence rates were strongly related (the Spearman's values were close to 1.00 and statistically significant). It suggests that *FQR* and *ACR* are quantitatively similar indicators but could be applied to obtain diverse and country-case-specific conclucions on sick absences from work at the national level. The results also showed that the *SAR* moderated the relationship between *FQR* and *ACR* with noticeable differences between countries. For example, for Germany, to define the sickness absence rate, all the indices could be used alternatively and substantively (the Spearman's values are statistically significant and have an identical trend), but for Latvia, the results revealed differences.

Table 3. Spearman's rank correlations calculated for each pair of sick-related absence rates, 2006–2020

	Spearman's rank correlations		
	SAR vs. FQR	*SAR vs. ACR*	*FQR vs. ACR*
Austria	0.659***	0.686***	0.992***
Belgium	0.525**	0.525**	1.000***
Czech Republic	0.889***	0.889***	1.000***
Germany	0.968***	0.957***	0.996***
Denmark	0.646***	0.629**	0.984***
Estonia	0.3986	0.425	0.996***
Spain	0.988***	0.871***	0.865***
Finland	0.570**	0.571**	0.990***
France	0.734***	0.737***	0.990***
Greece	0.645***	0.629**	0.996***
Croatia	0.5036	0.496	0.986***
Hungary	0.817***	0.818***	0.996***
Italy	0.850***	0.846***	0.996***
Lithuania	0.693***	0.704***	0.996***
Luxembourg	0.3148	0.311	0.998***
Latvia	0.532**	0.500	0.993***
Netherlands	0.658***	0.565**	0.908***
Norway	0.744***	0.731***	0.999***
Poland	0.700***	0.711***	0.996***
Portugal	0.4781	0.484	0.998***
Romania	0.928***	0.944***	0.992***

	Spearman's rank correlations		
	SAR vs. FQR	*SAR vs. ACR*	*FQR vs. ACR*
Sweden	0.770***	0.761***	0.999***
Slovakia	0.2970	0.289	0.998***
Slovenia	0.2144	0.189	0.963***
United Kingdom	0.981***	0.981***	0.995***

Source: own elaboration.

The results of the Kruskal–Wallis test confirmed significant differences in sick-related absences indices among countries during the period analysed (Tab. 4). The mean ranks of the Kruskal–Wallis and Dunn's multiple comparisons show that Norway was the biggest discriminator of differences among sick-leave absence measurements, followed by Greece and the Czech Republic, whereas Slovakia and Slovenia were the weakest discriminators.

Table 4. Results of the Kruskal–Wallis test on the difference of sick-related absence index among countries

	Kruskal–Wallis on countries differences		
Measure	*SAR*	*FQR*	*ACR*
Chi-square	323.5***	312.9***	316.2***

Note: the results of mean ranks of the Kruskal–Wallis test and pairwise comparison of Dunn's post hoc tests are available upon request.
Source: own elaboration.

Discussion

As there is no single data source to be used for international comparisons, data availability differs across countries, and some types of information may be more difficult to obtain than others. The vast majority of European countries have statutory paid sick-leave systems, although there are differences in the legitimation of work incapacity, level of sick pay, and criteria for transferring people to invalidity insurance. The validity of diagnoses recorded in medical certificates is a kind of data; however, validity and reliability vary between registers and certificates. These complexities are often overlooked. Therefore, we have limited our study to 25 European countries and the available comparative time span. In spite of the quite close link among the suggested measurements, they vary across countries and therefore provide a substantially different and broader picture of a health problem in Europe. The *SAR* index, calculated by the Eurostat, is a basic

measure of health status for working populations with the whole population of those who are sickness insured.

SAR is based on records from health insurance or company registers. While they provide the main source of information for each country, they are affected by different national practices in the recording of such absences. Moreover, *SAR* may be relatively stable over time, even though the number of absent staff may be increasing and the duration of absences falling, and vice versa. However, a robust set of indicators has been developed at the European level to track progress in compensated sickness absence (Eurostat 2021). Therefore, The results are comparable between countries since EU LSF is based on the same target populations and uses the same definitions in all countries (Weik 2000).

If data are unavailable for a country, the corresponding aggregates are calculated with estimates (Current Population Survey 2021). There is a limitation in our approach when it comes to measuring absenteeism using the *SAR* indicator. Sickness absence is recorded for administrative and economic reasons, and as such, the data are often valid, at least in terms of numbers. However, the validity of diagnoses recorded in medical certificates is a different type of data, and the validity and reliability can vary between registers and certificates. Even within the same country, sickness absence can be defined differently by different organisations. In some places, a month's sickness absence is recorded as four calendar weeks (28 days), while in others, it is four working weeks (20 days) (Whitaker 2001, pp. 420–410). Moreover, the insurance schemes vary widely between countries, both in terms of measurable entities (such as the compensation level) and unmeasurable traits concerning the actual implementation of the programs (Palme and Persson 2020, pp. 85–108).

Additionally, sickness absence can be self-reported. As such, it shares pros and cons with other self-reported information, particularly regarding recall bias (OECD 2007). The other two indices suggested in this study could be a good alternative to *SAR*. Thus, the *FQR* and *ACR* indicators answer a basic question about the proportion of lost working time. These measurements can be used for costing purposes. The difference between the absence rate (*SAR*), the absence frequency rate (*FQR*), and the absence crude rates (*ACR*) is that the absence rate indicates severity, while the absence frequency and crude rate are about the absence pattern (Scheil-Adlung, Sandner 2010). In our data, we also found a very close relationship between *FQR* and *ACR*. Both are relevant measures and can be used to assess the burden of illness in a region or society (Hensing 2010). The frequency rate shows the average number of absence days per insured person, whereas the annual crude rate refers to the number of workdays lost to sickness absence per year divided by the total number of available workdays multiplied by the number of rostered workdays per year. Confirming Johns and Al Hajj's (2016, pp. 456–479) statement,

we also concluded that the idea that time lost and frequency reflect different degrees of voluntariness is an unsupported urban research legend.

Moreover, the outcomes of the implication analysis showed that *FQR* and *ACR* are highly (more than *SAR*) and statistically significantly negatively correlated with the unemployment rate (especially for Denmark, Spain, Croatia, Poland, and the Netherlands). The literature on the subject stresses that unemployment has been found to have a negative impact on workers' decisions to take sick leave (Blomgren, Laaksonen, and Perhoniemi 2021; Reuter, Dragano, and Wahrendorf 2021, pp. 574–580). Therefore, these measurements may report employee burnout and lost productivity (Knies et al. 2013). This is in line with recent results from Poland, where it is possible to confirm the impact of cyclical unemployment on absenteeism behaviour and determine several premises that may indirectly prove the impact of seasonal unemployment (Kusideł and Striker 2016, pp. 6–10; Jurek, 2021 pp. 197–219).

It is appropriate to analyse the situation in which employees are more likely to choose presenteeism over sickness absence, which is associated with high regional unemployment and, consequently, a much-reduced prospect of finding another job (Caverley, Cunningham, and MacGregor 2007; Janssens et al. 2013, pp. 132–141; Nowak et al. 2022). What is more, for some countries, the indices were positively correlated with the unemployment rate, but simultaneously, they decreased labour productivity. These results support the novel way of assessing and controlling presenteeism in Romania, Luxemburg and the UK (Cicei, Mohorea, and Teodoru 2013, pp. 325–329; Collins, Cartwright, and Cowlishaw 2018, pp. 68–83). Furthermore, the outcomes of the analysis revealed that for most countries, the sickness absence measurements were strong predictors of death (Ropponen et al. 2021). However, the associations between sickness absences and mortality were stronger for the *SAR* measure, and in some cases, they became non-significant after adjusting for *FQR* and *ACR* sickness absence rates.

These findings correspond with Finnish, Swedish and Danish conclusions, which suggest that measures of sickness absence, such as long-term absence and sick days (*FQR* or *ACR*), are strong predictors of the cause of mortality, but only due to cardiovascular disease, cancer, alcohol-related causes, and suicide (Qin et al. 2000, pp. 546–550; Vahtera, Pentti, and Kivimäki 2004, pp. 321–326; Billingsley 2020). Finally, the results indicated that sickness absenteeism directly affects labour costs (Csillag 2019, pp. 195–225; Garbiec 2019, pp. 7–14). It was particularly noticed in post-communist countries, where in the early 2000s, policymakers decided to change the sickness insurance system and decrease benefits to zero for the first three days of absence (Barmby, Ercolani, and Treble 2002, pp. 315–331; De Paola, Scoppa, and Pupo 2014, pp. 337–360). The opposite correlations were detected for Sweden, Norway, and the UK, as confirmed in the literature on the subject. For example, the higher level of absenteeism in Norway compared to Britain relates to the threshold for statutory sick pay in the Norwegian public sick pay legislation. More-

over, in those countries, private sick pay, as well as other benefits provided by employers, are chosen by employers in a way that maximises profits, having accounted for different dimensions of labour costs (Bryson and Dale-Olsen 2019, pp. 227–252).

The main limitation of *FQR* and *ACR* is that the time lost may consist of a small number of people absent for long periods or a large number absent for short periods, while "length of sickness- work lost" is a measurement relevant for use in studies of return to work (Hensing 2010). However, there are several advantages of these measurements of sick-related absences from work. They appear to be the most appropriate for measuring absenteeism from a macro perspective. They are calculated from free open data sources, and no additional rules, definitions, or modifications to existing data are needed to calculate these indices.

We conclude that the use of the surveyed measures could also identify and describe the changes made to the health workforce and medical system of each country as a result of the COVID–19 pandemic. This is consistent with the International Labour Organisation's (ILO) view that the COVID–19 crisis revealed important gaps in social protection entitlements in the event of illness (Ose et al. 2022).

Conclusions

The results of this analysis revealed that, despite the obvious quantitative nature of sickness absence, measured as an occurrence or as a period, assessing sickness absence is a challenge with little standardisation at the national level. Comparing sick-leave rates is a complex task that requires a clear understanding of the interplay between statutory, corporate and private forms of income protection during sickness absence. Because of the multiplicity of approaches to defining sickness absence, it is necessary to provide unambiguous definitions. This article presents three indicators of sick-related absences based on openly available data: the global sickness absence rate, the frequency rate, and the absolute crude absence rate.

Different measures are, of course, needed for different types of studies and different aims. However, the indices presented in this article may constitute new health management paradigms in European countries, and they can be used to show whether patterns of absence are stable or not. Such a comparison has not been done before, but it should be relevant when considering that absenteeism among employees represents a significant financial burden. In recent decades, monitoring sickness absence has become a priority in many management programs, and absenteeism data are increasingly used as an integrated measure of health status in the employee population. Crucially, the findings also help to value the burden of illness-related absenteeism.

They are also relevant in sickness absence research and health-related studies, and as such, they constitute the basis for epidemiological monitoring and studies of occurrence and causes of absenteeism. For instance, *SAR* is considered a global measure of health status, a marker of psychosocial and physical functioning for working populations. It is possible to develop and adapt that index to the micro-level, i.e., the individual enterprise. Therefore, it would be worthwhile for future research to focus on assessing the adequacy of using individual measures from a micro perspective. From the perspective of the objective pursued in this study, it would be worth extending the study to a less policy-homogeneous group of countries. Modelling carried out in this way would reveal a more accurate nature of sickness absence. Future research should also analyse the relationship between presenteeism and sickness absence. More generally, this is when individuals substitute sickness absence for presenteeism when absence is an unavailable choice, such as when there is job insecurity or financial insecurity, which is more pronounced when regional unemployment is high.

Regarding the study's limitations, the availability and quality of the data collected were major concerns. However, the results show that the aforementioned indices present a unique and valid approximation to evaluate and monitor the state of sick absence and inequality in European countries and to better set national policy priorities.

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Pomiar i ocena absencji chorobowej pracujących: badanie przekrojowe w krajach Europy

W artykule dokonano obszernej analizy absencji chorobowej pracowników w krajach Europy. W tym celu skonstruowano i przetestowano trzy miary absenteizmu: globalny wskaźnik absencji, wskaźnik częstości absencji i surowy absolutny wskaźnik absencji. Do obliczenia wskaźników wykorzystano dane pochodzące z baz mających otwarty dostęp, m.in. Eurostatu, OECD, WHO. W artykule uwzględniono długookresową trajektorię (1970–2020) oraz wpływ zróżnicowania regionalnego na absencję chorobową pracujących. Wykorzystując współczynniki korelacji i analizę wariancji, przetestowano odporność miar oraz przedstawiono ograniczenia proponowanego podejścia. Wyniki dowodzą, że proponowane wskaźniki stanowią unikalne narzędzie służące ocenie i monitorowaniu stanu absencji chorobowej w krajach europejskich. Co więcej, miary dają pewną elastyczność i możliwość ich stosowania w kontekście porównywalności i dostępności danych statycznych. Wybór indeksu powinien być jednak determinowany celem badań nad absencją chorobową, ze względu na zróżnicowany potencjał interpretacyjny i aplikacyjny mierników.

Słowa kluczowe: absencja chorobowa pracowników, absenteizm, globalne miary absencji, międzynawowe porównania, zróżnicowanie regionalne, kraje Europy