REPORT
OF THE SGH WARSAW SCHOOL OF ECONOMICS
AND THE ECONOMIC FORUM
2025

SGH

Report
of the SGH Warsaw School of Economics
and the Economic Forum
2025

Reviewers
Marcin Czupryna, PhD
Małgorzata Dziembała, PhD
Łukasz Goczek, PhD
Professor Jolanta Grotowska-Leder
Ryszard Kata, PhD
Marta Kluzek, PhD
Agnieszka Kurczewska, PhD
Professor Elżbieta Mączyńska
Edward Molendowski, PhD
Maria Węgrzyn, PhD
Ireneusz Żuchowski, PhD

English editors
Ryszard Guz-Rudzki
Mirosław Szymański

First Edition

ISBN 978-83-8030-742-1
DOI: 10.33119/978-83-8030-742-1.2025

SGH Publishing House
162 Niepodległości Ave., 02-554 Warsaw, Poland
www.wydawnictwo.sgh.waw.pl
e-mail: wydawnictwo@sgh.waw.pl

Cover design and production
Marcin Flis

DTP
DM Quadro

Print and binding
Quick Druk

Order 84/VII/25

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

PREFACE

It is the eighth time now we can proudly unveil the *Report of the SGH Warsaw School of Economics and the Economic Forum*, the presentation of which marks the opening of the deliberations of the Economic Forum in Karpacz – a strategic event that provides a platform for economic and social dialogue in Central and Eastern Europe.

The SGH Warsaw School of Economics and the Foundation Institute for Eastern Studies share a long-standing partnership, and their collaborative effort has produced the *Report*, to which over sixty experts have contributed this year. Our publication is an expression of a common mission: to provide external stakeholders with an in-depth analysis and to set a space for responsible debate on the economic future of Europe and the world.

This year's *Report* comprises eleven chapters, which analyse the social and economic situation in the countries of Central and Eastern Europe. SGH experts have examined and described the region in terms of international economic relations, the impact of energy transition on the economic growth of individual countries, investment climate and business outlook, fiscal policy challenges in the face of armed conflicts, healthcare policies, as well as economic development and growth in the patchwork model of capitalism in the decade ahead.

What makes this publication especially valuable is its comprehensive nature, as it delivers not only data and analyses but also bold insights into the resilience of our region to global shocks, such as the COVID-19 pandemic, the Middle East crisis or the war in Ukraine. It also identifies areas that require urgent action, such as delays in the implementation of artificial intelligence technologies in the Polish economy. The authors of the *Report* also address salient issues of public health, mental well-being of children and young people, competitiveness of the agri-food sector and smart cities.

We believe that the extensive range of topics and diversity of the studies presented here will encourage entrepreneurs, decision-makers, analysts and journalists to draw on the *Report of the SGH Warsaw School of Economics and the Economic Forum 2025*, a reliable, data-based resource of knowledge about the economy of the countries of our region. It is a testimony to our common concern for the future of Europe and convincing proof of how fruitful the alliance of academia and practice can be in the service of the public good.

SGH Professor Piotr Wachowiak
Rector of the SGH Warsaw School of Economics
Zygmunt Berdychowski
Chairman of the Programme Board of the Economic Forum

INTRODUCTION

It is with great pleasure that we present to you the eighth edition of the *Report of the SGH Warsaw School of Economics and the Economic Forum* prepared for this year's congress in Karpacz.

The *Report* is a yearly publication which is an important reference point in the analysis of economic and social processes occurring in Poland and the region of Central and Eastern Europe (CEE) for years. This edition comes at a particularly dynamic time – after a period of rapid geopolitical changes and inflationary, migration and energy pressures which are redefining the existing development models. In the conditions of growing uncertainty and challenges related to pressure on economic growth, the *Report* offers a comprehensive insight into the key trends, including in-depth analyses and policy proposals for the public policymakers and the private sector. In the era of search for stability and sustainable development, this publication is becoming not only a diagnosis but also a signpost for the future of the region.

This year's report consists of 11 chapters concerning the development outlook for the CEE countries in 2025–2035, the impact of AI technology on the development of the economy, the economic situation in Poland and the region, the impact of the energy transition on economic growth, the investment climate in the CEE countries, the architecture of new international economic relations, the challenges of fiscal policy for the countries of the region in the era of armed conflicts, the effectiveness of health care systems, the impact of investments on the competitiveness of food producers, the competitiveness of smart cities and the state of mental health and well-being of children and young people in the context of the challenges of the labour market in CEE countries.

In the first chapter, entitled *Development outlook for Central and Eastern Europe in 2025–2035 – institutional changes and economic growth in a patchwork model of capitalism*, SGH experts indicate that the economic growth in the CEE-11 countries throughout the period 2004–2024 was, on average, nearly three times faster than in the countries of the "old" EU and proved to be the most resilient of all models of capitalism in the EU to the last two asymmetric adverse exogenous shocks brought about by the COVID-19 pandemic and the war in Ukraine. The authors stress that among the CEE-11 countries, the fastest economic growth in the entire analysed period was achieved by Poland, where the average annual GDP growth rate in constant prices amounted to 3.8%, and after 21 years of membership, the CEE-11 countries made up more than 31 pp of development gap in relation to the average level of the EU "core" countries (EU-15). The process of real convergence between 2004 and 2024 was fastest in Romania (45 pp) and Lithuania (40 pp), followed by Bulgaria (33 pp) and Poland (30.5 pp), with the slowest pace (below 20 pp) recorded in Slovenia, Czechia and Hungary. The study also presents economic forecasts until 2035 in several variants. In variant A of the positive scenario, GDP per capita at PPS will exceed the level of income per capita in Western Europe (EU-15) by 2.0% in 10 years, and Poland will close its historical income gap with Western Europe and achieve GDP per capita at the EU-15 average. In the baseline scenario, only Lithuania will outperform the EU-15 group in terms of the level of economic development. In Poland, the development gap with the EU-15 is expected to decrease by about 15 pp; but in 2035, it will still be significant and exceed 10%. In the cautionary scenario, the CEE-11 countries will see a reversal of the current trends – in 2035 their income gap will be, on average, 1 pp higher than in 2024. Income divergence will not affect only three CEE-11 countries – Poland, Lithuania and Slovakia.

The authors of the second chapter, entitled *Impact of AI technology on economic growth – challenges and recommendations* studied the impact of artificial intelligence (AI) on enterprises in Poland and CEE. The results show that Poland ranks one of the last in the EU with regard to AI adoption. According to Eurostat data, in 2024, only 5.9% of Polish companies employing at least ten people decided to adopt this technology, while the EU average is 13.5%. Moreover, as many as 63% of companies listed on the Warsaw Stock Exchange believe that their industry will be transformed by this technology to a significant or very significant extent. Most AI adoptions can be observed in the areas of sales, marketing and customer service, i.e. on the revenue-generating side. On the other hand, in back-office areas (e.g. supply chain, operations, manufacturing, HR), more than half of the surveyed companies are not planning to use AI solutions.

In the third chapter, entitled *Economic situation in Central and Eastern European countries*, the authors present data showing that the CEE countries managed to recover their consumption, on average, after 7.7 quarters – Poland was first to do it – after only five quarters. However, SGH experts note that at the end of the year, numerous signs of economic deterioration could be observed, which is line with the indications of the KOF/FGV Global Leading Economic Barometer, whose latest readings herald the onset of a global recession.

In the chapter entitled *Impact of energy transition on economic growth in Central and Eastern European countries,* the team of SGH authors state that in all CEE economies, fossil fuels (coal, oil and natural gas) play a dominant role in the energy mix, and the highest dependence on these fuels is in Poland (almost 88%), Estonia (almost 85%). Only six of the eleven economies in the region have nuclear energy (Bulgaria, Czechia, Romania, Slovakia, Slovenia and Hungary), which accounts for 8–25% of their total energy mix. The highest share of RES in the region overall energy mix can be seen in Latvia and Croatia (over 31%), while the lowest level has been recorded in recent years in Czechia (nearly 8%). In Poland, the share of RES increased from only 0.8% in 2001 to 12.2% in 2023, i.e. by 11.4 pp, which is in line with the average calculated for all CEE economies (+11.1 pp).

The authors of the chapter entitled *Investment climate in Central and Eastern European countries* indicate the CEE region is not homogeneous, with different countries showing different responses to global economic shocks, which requires a case-by-case investment approach. The data presented in the study show that the war in Ukraine triggered the most negative response from investors (average CAR = –3.59%), while the COVID-19 pandemic had a moderate negative impact on investor sentiment (CAR = –2.53%). The US presidential election, on the other hand, on the average, brought a positive response (CAR = +0.62%). SGH experts underline that market liquidity is a factor cushioning the effects of external shocks. Large capital markets, such as Poland and Czechia, were more stable and able to absorb negative information in the analysed period.

Central and Eastern European countries in the architecture of new international economic relations is the title of the next chapter, in which the authors argue that the most serious challenge for CEE countries after 2019 was the Russian invasion of Ukraine in February 2022 and the unprecedented influx of forced migration from the country. While in 2010 most CEE countries were countries of net emigration, in 2019 there were only four such countries – Romania, Bulgaria, Latvia and Croatia, and in 2022, after the Russian invasion of Ukraine, the balance of migration of all CEE countries was positive. In the period 2020–2022, the percentage increase in total immigration to the CEE countries almost doubled. At the end of 2024, nearly seven million Ukrainians who fled the war applied for protection outside their homeland. Among the CEE countries, most of them stayed in Poland (nearly one million) and Czechia (390 thousand).

The next chapter, entitled *Fiscal policy challenges for Central and Eastern European countries in the era of armed conflicts*, makes an interesting comparison of defence spending to prove that in most CEE countries, national defence spending in 2023 accounted for 2.5–7.2% of total public expenditure. In the Baltic states, this share was highest and on average accounted for about 6.8%. The national defence spending in Poland was slightly higher (4.4%) than the average in the CEE countries (4.3%). Estonia Lithuania and Latvia have exceeded the level of EUR 600 per capita of the national defence spending in recent years, exceeding EUR 600, while in Bulgaria, Croatia, Slovakia and Romania, defence spending has been around EUR 200–300 per capita; and in Czechia, Poland, Slovenia and Hungary, it came up to about EUR 400 per capita last year.

In the article entitled *Effectiveness of healthcare systems in Central and Eastern European countries* the authors point out that public expenditure on healthcare in Poland amounts to 5.3% of GDP, much less not only than in Western European countries but also in other CEE countries. In most Western European countries, expenditure on healthcare is above 7% of GDP. Czechia is a noteworthy exception in CEE, with a share of expenditure on healthcare at 9.1% of GDP.

The authors of the study entitled *Impact of investment on the competitiveness of food manufacturers in selected Central and Eastern European countries* claim that in 2022, the highest value of the average investment per farm was recorded in Czechia (EUR 90,715) and Hungary (EUR 24,248), while the lowest was found in Romania (EUR 4102) and Poland (EUR 4768). Poland is the leader in terms of the value of export of agri-food products – in 2004–2023, it increased 9.1 times – to EUR 52.1 billion. At the same time, imports grew – 7.6 times, to EUR 33.4 billion, and the trade balance rose 6.9 times, to a level of EUR 18.7 billion.

The next chapter, entitled *Smart city competitiveness index and its application to the analysis of selected urban centres in Poland* describes the assumptions of a proprietary tool for analysing the competitiveness of urban centres. The presented data prove that in the category of overall level of competitiveness Warsaw and Krakow stand out consistently as the most competitive cities in Poland.

The authors of the study entitled *Health and mental well-being of children and young people as labour market challenges in CEE countries* claim that the share of young people (16–29 years old) reporting sense of happiness always or most of the time is highest in Poland, where it amounts to 84.8%. In addition, in Poland, Romania, Bulgaria and Slovakia, the share of young people declaring no or only minimum symptoms of depression in the analysed period increased, which may indicate an improvement in the mental condition of young people in these countries.

Editorial Board

Agnieszka Chłoń-Domińczak – Professor at SGH, Vice Rector for Science, Director of the Institute of Statistics and Demography, SGH.

Marta Ekner – SGH graduate, Project Coordinator at the Center for Entrepreneurship and Technology Transfer, SGH.

Bartosz Majewski–Director of the Centre for Entrepreneurship and Technology Transfer, SGH, cooperates with the Institute of Management, SGH.

Dorota Niedziółka – Professor at SGH, Vice Rector for Development, Head of the Department of Economic Geography, SGH.

Mariusz Strojny – PhD, Assistant Professor at the Institute of Value Management, SGH, Deputy Director of the Center for Entrepreneurship and Technology Transfer, SGH. Scientific Editor of the *Report of the SGH Warsaw School of Economics and the Economic Forum*.

DEVELOPMENT OUTLOOK FOR CENTRAL AND EASTERN EUROPE IN 2025–2035 – INSTITUTIONAL CHANGES AND ECONOMIC GROWTH IN A PATCHWORK MODEL OF CAPITALISM

Piotr Maszczyk
Mariusz Próchniak
Ryszard Rapacki

DOI: 10.33119/978-83-8030-742-1.15_53

Abstract

This paper seeks to outline the development prospects of the Central and Eastern European (CEE-11) EU member states in 2025–2035. To this end, we make a multivariate forecast of the paths of their economic growth and real income convergence, embedded in a broader institutional context, i.e. the key features of the model of patchwork capitalism that has emerged in these countries. The starting premise of our approach is that the design and operation of institutions strongly determine economic performance, including the rate of economic growth and real convergence. The study consists of two parts. The first, retrospective part contains a discussion of the origins and the most salient features of patchwork capitalism, as well as a comparative analysis and assessment of the growth trajectory of the CEE-11 countries in the period 2004–2024 against the background of the entire EU, with a particular focus on the four models of Western European capitalism. The comparative analysis is developed by decomposing GDP growth rates into their main components, i.e. the rate of change in labour and capital stocks and the dynamics of total factor productivity (TFP), as well as assessing the long-term determinants of economic growth. The second, prospective part outlines the possible lines of the evolution of patchwork capitalism in 2025–2035; this part of the paper also includes the authors' forecast of future growth paths and income convergence of the CEE-11 economies to the average level of the countries of the "old" Union (EU-15) over the same period. The forecast is presented in three scenarios: baseline, positive and the cautionary one. In most of these scenarios, the process of real convergence will continue, albeit at a decelerating pace, which is due to the adverse impact of the institutional short-sightedness syndrome inherent to the model of patchwork capitalism. In the cautionary scenario, however, the CEE-11 countries, with few exceptions (including Poland), would experience a reversal of hitherto development trends and enter a path of income divergence. The study closes with the most important conclusions and recommendations for economic policy makers, including in particular recommendations that would diminish the probability of the cautionary scenario materialising.

Authors

Piotr Maszczyk – PhD, Head of the Macroeconomics and Public Economics Unit, SGH Warsaw School of Economics, Deputy Dean of the SGH Graduate Studies. Author and co-author of almost 40 articles and scientific papers, as well as numerous expert opinions. Former employee of the Ministry of Finance and Ministry of Regional Development as advisor to the Minister. Economic commentator for Polish Radio 24 and RDC radio.

Mariusz Próchniak – Professor, Head of Department of Economics II, SGH Warsaw School of Economics. Since 2020, Dean of the Collegium of the World Economy at SGH. His research interests focus on the problems of macroeconomics, particularly related to economic growth and real convergence, as well as diverse forms of contemporary capitalism.

Ryszard Rapacki – Professor, former Head of Department of Economics II, Warsaw School of Economics. His research interests comprise macroeconomics and new institutional economics; pursues research into economic growth and real convergence, as well as comparative studies on diverse forms of contemporary capitalism, with a particular focus on CEE.

This study seeks to forecast the economic growth paths and real income convergence of eleven European Union (EU) member states from Central and Eastern Europe (CEE-11) in 2025–2035. This study is embedded in a broader institutional context of the most salient features of the model of capitalism that emerged in the region, which – on the basis of our earlier work – we refer to as patchwork capitalism [Rapacki, 2019; Rapacki et al. 2019; Gardawski, Rapacki, 2021]. The study also draws extensively on the results of our latest research on the relationship between institutions (the institutional architecture of the economy) and the economic performance recorded [Maszczyk, Próchniak, Rapacki, 2024; Próchniak, Rapacki, 2024; Mrozowicki, Gardawski, Burski, Rapacki, 2025; Rapacki, Maszczyk, Lissowska, Próchniak, Sulejewicz, 2025]. At the same time, we start (both here and there) with the assumption, firmly established in New Institutional Economics (NEI), that the design and operation of institutions strongly determine economic performance, including the rate of economic growth and real convergence.

The approach taken in this study is of a retrospective and prospective nature. Our forecast is based, on the one hand, on the identification of the most vital features of the institutions underpinning the patchwork model of capitalism, and on the other hand, an in-depth analysis and assessment of the historical trajectories of economic growth and income convergence and their key determinants in the CEE-11 countries, representing the patchwork model of capitalism in 2004–2024, following their accession to the EU. We analyse the whole of the European Union (EU-28),[1] with particular emphasis on the four other models of capitalism coexisting within it, i.e. the Anglo-Saxon, Continental, Nordic and Mediterranean models [Amable, 2003; Rapacki et al., 2019]. Such a comprehensive comparative analysis allows us to assess the ability of the patchwork model to generate rapid and sustainable economic growth and to achieve real convergence in the broader context of Western European models of capitalism. At the same time, it allows the sources and possible lines of the evolution of the institutional comparative advantage of the patchwork model to be screened in more detail, and the sustainability of this advantage to be assessed within the timeframe of our forecast, which in turn translates into the assumptions adopted in formulating its various scenarios (baseline, positive and cautionary).

The study consists of two main parts. Part I is retrospective and presents a picture of the current paths of institutional development and economic growth, as well as real income convergence of the CEE-11 countries in the period 2004–2024. It was divided into five sections. First, we discuss the essence and most vital traits of the patchwork model of capitalism in the CEE countries, with particular emphasis on its origins, design and mode of operation. Next, we present a historical picture of the economic growth paths and real convergence of the CEE-11 countries in 2004–2024 against the background of four models of Western European capitalism coexisting in the EU. It is further developed by a subsequent decomposition of GDP growth rates (growth accounting) into the main components, i.e. the rate of change in labour and capital stocks and the dynamics of total factor productivity (TFP). The next section of this part analyses the most crucial long-term determinants of economic growth in the analysed group of countries. Part I closes with a section in which we point to the basic relationships between the design and operation of the institutional architecture constituting the patchwork model of capitalism and the CEE-11 countries' performance in terms of economic growth and real income convergence. It is a bridge between the retrospective view and the prospective approach set out in Part II, where we seek to predict the possible lines of evolution of patchwork capitalism and forecast future

[1] We also included the United Kingdom, as this country remained a member of the EU for most of the analysed period (until 2020).

growth paths and income convergence of the economies of the CEE-11 countries to the average level of the "old" EU countries (EU-15), including the four models of Western European capitalism, in the years 2025–2035. We present our forecast in three variants, which we conventionally call "scenarios": baseline, positive and cautionary. The study closes with specific conclusions and recommendations for economic policy and development strategy.

Part I. Trajectories of institutional development and economic growth of the CEE countries – retrospective approach

The nature and most salient features of patchwork capitalism in CEE

Introductory notes

The starting premise of our approach in this study is a belief, widely shared in NEI [see, e.g., Landes, 2005; Acemoğlu, Robinson, 2014, 2019], that the economic performance of individual countries and their groups is strongly determined by the broad quality of their institutions, usually defined as the rules of the game accepted in society [North, 2005]. According to this belief, countries with a coherent set of efficient and complementary institutions tend to achieve faster growth and a higher level of economic development than countries with weak institutional endowment (an incomplete, inconsistent set of inefficient and non-complementary institutions).[2]

Generally speaking, the relationship between institutions and economic development is multifaceted and runs through various channels, mainly indirectly. The institutional framework for development consists of two different sets of institutions:

1) those that encourage trust and thus foster exchange by lowering transaction costs;
2) those that induce the government and other influential entities to protect property and individuals rather than expropriate and subjugate them.

The first set includes contracts and contract enforcement mechanisms, commercial norms and rules, and standards of conduct and beliefs that are consistent with shared values in society and foster the accumulation of human capital. The second

---

2 Acemoğlu and Robinson [2019] use the terms "inclusive" to describe institutions that foster rapid economic growth, and "exploitative" to refer to institutions that have an adverse impact on the rate of growth. At the same time, they point out that there are sometimes deviations from this pattern. These include mainly cases of countries with weak institutions, most often governed by authoritarians, which have managed to enter the path of rapid economic growth. However, they prove unable to stay on this path (remain in a "narrow corridor") in the long term.

set consists of constitutions, electoral rules, laws governing freedom of expression and education, and norms that motivate people to comply with the law and cooperate to monitor government [Shirley, 2005].

For its part, the link between institutions and economic growth is that well-chosen, efficient and effectively enforced institutions reduce the costs of production and distribution, allowing private entities to benefit more from specialisation, investment and trade [Engerman, Sokoloff, 2005]. At the same time, economic growth is also affected by the scope and effectiveness of the control of potential risks related to business activity (e.g. job evasion or opportunistic behaviour) by institutions that reduce the costs of obtaining information and transaction costs, encourage capital creation and increase its mobility, enable risk assessment and sharing, and facilitate cooperation [Klein, 2000]. Taken together, these impacts translate into reduced uncertainty and stronger incentives for business start-up and entrepreneurship, which promotes the growth of factor inputs and their efficiency, and thus accelerated growth in total factor productivity (TFP).[3]

All institutions governing the operation of the economy form its institutional architecture (institutional order), which constitutes the existing model of capitalism in a particular country. This architecture has three main dimensions. Firstly, it consists of the rules of conduct in force in society, i.e. codified laws (formal institutions) and the dominant patterns of values and norms of behaviour of economic and social actors (informal institutions). The second dimension is the actors' attitude to the existing rules, i.e. the degree of acceptance of existing formal institutions or, on the contrary, their involvement in activities aimed at changing them. The third dimension is the way in which the existing formal rules (law) are enforced by state agencies. Each of these dimensions is equally important because even the best-designed formal institutions, which by definition should ensure the reduction of uncertainty in the economy, will not have a positive impact on the growth rate and the level of development if they are widely avoided by economic actors and state agencies are not be able to effectively penalise such behaviour.

3 These relationships are confirmed by the results of many empirical studies. For example, the authors of the latest World Bank study [Pontara, Medic, Relic, Record, 2025] calculated that improving the quality of key institutions for growth (regulatory quality, government effectiveness, control of corruption and scope of the rule of law) in the six Balkan candidate countries and the resulting institutional convergence of these countries with the CEE EU member states would increase the economic growth rate of the former by an average of 0.6 pp per year, i.e. by about 30% of the total growth rate, due to the "integration anchor", i.e. the effects of the future membership of the Balkan countries in the EU. The positive relationship between selected institutions (the scope of economic freedom) and socio-economic growth and development (HDI index) in the CEE-11 group of countries was also confirmed by empirical research published by Osińska, Malaga and Lach [2025].

Historical origins, structural features and the way the patchwork capitalism model works

The most vital features of the patchwork capitalism model can be briefly divided into three broad categories:

a) how patchwork capitalism emerged,
b) its institutional design,
c) the functioning of a patchwork.

With these features, the model exhibits many institutional peculiarities and significantly differs both from the models of Western European capitalism coexisting in the EU and from the varieties of post-communist capitalism that emerged in other former socialist countries.[4] At the same time, the peculiarities resulting from the origin, design of the institutional architecture and the way patchwork capitalism operates translate into a different pattern (compared to other models) of the paths of economic growth and real convergence of the CEE-11 countries, as well as have a strong impact on their development prospects within the timeframe of our forecast.

A. Emergence of patchwork capitalism

One of the peculiarities of patchwork capitalism in a comparative historical context is the way it emerged. It can be organised around the following points:

1. **Historical origins**. Patchwork capitalism in CEE is a product of long duration [Braudel, 1999] or in other words – the result of dependence on the historical path of development [David, 1994], the beginnings of which can be traced back to the late Middle Ages. One of the unique traits of this path is the fact that the institutional development of the CEE countries collapsed twice and completely reversed its direction within the lifetime of one generation – first, the transition (1945–1948) from capitalism to socialism, and then (after 1989) the political transformation from socialism to capitalism [Gardawski, Rapacki, 2021]. As a consequence, today's institutional architecture of this political model is a heterogeneous set of loosely connected structural elements inherited and/or transplanted from various socio-economic orders, which may be arranged chronologically into three time layers:
   a) feudal and capitalist institutional heritage,
   b) institutional legacy of socialism,

[4] It is also worth mentioning that patchwork capitalism, e.g. in Poland, also significantly diverges, in terms of the structural qualities of its institutional architecture, from the model of an ordoliberal social market economy enshrined in the Constitution of the Republic of Poland (Article 20). For more about this pattern, see Mączyńska and Pysz [2016].

c) institutions imported after 1989 from several different models of capitalism co-exiting today in Western Europe.

2. **Special role of the elite reforming the economy** as capitalism builders in the CEE-11 countries, who – symptomatically – did not seek to become a new class of production factors owners, unlike the transformation leaders in Russia and the Commonwealth of Independent States (CIS) [Gardawski, Rapacki, 2021].
3. **Building capitalism without capitalists**. Another unique feature of the way patchwork capitalism arose after 1989 was that the process of building it initially unfolded without domestic capitalists, i.e. a class with an economic interest in creating the institutions that form the fabric of this order, ensuring its stability and protection, by setting barriers to entry for new players and enforcing their compliance with the applicable rules of the game [Gardawski, Rapacki, 2021].
4. **The privileged role of foreign capital** as a key actor in shaping the new social and economic order, which exhibited many features of a dependent market economy [Nölke, Vliegenthart, 2009]. Transnational corporations (TNCs), which were the main channels of foreign direct investment inflow to CEE countries, encountered very low entry barriers and remained fully independent in shaping the internal institutional (corporate) governance in their subsidiaries in these countries, which additionally contributed to the development of patchwork governance [Mrozowicki et al., 2025].
5. **EU membership**. On the one hand, this factor led to a certain institutional "standardisation" of the socioeconomic order in the CEE countries, but on the other hand, at least in the short and medium term, it also involved a kind of exogenous shock, temporarily increasing their institutional heterogeneity.

B. Institutional architecture

Historical roots and ways of emergence of patchwork capitalism after 1989 make its institutional architecture highly heterogeneous, with the most important qualities being:

- fundamental weakness of the institutional fabric, i.e. basic instruments that set the rules of the game within the existing socioeconomic order;
- incoherence and lack of complementarity of the institutional architecture;
- coexistence of different, often divergent mechanisms of coordinating decisions/actions taken by economic and social players in various areas of the institutional architecture [Rapacki, 2019; Czerniak, 2023];
- mismatch between formal and informal institutions and weak social embeddedness of the former;

- axiological heterogeneity, i.e. the multiplicity and internal inconsistency of values professed by society, including in particular the coexistence of contradictory values at the domestic level, their high diversity and poor compatibility with the principles of the market economy [Lissowska, 2020; Rapacki et al., 2025];
- low barriers and (transaction) costs of entry into the patchwork order that make it an "open-access order" [Gardawski, Rapacki, 2021].

C. Mode of operation

The origin and institutional structure of patchwork capitalism results in the way this model works, which displays some unique traits, namely:

- inclination to fall into development drift;
- growing import of entropy from highly developed countries [Gardawski, Rapacki, 2021];
- high extent of government failure;
- underdeveloped and chronically malfunctioning public services;
- poor government support for social actors in crisis situations;
- plenty of room for grassroots, spontaneous entrepreneurship [Mrozowicki et al., 2025].

Economic growth paths of the CEE-11 countries in 2004–2024

The economic growth paths of the CEE-11 countries in the years 2004–2024 are illustrated by the data shown in Table 1. For comparison purposes, they were referred to the averages covering smaller groups of the countries of the "old" EU, representing four Western European models of capitalism,[5] as well as to the EU-15 average. It also allows a synthetic assessment to be made of the process of real income convergence of the CEE-11 countries, embodying the patchwork model of capitalism, with the EU-15 average and with the clusters corresponding to the respective models of capitalism in the EU. In addition, the table presents the relevant indicators for 2020–2024, when the economic effects of the COVID-19 pandemic and the war in Ukraine became apparent.

[5] Thus, the Continental model of capitalism is represented by Austria, Belgium, France, the Netherlands, Luxembourg and Germany, the Mediterranean model by Greece, Spain, Portugal and Italy, the Nordic model by Denmark, Finland and Sweden, and the Anglo-Saxon model by Ireland and the United Kingdom. For the sake of completeness, patchwork capitalism is embodied by 11 CEE countries.

Table 1. Economic growth and real convergence in the CEE-11 countries in 2004–2024

Country	Average annual GDP growth rate in constant prices			GDP per capita (PPS*, EU-15 = 100)		
	2004–2019	2020–2024	2004–2024	2004	2019	2024**
Poland	4.1	2.6	3.8	44.1	69.1	74.6
Bulgaria	3.1	2.6	3.0	30.0	51.6	62.9
Croatia	1.5	3.5	2.0	48.3	63.0	73.0
Czechia	2.8	0.4	2.3	69.0	88.8	86.6
Estonia	3.0	0.2	2.3	47.7	78.2	75.2
Lithuania	3.5	2.4	3.3	43.1	78.1	83.2
Latvia	2.9	1.5	2.5	38.7	62.0	67.3
Romania	4.0	1.8	3.5	29.6	64.7	74.7
Slovakia	3.8	1.3	3.2	49.8	65.4	71.1
Slovenia	2.2	2.1	2.2	74.3	81.5	86.4
Hungary	2.2	1.3	2.0	53.5	68.6	73.1
Models of capitalism						
Patchwork***	3.5	2.0	3.2	44.3	69.2	75.2
Continental***	1.5	0.6	1.2	103.8	109.2	106.2
Mediterranean***	0.5	1.3	0.7	89.7	84.2	87.4
Nordic***	1.7	1.3	1.6	108.2	109.3	109.3
Anglo-Saxon***	1.7	1.0	1.6	106.5	101.1	103.2
EU-15	1.2	0.9	1.2	100.0	100.0	100.0

* Purchasing Power Standard, PPS), calculated in accordance with the methodology used by Eurostat.
** The EU-15 average in 2024 was calculated and adjusted by the authors to the Eurostat data source for the EU-27 including the United Kingdom.
*** Population-weighted average. Unless otherwise indicated, the population of each country is based on Worldometers [2025] data.

Source: Authors' own compilation based on Eurostat [2025a] data; missing observations for the United Kingdom are complemented with data from the International Monetary Fund [IMF, 2024].

An analysis of the data in Table 1 allows the following conclusions to be drawn:

1. Economic growth in the CEE-11 countries throughout the period 2004–2024 was on average nearly three times faster than in the countries of the "old" EU.
2. The CEE-11 countries, which represent the patchwork capitalism model, showed the highest rate of economic growth during this period compared to the four other models of capitalism in the EU – Continental, Mediterranean, Nordic and Anglo-Saxon. A particularly large, nearly five-fold gap in growth dynamics was witnessed compared to the Mediterranean model.
3. Despite its ability to achieve relatively high GDP growth rates in the long term, the patchwork capitalism model was less successful in dealing with some short-

and medium-term adverse external shocks. This is evidenced by data for the global financial crisis period (2009–2014), when the average rate of economic growth in the CEE-11 countries was – with the exception of the Mediterranean model – lower than in the economies representing other models of capitalism in the EU [Maszczyk, Lissowska, Próchniak, Rapacki, Sulejewicz, 2023]. Poland diverged from this general pattern, as it did not experience a recession in 2009 and even achieved the highest average GDP growth rate in the EU (except for Malta) in that period.

4. On the other hand, economic growth in the CEE-11 countries proved to be the most resilient of all models of capitalism in the EU to the last two adverse asymmetric exogenous shocks brought about by the COVID-19 pandemic and the war in Ukraine. The pandemic-induced recession in 2020 was the shallowest and shortest in this group of countries, and overall, in the entire sub-period 2020–2024, the average annual GDP growth rate was more than twice as high as the EU-15 average, and the highest compared to the other models of capitalism.
5. Among the CEE-11 countries, the fastest economic growth in the entire analysed period was boasted by Poland; a similar performance in this category was reported only by Romania, Lithuania, Slovakia and Bulgaria. In the whole EU, only Ireland and Malta recorded higher growth rates.
6. Consequently, the CEE-11 countries experienced a rapid process of income convergence, which resulted in the countries catching up with the average level of the EU-15 core countries after 21 years of membership. At the same time, it also outperformed Greece in terms of GDP per capita (at purchasing power standard, PPS), making up for most of the development gap with the entire group of Mediterranean countries (over 33 of 45 pp in 2004, where the EU-15 average was the benchmark).[6]
7. The process of real convergence between 2004 and 2024 was the fastest in Romania (45 pp) and Lithuania (40 pp), followed by Bulgaria (33 pp) and Poland (30.5 pp), with the slowest pace (below 20 pp) recorded in Slovenia, Czechia and Hungary. This means that the development gap was reduced faster in the CEE-11 countries with a lower GDP per capita, while the process was the slowest in those where the gap with the EU Fifteen was the smallest. These results support the claim of growth theory that there is an inverse relationship between the level of economic development and the rate of real convergence (the lower the

[6] If these comparisons included only the three countries representing the Mediterranean model that joined the Union in the 1980s (Greece, Spain and Portugal), the income gap of the CEE-11 countries in 2024 would be on average not 12 pp but less than 8 pp (calculations by authors based on Eurostat data).

GDP per capita, the higher the relative growth dynamics). The dynamics of real convergence was also significantly influenced by the different scale of population changes (including net migration) in the CEE-11 countries. Many of them (including Poland) saw a reversal of the existing demographic trends – the phenomenon of secular depopulation emerged, which intensified after the outbreak of the COVID-19 pandemic in 2020.[7] As a result, the GDP per capita growth rate in these countries was significantly higher than in absolute terms[8] – unlike most of the "old" EU member states.

In the context of the main objective adopted in this study, i.e. to prepare a forecast of economic growth in the CEE-11 countries, it is worth emphasising that their accession to the EU took place (with the exception of Czechia and Slovenia) under conditions of an unprecedentedly large disparity in the level of economic development relative to the countries of the "old" EU (EU-15). GDP per capita at purchasing power standard (PPS) in the CEE-11 group was on average only 44% of the EU-15 average in 2004. By comparison, between 1982 and 1986 – when the three Mediterranean countries joined the Community – the corresponding rate averaged 72% and ranged from 60% (Portugal) to 76%– 80% (Spain and Greece) [Rapacki, 2012]. Such large development gaps imply significant room for the operation of the income convergence mechanism in the economically less developed new EU member states. This is confirmed by the results presented above, as well as broader empirical evidence contained in our other study [Próchniak, Rapacki, 2024]. It is worth being aware, however, that in the time span of our forecast, i.e. until 2035, the hitherto rapid process of income convergence in the CEE-11 countries means at the same time that the potential of this mechanism is being gradually exhausted and, consequently, there is a high probability of their catching up with the more developed EU member states at a lower rate (the average annual pace of closing the gap was higher in the situation where the development gap with the EU-15 was 56%, as was the case in 2004, than when it was reduced to 25%, as in 2024).[9] Thus, the probability of the cautionary scenario outlined in Part II of our forecast materialising also increases.

7 Between 2004 and 2024, Romania's population declined by nearly 2.5 million people, or 11.4%. Over the same period, the population of Poland, Bulgaria and Croatia decreased by nearly 1.6 million, 1.3 million and 1.25 million, respectively [Eurostat, 2025a]. In relative terms, the largest scale of depopulation occurred in Croatia (–29%), Latvia (–18%), Bulgaria (–17%) and Lithuania (–15%), according to Eurostat data.

8 For example, in 2024, the GDP growth rate in the EU averaged 1.0% and in Poland 2.9%. Due to different demographic trends (an increase in the total population in the EU-27 by 0.3% and a decrease in Poland by 0.4%) per capita, these rates stood at 0.7% for the EU-27 and 3.3% for Poland.

9 A broader explanation of the statistical significance of the base effect can be found in Part II of the study (pp. 45–46).

Economic growth account for the CEE-11 countries in 2004–2024

In this section, we will complete the picture of the economic growth paths of the CEE-11 countries against the background of other models of capitalism in the EU and decompose the achieved growth rates into their constituent factors by means of growth accounting.

Economic growth accounting is an empirical exercise aimed at determining to what extent economic growth results from changes in the inputs of measurable production factors and from changes in the level of technology (technological progress), measured by the growth rate of total factor productivity (TFP). Two or three measurable factors of production are usually taken into account in empirical research, namely: labour, physical capital, and possibly human capital.

In this study, the economic growth account includes two measurable factor inputs: labour (L) and physical capital (K). The production function (Y) therefore takes the following form (the equation is a Cobb–Douglas production function):

$$Y = AK^{\alpha}L^{1-\alpha}.$$

In order to decompose the rate of economic growth, the above function should be logarithmised and differentiated with respect to time. As a result, we obtain:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L},$$

where α means the share of tangible capital remuneration in income, while $(1 - \alpha)$ is the share of remuneration of labour in income.

The above equation shows that the economic growth rate is the sum of technological progress (TFP growth) and the average growth rate of labour and physical capital stocks, weighted by the shares of remuneration of both factors in income. This equation forms the basis of the standard economic growth account. It can be used to calculate the TFP growth rate as the difference between the GDP growth rate and the weighted average growth rate of stocks of both factors of production:

$$\text{TFP growth} \equiv \frac{\dot{A}}{A} = \frac{\dot{Y}}{Y} - \left[\alpha\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L}\right].$$

For the purposes of our analysis, we have gathered data forming the following time series:

a) the economic growth rate,
b) rate of change in labour inputs,
c) rate of change in physical capital inputs.

The economic growth rate is the annual growth rate of total real GDP. The rate of change in labour input is measured by employment dynamics. We have calculated the time series of the physical capital stock using a method called the perpetual inventory method. This method requires several assumptions to be taken into account. Accordingly, we have assumed that the depreciation rate is 5% and the initial capital/output ratio is 3.[10] In the perpetual inventory method, the initial year should be a little earlier than the years for which TFP is being calculated; in our study, we start calculations in 2000, which is the year to which the assumption of capital to output ratio of 3 applies. As investments, we use a variable measuring gross fixed capital formation. The assumed shares of labour and physical capital are 0.5 each.[11]

Table 2 presents the dynamics of changes in TFP and its contribution to the economic growth of the CEE-11 countries and groups of countries representing Western European models of capitalism throughout the period 2004–2024 and in the years 2004–2019 and 2020–2024.

In the period before the COVID-19 pandemic, i.e. between 2004 and 2019, the TFP growth rate in the CEE-11 countries was relatively high, averaging 1.8% per year. This means that the contribution of increasing total factor productivity (technological progress) to the economic growth of this group of countries accounted for nearly a half (49%). TFP grew the fastest (over 2% per year) in Poland, Romania and Lithuania, and the slowest (less than 1%) – in Croatia, Hungary, Estonia and Slovenia.

The picture that emerges from our decomposition of economic growth is favourable for the patchwork model in a broader comparative context. It turns out that the dynamics of TFP changes achieved by the CEE-11 countries was much higher than the EU-15 average and by far the highest among all five models of capitalism coexisting in the EU (Table 2). TFP's contribution to GDP growth was also the highest in the patchwork model – by comparison, it was 34% in the Anglo-Saxon model, 20% in the Nordic model, 18% in the continental model, and negative in the Mediterranean model.

The pandemic, the war in Ukraine and the resulting energy crisis caused a decrease in the TFP growth rate in most of the identified groups of EU member states, as well as in all models of capitalism except the Mediterranean model. Nevertheless, also in this period, the advantage of the CEE-11 countries over Western Europe was maintained.

10 Estimates by King and Levine [1994] indicate that the ratio of capital stock to the value of the annual output stream in the 24 OECD countries is on average about 2.5. The value of 3 adopted here therefore seems justified.

11 It is usually assumed in the literature that the share of tangible capital remuneration in income is 0.3. Nevertheless, the use of such an assumption in the case of some countries (especially Poland) leads to a significant overestimation of the TFP growth rate. Therefore, as suggested by Welfe [2001], the share assumed here is 0.5, which better reflects the actual data.

Between 2020 and 2024, TFP grew by 0.4% per year, while in the EU-15 it decreased by an average of 0.2%. At the same time, Poland showed a TFP growth of 0.5% per year and was in the middle of the pack in the CEE-11 in this category.

Table 2. TFP growth dynamics in the CEE-11 countries in 2004–2024 (%)

Country	TFP growth rate			TFP contribution to economic growth		
	2004–2019	2020–2024	2004–2024	2004–2019	2020–2024	2004–2024
Poland	2.3	0.5	1.8	55	17	49
Bulgaria	1.3	2.1	1.5	40	79	48
Croatia	0.4	2.0	0.8	23	54	37
Czechia	1.0	−0.8	0.6	34	−158	24
Estonia	0.8	−2.7	−0.0	25	−1218*	−2
Lithuania	2.2	−0.5	1.6	60	−21	46
Latvia	1.2	0.7	1.0	37	43	38
Romania	2.3	0.8	1.9	56	46	55
Slovakia	1.7	0.1	1.3	42	7	39
Slovenia	0.9	1.1	1.0	39	53	43
Hungary	0.7	−0.8	0.4	32	−61	18
Models of capitalism						
Patchwork**	1.8	0.4	1.4	49	18	45
Continental**	0.3	−0.6	0.0	18	−103	4
Mediterranean**	−0.1	0.4	−0.0	−24	24	−2
Nordic**	0.3	−0.2	0.2	20	−14	14
Anglo-Saxon**	0.6	0.1	0.5	34	7	29
EU-15	0.2	−0.2	0.1	16	−17	9

* The result for Estonia is an anomaly and follows from the statistical method adopted. Between 2020 and 2024, Estonia's GDP grew at an average rate of 0.22% per year, while TFP declined by an average of 2.68% per year. As a result, TFP's contribution to economic growth amounted to $-2.68 / 0.22 \times 100 = -1218\%$.
** Population-weighted average.

Source: Authors' own compilation based on World Bank [2025a], ILO [2025], Eurostat [2025] and IMF [2024] data.

However, the years 2020–2024, when several adverse external asymmetric shocks overlapped, did not bring any fundamental changes in TFP dynamics compared to 2004–2019, either in absolute or relative terms. Throughout the period 2004–2024, Romania and Poland continued to be the leaders in terms of TFP growth rate in the CEE-11 group. On the other hand, the lowest productivity growth rates were recorded in Hungary, Czechia and Croatia. Estonia was an outsider, where TFP showed a marginally negative growth rate (Table 2).

As in 2004–2019, the patterns also persisted across the models of capitalism compared here throughout the period 2004–2024. In the CEE-11 countries, which represented the patchwork model, TFP increased by an average of 1.4% per year, which contrasted strongly with the TFP dynamics achieved by the Anglo-Saxon (0.5%) and Nordic (0.2%) models, not to mention the Continental and Mediterranean models, where the rate of change in productivity was close to zero between 2004 and 2024. The above disproportions translated into a differentiated contribution of TFP to GDP growth – it was by far the highest in the patchwork model (45%). By comparison, in the Anglo-Saxon model it was 29%, in the Nordic model – 14%, while in the Continental model it was almost zero, and in the Mediterranean model – negative.

We treat TFP growth as an approximation of technological progress. However, TFP calculated using the residual method has some limitations as a measure of technological progress, which is worth bearing in mind when interpreting growth accounting results. Firstly, the pandemic-induced recession in 2020 caused multidirectional changes in the GDP growth rate and its components (a negative GDP growth rate not accompanied by a sharp decline in the labour force with a simultaneous increase in the capital stock as a result of investments made before the recession). In the growth accounting formula, these changes were manifested in the same year in the form of negative TFP dynamics. Secondly, one of the key assumptions in growth accounting is the full use of factor inputs. In this respect, the recession also led to a significant decline in capacity utilisation (widening of the output gap). The increase in their use under conditions of recovery from the recession in the following years was a source of distortion of the picture of TFP changes – they resulted not only from technological progress but to some extent also from the improvement in the use of existing labour and capital stock. Thirdly, and finally, the part of TFP that is the result of increased labour productivity should be treated partly as the contribution of human capital to economic growth. Due to the difficulties in calculating the stock of this capital for the analysed group of countries, in our view, TFP also includes the impact of human capital on GDP growth.

Long-term determinants of economic growth in the CEE-11 countries

In this section, we undertake an analysis of the long-term determinants of the economic growth of the CEE-11 countries. Its results will be particularly relevant to the construction of our forecasts for 2025–2035, included in Part II, as they will allow us to get closer to answering the question of how sustainable the growth of these countries has been so far.

Therefore, eleven indicators are evaluated that characterise the input and output sides of the institutional architecture of the economy. The ability to adapt to changing development conditions is assessed, i.e. the de facto ability to maintain a high rate of economic growth in these conditions, on the basis of a synthetic measure of government effectiveness prepared by the World Bank[12] and the position of the CEE-11 countries in the Global Competitiveness Index (GCI), prepared for the World Economic Forum (WEF), and the World Competitiveness Ranking (WCR), prepared by the IMD[13] (Table 5). The assessment of the ability to initiate changes in the development model was based on four indicators used for the European Innovation Scoreboard (EIS) prepared by the European Commission [European Commission, 2025], which show research and development (R&D) spending as a percentage of GDP both in total and broken down into the public and enterprise sectors, as well as the share of direct expenditure and tax support in total public sector expenditure (Tables 3 and 4). The output side, i.e. the outcomes of the activities of the institutions forming the patchwork model of capitalism, which provide prerequisites for changes in the current pattern of international specialisation and competitiveness improvements through an increase in innovation capacity, was assessed using five other indicators also taken from the EIS. The indicators represent:

1) the number (relative to GDP) of patent applications filed with the European Patent Office (EPO),
2) the number of new environmental protection technologies relative to all technologies developed in the country concerned (Table 6),
3) the share of high-tech goods in exports,
4) the share of high-tech and medium-tech goods in exports (Table 7),
5) the ratio of knowledge-based service exports to total service exports (Table 8).

We tried to present these indicators for three selected years from the period 2005–2024 (2005, 2019 and 2024), but this was not always possible due to incomplete statistical coverage for 2005 and 2024. Therefore, in the analysis we used the latest and oldest available data (most often from 2016) relating to particular indicators.

---

12 The World Bank's government effectiveness measure is a weighted average of seven indexes reflecting the opinions of experts, entrepreneurs and households on various operational aspects of state institutions. In particular, the following are evaluated: the quality of public services, the quality of public administration and the degree of its independence from political influence, the quality of policies developed and implemented, and public infrastructure (transport, sanitation, IT).

13 The World Competitiveness Ranking is a list prepared by the Swiss Institute for Management Development (IMD), which presents the level of competitiveness of 67 most developed countries, mainly from Europe, the Americas, and a few economies from the south-eastern hemisphere. The ranking takes into account 164 variables divided into four main areas: economic performance, infrastructure, and government and business efficiency. The databases of the World Bank [2025a] and the International Monetary Fund [IMF, 2024] are used.

Table 3. Total R&D spending as percentage of GDP and corporate sector spending on R&D as percentage of GDP in selected years of the period 2005–2024 (%)

Country	R&D spending as percentage of GDP			Corporate spending on R&D as percentage of GDP		
	2005	2019	2023	2016	2019	2024
Poland	0.56	1.31	1.56	0.44	0.67	0.96
Bulgaria	0.44	0.84	0.79	0.52	0.52	0.52
Croatia	0.85	1.08	1.39	0.37	0.41	0.78
Czechia	1.16	1.90	1.83	1.08	1.11	1.26
Estonia	0.92	1.59	1.84	0.62	0.60	1.00
Lithuania	0.75	0.99	1.05	0.32	0.33	0.50
Latvia	0.53	0.66	0.83	0.24	0.14	0.27
Romania	0.41	0.47	0.52	0.16	0.29	0.28
Slovakia	0.49	0.82	1.04	0.32	0.48	0.56
Slovenia	1.42	2.06	2.13	1.83	1.39	1.48
Hungary	0.92	1.46	1.39	1.14	1.14	1.00
Models of capitalism						
Patchwork*	0.65	1.16	1.28	0.54	0.65	0.80
Continental*	2.19	2.69	2.70	1.71	1.79	1.84
Mediterranean*	1.00	1.36	1.42	0.70	0.74	0.81
Nordic*	3.09	3.13	3.29	2.03	2.10	2.19
Anglo-Saxon*	1.53	1.72	1.74	1.24	1.23	1.22
EU-15*	1.75	2.13	2.17	1.33	1.38	1.43

* Population-weighted average.
Notes: Missing observations for the United Kingdom are complemented with World Bank [2025a] data.
Source: Authors' own compilation based on European Commission [2025] and Eurostat [2025a] data.

As follows from the data in Table 3, both total R&D expenditure as a percentage of GDP in the period 2005–2023 and a similar indicator for the corporate sector in the years 2016–2024 put the patchwork model in an unfavourable position against other models of capitalism in the EU. Since the beginning of their EU membership, the CEE-11 countries have clearly lagged behind the EU-15 countries, including the Mediterranean countries, in terms of the level of funding for research and development activities (albeit by a slim margin). It should be noted, however, that the gap in the level of R&B financing was gradually decreasing, although relatively slowly. In 2005, R&D expenditure as a percentage of GDP in countries embodying the patchwork model was 1.10 pp lower than the EU-15 average, while in 2023 the difference was 0.89 pp. The ratio of corporate sector spending on R&D to GDP in the CEE-11 countries increased by 0.26 pp between 2016 and 2024, while in the EU Fifteen this increase averaged at 0.10 pp. By simply extrapolating the current trends, it can be inferred with high probability that in the next 10 years the CEE-11 countries will still be unable to achieve the average level of R&D spending relative to GDP in the EU-15 (in 2035, the difference will still be approx. 0.76 pp for total expenditure and approx. 0.23 pp for corporate sector expenditure). The persistence of this unfavourable trend for nearly 20 years testifies to the permanent, structural nature of the international specialisation pattern present in patchwork capitalism, which is characterised by low innovation capacity, and to the lack of prospects for its change in the future, which may have an adverse impact on the economic growth rate of the CEE-11 countries in the long term.

Table 4. Public sector direct spending on R&D as percentage of GDP and support for R&D activities of the corporate sector through the tax system in 2016–2024 (%)

Country	Public sector direct spending on R&D relative to GDP			Government support for corporate R&D through tax system		
	2016	2019	2024	2016	2019	2024
Poland	0.51	0.36	0.50	0.04	0.11	0.15
Bulgaria	0.27	0.21	0.24	0.01	0.01	0.00
Croatia	0.40	0.44	0.65	0.26	0.00	0.01
Czechia	0.87	0.65	0.69	0.16	0.11	0.11
Estonia	0.79	0.66	0.77	0.08	0.03	0.07
Lithuania	0.72	0.57	0.52	0.02	0.03	0.06
Latvia	0.45	0.37	0.48	0.00	0.01	0.01
Romania	0.22	0.21	0.17	0.02	0.04	0.01
Slovakia	0.55	0.40	0.42	0.02	0.02	0.09
Slovenia	0.54	0.47	0.60	0.34	0.16	0.19
Hungary	0.35	0.35	0.38	0.32	0.16	0.25
Models of capitalism						
Patchwork*	0.47	0.37	0.44	0.09	0.08	0.10
Continental*	0.84	0.83	0.84	0.22	0.22	0.24
Mediterranean*	0.56	0.53	0.59	0.07	0.10	0.17
Nordic*	0.99	0.97	0.96	0.09	0.09	0.12
Anglo-Saxon*	0.53	0.50	0.50	0.19	0.37	0.46
EU-15*	0.71	0.68	0.71	0.16	0.20	0.25

* Population-weighted average.

Source: Authors' own compilation based on European Commission [2025] data.

The situation of Poland in this context does not appear very encouraging – in terms of the level of both indicators assessed here, it ranks forth or fifth among the CEE-11 countries, and one of the last in the EU-28.

A similar pattern was also recorded in the case of the relative amount of direct spending by the public sector on R&D and the extent of government support for the activities of enterprises in this area in the form of tax reliefs relative to GDP (Table 4). In terms of these indicators, the CEE-11 countries compare unfavourably with the EU "core" countries throughout the analysed period.

The percentage of GDP allocated to public sector R&D in the first group of countries was more than twice as low as in the Nordic countries, and also lower than the corresponding indicators characterising other models of capitalism coexisting in the EU. In the ranking of countries assessed for public sector spending on R&D as percentage of GDP, Poland was usually in the middle of the pack for CEE-11 and in the bottom half of the ranking for the entire EU-28; the corresponding indicator for Poland was above the average for the patchwork model but remained below the EU-15 average.

While in the case of the total R&D spending relative to GDP, and the corresponding indicator for the corporate sector, a slow but steady process of closing the gap with the EU Fifteen can be observed, the data contained in Table 4 do not confirm the existence of this pattern. In 2016, public sector direct spending on R&D in relation to GDP in the CEE-11 countries was at an average level of 0.47% (for the EU-15 it was 0.71%), while in 2024 these indicators amounted to 0.44% (patchwork) and 0.71% (EU-15), respectively.

A similar picture emerges from the analysis of the extent of government fiscal support for research and development activities of enterprises. In the case of this indicator, the highest average value relative to GDP is found in the Anglo-Saxon model, while the patchwork model holds the last position in this ranking. Also for this indicator, no improvement can be seen in the situation of the countries representing patchwork capitalism compared to the EU Fifteen average (0.09% of GDP in the CEE-11 countries compared to 0.16% in the EU-15 in 2016 and 0.10% and 0.25% in 2024, respectively).

In 2024, Poland was third in the CEE-11 group, which meant a significant advancement compared to 2016, the initial year in this ranking. For Poland, however, the question can be raised about the effectiveness of such a form of government support for research and development as part of fiscal policy, especially in the context of irregularities detected in the activities of the National Centre for Research and Development (NCBiR).

Table 5. Government effectiveness and country position in the Global Competitiveness Index / World Competitiveness Ranking in selected years of the period 2005–2024

Country	Government effectiveness*			Country position in GCI (2005 and 2019) and WCR (2024)		
	2005	2019	2023	2005	2019	2024
Poland	0.45	0.51	0.42	43	38	39
Bulgaria	0.13	0.17	0.05	61	48	56
Croatia	0.46	0.46	0.71	64	60	46
Czechia	0.91	0.92	1.11	29	33	32
Estonia	0.94	1.14	1.26	26	35	24
Lithuania	0.76	1.01	1.05	34	29	22
Latvia	0.53	1.07	0.70	39	40	38
Romania	−0.29	−0.22	−0.09	67	49	47
Slovakia	0.88	0.55	0.23	36	53	52
Slovenia	0.89	1.04	1.04	30	37	41
Hungary	0.75	0.45	0.37	35	47	53
Models of capitalism						
Patchwork**	0.40	0.43	0.42	47	43	43
Continental**	1.62	1.44	1.21	10	22	21
Mediterranean**	0.95	0.68	0.66	35	42	36
Nordic**	2.01	1.80	1.75	5	10	6
Anglo-Saxon**	1.76	1.44	1.19	10	22	18
EU-15**	1.45	1.22	1.07	17	27	24

* Variable between –2.5 (worst) and 2.5 (best).

** Population-weighted average.

Source: Authors' own compilation based on World Bank [2025b] and WEF [2023] data.

An analysis of indicators assessing government effectiveness and the competitiveness of the CEE-11 economies (Table 5) gives no reason to believe that the scenario of the countries that represent the patchwork model in our forecast to 2035 accelerating or at least maintaining their current rate of economic growth is likely to materialise (Table 5). The average value of the government effectiveness index in the patchwork model over the entire period 2005–2023 was more than twice lower than the EU-15 average and significantly lower than the indicators characterising other models of capitalism in the EU, especially the Nordic model (1:4 ratio). These results seem to empirically confirm the validity of the claim posited in the literature about the historical inability of the CEE countries to build a strong and efficient state [Wallerstein, 1974; Szücs, 1983; Sowa, 2011]. In this context, Poland's particularly poor score is striking, as in terms of this criterion of assessing institutional comparative advantage, it was fifth from the bottom in the EU, ahead of only Romania, Bulgaria, Slovakia and Hungary. The increase in the analysed indicator in the CEE-11 group against the EU average and the averages for other models of capitalism should not be viewed optimistically, as it results not so much from an improvement of the indicator itself in absolute terms but from the deterioration of the situation in the countries of the EU Fifteen.

Despite a slight improvement in performance between 2005 and 2024, the CEE-11 countries also took the bottom positions among the EU-28 countries in the international competitiveness ranking prepared by the WEF and IMD, clearly losing in this category to countries representing other models of capitalism coexisting in the EU. The Nordic countries led the ranking by far throughout the entire analysed period. It is worth emphasising the tendency of the gradual deterioration of the competitive position of the entire Union and the models of Western European capitalism against the background of the world economy, visible in Table 5.

Moving on to the assessment of output variables reflecting the performance of patchwork capitalism countries, we will begin with a comparative analysis of indicators characterising innovation capacity and their potential ability to deal with environmental challenges (Table 6). If the number of patent applications per unit of GDP (EUR billion) is taken as a measure of the effects of R&D activities, reflecting the economy's innovation capacity, it will turn out that the patchwork model was separated in the period 2016–2024 by a huge gap from other models of capitalism in the EU, including the Mediterranean model, which did not rank particularly high in terms of patent activity and innovation capacity on an international scale. Poland scores rather modestly in this ranking, below average for the patchwork model. In this context, the decline in the relative number of patents between 2016 and 2024 should be particularly worrying, which may indicate that the relatively rapid GDP growth in the CEE-11 countries did not have lasting foundations in a growing capacity of these countries to innovate.

The competitive position of the patchwork model was similar, albeit not that bad, in terms of the relative number of new environmental protection technologies in the field of power generation, storage and saving – crucial aspects in the context of the fourth industrial revolution and a deep climate change affecting all countries of the globe. Although the share of such technologies in the total number of technologies developed in the CEE-11 countries in 2016 and 2019 was at a similar level as in other EU countries, in 2024 the situation changed dramatically – their share decreased by more than 3 pp, which caused the patchwork model to fall to the last position in the EU. In Poland, as in the case of patent activity, this indicator was lower than the average for the patchwork model, recording a decrease of over 4 pp after 2016.

Table 6. The number of patent applications relative to GDP at PPS and the share of new environmental protection technologies in all technologies developed in 2016–2024

Country	Number of patent applications (European Patent Office) relative to GDP at PPS			Share of new environmental protection technologies in all technologies developed (%)		
	2016	2019	2024	2016	2019	2024
Poland	0.55	0.74	0.56	14.49	14.44	8.25
Bulgaria	0.65	0.59	0.50	18.43	22.02	12.84
Croatia	0.68	0.44	0.46	15.05	9.82	5.03
Czechia	0.96	1.01	0.83	11.61	10.02	12.30
Estonia	0.70	0.98	1.22	23.75	17.61	7.76
Lithuania	0.84	0.42	0.52	12.67	15.54	9.91
Latvia	1.02	0.85	0.97	13.37	10.17	7.66
Romania	0.23	0.26	0.17	15.81	6.37	8.64
Slovakia	0.42	0.55	0.56	17.93	16.43	12.68
Slovenia	2.85	1.78	1.96	8.98	10.56	9.05
Hungary	1.40	1.46	1.07	12.04	10.60	7.70
Models of capitalism						
Patchwork*	0.68	0.73	0.60	14.63	12.44	9.17
Continental*	5.57	5.33	4.61	14.49	13.24	13.05
Mediterranean*	1.66	1.75	1.80	13.61	11.41	10.04
Nordic*	8.92	8.11	7.81	16.35	15.65	15.43
Anglo-Saxon*	3.14	3.09	3.08	12.87	11.99	11.18
EU-15*	4.09	3.97	3.64	14.03	12.58	11.92

* Population-weighted average.

Source: Authors' own compilation based on European Commission [2025] data.

Both indicators analysed in Table 6 and their changes over the period 2016–2024 can be considered as a strong case for the assumption adopted in the pessimistic scenario of our forecast in Part II of the study, predicting a decreasing rate of real income convergence in the CEE-11 countries in 2025–2035.

On the other hand, the indicators reflecting the level of technological advancement of goods exports of the CEE-11 countries (Table 7) were relatively favourable, including a high share (over 50%) of high-tech and medium-tech products in total exports of goods, which persisted over 2016–2023. This could be seen as the first sign that the CEE-11 countries are heading towards a middle development trap, manifested e.g. in specialisation in the export of goods embodying mainly medium technologies.

This conclusion is also supported by the stagnation of the share of exports of high-tech goods in the total exports of goods of the CEE-11 countries in 2016–2022. In terms of the level of this indicator, the patchwork model was definitely inferior to the Anglo-Saxon and Continental models, ahead only of the Mediterranean model.

Table 7. Share of high and medium technologies in exports in 2016–2024 (%)

Country	Exports of high-tech goods relative to total exports			Exports of high and medium-tech goods relative to total exports of goods		
	2016	2019	2022	2016	2019	2024
Poland	8.50	8.68	9.14	49.44	48.60	49.70
Bulgaria	5.14	6.32	5.48	30.70	34.33	35.17
Croatia	9.67	8.11	6.85	37.98	39.07	38.37
Czechia	15.05	18.95	19.19	64.08	67.09	68.16
Estonia	15.60	11.08	10.79	40.92	38.24	41.21
Lithuania	7.84	8.21	7.79	34.06	36.40	36.65
Latvia	10.03	9.94	8.70	33.52	35.61	32.65
Romania	8.28	9.12	8.89	52.07	57.18	54.54
Slovakia	9.75	9.08	7.44	66.56	67.82	69.94
Slovenia	5.71	6.50	6.70	56.00	57.30	65.62
Hungary	15.90	16.26	14.77	69.09	65.96	69.08
Models of capitalism						
Patchwork*	9.76	10.39	10.18	51.74	52.94	53.74
Continental*	17.67	17.93	15.86	60.55	60.97	58.92
Mediterranean*	6.27	6.69	7.69	46.49	46.06	46.12
Nordic*	10.94	9.91	10.38	50.22	50.31	51.39
Anglo-Saxon*	21.05	21.27	23.42	54.62	53.63	50.98
EU-15*	14.31	14.59	14.38	54.55	54.47	53.15

* Population-weighted average.
Notes: Missing observations for the United Kingdom are complemented with World Bank [2025a] data.
Source: Authors' own compilation based on European Commission [2025] and Eurostat [2025a] data.

Despite a slight improvement in the indicator analysed here, in 2016–2022 Poland unfortunately lags behind the top CEE-11 (Czechia, Hungary and Estonia), taking fourth place in this group of countries.

On the other hand, the situation of the CEE-11 countries was much less favourable in the case of exports of knowledge-based services in 2016–2024 (Table 8). The share of this type of services in total exports of services in countries representing the patchwork model was consistently lower than the corresponding indicators for all other models of capitalism in the EU, excluding the Mediterranean model, which was outperformed in 2024. In this respect, Poland fared slightly below the CEE-11 average, ranking seventh.

Table 8. Share of exports of knowledge-based services in total exports of services in 2016–2024 (%)

Country	2016	2019	2024
Poland	38.90	41.26	46.87
Bulgaria	37.62	41.02	54.31
Croatia	20.33	20.13	23.10
Czechia	42.67	42.96	50.48
Estonia	45.33	49.91	65.10
Lithuania	18.66	20.13	36.64
Latvia	47.02	51.36	58.70
Romania	44.45	44.21	51.65
Slovakia	35.35	38.37	41.64
Slovenia	34.80	35.44	39.37
Hungary	48.54	51.14	56.61
Models of capitalism			
Patchwork*	39.83	41.53	48.40
Continental*	68.98	69.04	70.39
Mediterranean*	43.29	42.68	45.50
Nordic*	76.26	72.91	79.40
Anglo-Saxon*	72.53	81.69	82.54
EU-15*	61.86	63.23	65.37

* Population-weighted average.

Source: Authors' own compilation based on European Commission [2025] data.

Patchwork capitalism in the context of economic growth and real convergence in the CEE-11 countries

The empirical analysis carried out above reveals the existence of a clear relationship between the structural features of the institutional architecture and the mode of operation of patchwork capitalism and the paths of economic growth and real convergence of the CEE-11 countries in the short, medium and long term. The following areas/dimensions are crucial in assessing this impact:

1) short and medium term:
   a) dynamics of economic growth and real convergence;
   b) stability of growth (macroeconomic balance);

   c) response to negative asymmetric exogenous shocks (including adjustment rate and cost);
2) long term:
   a) the ability to adapt to the changing conditions of development – especially to cope with the growing poly-crisis (demography, immigration, ecology, climate, etc.);
   b) the ability to initiate changes in the current pattern of international specialisation and improve competitiveness (mainly by increasing innovation capacity) and avoid the middle development trap;
   c) the learning and self-adjustment ability of the system (institutional memory).

In the broader perspective of institutional economics, our results can be interpreted as empirical evidence of the relationship between institutions (models of capitalism) – an explanatory variable – and economic outcomes. In particular, they show that the CEE-11 countries embodying the patchwork capitalism model differ from their Western European counterparts not only in terms of the structure and functioning of their institutional architecture but also in terms of the current features of economic growth paths and the institutional conditions for their possible development in the future.

In this context, the most important findings of our study can be summed up in the following points.

Firstly, the patchwork model proved to be capable of generating rapid economic growth in both the long term (2004–2024) and the medium term (2020–2024) and in this respect outperformed other models of Western European capitalism in the EU.

Secondly, as a result of rapid economic growth, the CEE-11 countries significantly narrowed the development gap with all four models of Western European capitalism both throughout the analysed period and during the COVID-19 pandemic and the war in Ukraine.

Thirdly, the rapid economic growth in the patchwork model was accompanied by a significant scale of macroeconomic imbalances. This was particularly true of inflation and unemployment [Maszczyk, Próchniak, Rapacki, 2024].

Fourthly, GDP growth in the patchwork model sometimes showed strong sensitivity to adverse asymmetric exogenous shocks – e.g. during the global financial crisis of 2008+.

Fifthly, even when economic growth proved relatively resilient to such shocks (2020–2024), sustaining it came at a high social cost (one of the highest rates of excess mortality and health sacrifice in the EU) and economic costs (record-high inflation and increased fiscal imbalances).

The results of the empirical analysis carried out in this part of the study shed new light on the most important manifestations of the institutional comparative advantage of patchwork capitalism [Maszczyk, Próchniak, Rapacki, 2024], as well as its greatest limitations and weaknesses from the point of view of the development prospects of the CEE-11 countries. In the short and medium term, this advantage manifests itself primarily in the ability to grow rapidly and to converge in real terms. At the same time, however, these countries are paying a high price for achieving these short- and medium-term goals (e.g. the economic and non-economic costs of fighting the pandemic).

The empirical results obtained also provide a strong rationale for the argument we posited in last year's edition of the *Report* about "institutional short-sightedness" of patchwork capitalism [Maszczyk, Próchniak, Rapacki, 2024]. In particular, they point to the limited ability of this model to learn, self-adjust and adapt to long-term challenges and changing conditions of development, and in particular to cope with numerous symptoms of the growing poly-crisis (such as the collapse of secular demographic trends, migration or environmental threats). At the same time, patchwork capitalism has so far proved incapable of initiating changes in the current pattern of "low-cost" international specialisation and of improving competitiveness in a sustainable manner (e.g. through an increase in innovation capacity), and thus of changing its economic and geopolitical status and moving from the (semi-) periphery to the centre of the EU. These properties of patchwork capitalism raise a legitimate question about the possibility of the CEE-11 countries remaining on the path of sustainable economic growth and maintaining the current pace of real convergence also in the future.

In our view, the occurrence of the institutional short-sightedness syndrome in the CEE-11 countries is particularly determined by three structural features of the patchwork capitalism model, namely:
1) weakness (low effectiveness) of government institutions;
2) the resulting large room for spontaneous, grassroots entrepreneurship;
3) the open nature of this socio-economic order, which allows a large inflow of foreign capital (TNCs), which is poorly controlled by CEE-11 governments.

To wrap up, the main findings of the empirical analysis carried out in this section of the study strongly support the probability of the cautionary scenario materialising, which provides for a slowdown in the economic growth rate of the CEE-11 countries in the next 10 years in relation to the trend line witnessed in the period 2004–2024. The growing probability of such a scenario is primarily due to the exhaustion of the existing institutional comparative advantage of patchwork capitalism and, as our research shows, the lack of clear prospects for change in its pattern (e.g. through a rapid improvement of the CEE-11 countries' innovation capacity) in the 2035 outlook. This means that there are no solid foundations for maintaining the previous fast pace of economic growth and real convergence of countries representing the patchwork model within the timespan adopted in our forecast.

Part II. Development prospects of the CEE-11 countries

Possible lines of patchwork capitalism transformation in 2025–2035

To start with, it is worth emphasising that attempts to predict possible lines of transformation of the socio-economic order, including its institutional architecture, over an eleven-year time span, present a major intellectual challenge. This is due to at least two reasons. Firstly, a significant part of the institutions that form the institutional architecture of the economy (especially informal institutions and the key formal institutions that make up its framework) are part of a phenomenon of long duration [Braudel, 1999], which is also indicated by Williamson in his well-known scheme [2000]. This means that changes of some of these institutions go beyond the timeframe of our forecast. Secondly, in today's turbulent times of accelerated technological change, advancing poly-crisis and intensifying geopolitical conflicts, there has been an enormous increase in unpredictability, which makes it even more difficult to prepare a detailed forecast of institutional changes.

Therefore, in this part of the study, we will limit ourselves to outlining three general, indicative scenarios of possible transformations of the patchwork capitalism model in the CEE-11 countries in the years 2025–2035: baseline, positive and cautionary.

In the **baseline scenario,** the essence and key features of the patchwork capitalism model remain essentially unchanged.

According to the **positive scenario**, some changes in the patchwork nature of capitalism occurring in the CEE-11 countries can be assumed, towards eliminating/curbing the intense syndrome of institutional short-sightedness. This may translate into an increase in innovation capacity and, consequently, into maintaining or even accelerating the TFP growth rate. The most important manifestations of these changes include:

- strengthening the fabric of institutional architecture;
- increasing its coherence and complementarity;
- reducing the scale of government failure and increasing its operational efficiency.

Under the **cautionary scenario**, the patchwork nature of capitalism in the CEE-11 countries will become more pronounced and the negative features of this model will intensify, which may mean a slowdown in the TFP growth rate in the future.[14] One

[14] At the same time, we are aware that none of the current models of capitalism in the EU (perhaps except for the Nordic model) creates an optimal institutional environment that would allow a rate of economic growth to be achieved in the long term comparable to its dynamics in countries that are leaders in innovation-based growth (e.g. China and the USA). This is due, among other things, to the evident weaknesses of the EU's institutional architecture, revealed e.g. in the Draghi report [2024]. However, the situation of the countries

of the variants of this scenario provides for the coming (return) to power of populist parties and the reactivation of the practices, known from Poland and Hungary, of circumventing formal institutions and further reducing the level of their enforcement. Under this scenario, the scale of national income redistribution is likely to increase at the expense of investment and the achievement of development goals (e.g. as a result of the persistence of low innovation capacity). The main features of these changes in the design and operation of the patchwork model of capitalism will include:

- further weakening of the institutional fabric or even its gradual atrophy;
- reducing the coherence and complementarity of the institutional architecture of the economy;
- decrease in the level of enforcement of existing formal institutions;
- the intensification of the phenomenon of social anomie and a further increase in the mismatch between formal and informal institutions;
- increase in the scale and frequency of the manifestations of government failure.

CEE-11 economic growth and real convergence forecast 2025–2035

In this section, we present scenarios for closing the income gap of the CEE-11 countries in relation to the EU-15. Given their multivariate nature, they are not strictly accurate forecasts of the trajectory of economic growth but rather different simulation variants that take into account a wide range of potential changes in economic, demographic, social, institutional and political trends. We do not seek to predict the future in detail or identify the most likely directions of development trajectories. Instead, we present various possible scenarios for the paths of GDP per capita changes, starting with different assumptions about the future over the timeframe we have adopted.

Simulations are performed in four variants: two variants of the positive scenario (designated A and B), the baseline scenario and the cautionary scenario. The starting point is the income gap with the EU-15 (i.e. a group of 15 Western European countries including the United Kingdom) in 2024, calculated on the basis of GDP per capita data at PPS (based on Eurostat data from April 2025). Their results are presented in Tables 9–11. They contain data for individual CEE-11 countries, five subgroups corresponding to the different models of capitalism in the EU, and for the EU-15 group as a whole (all averages are population-weighted).

---

that make up the core of the Union (EU-15) remains fundamentally different from that of the CEE-11 countries. While in the former a moderate rate of economic growth is enough to maintain a relatively high level of development, the latter must develop much faster than the EU-15 countries, which seems difficult to achieve given the increasing "patchworkisation" of their model of capitalism.

The catch-up scenarios prepared can be viewed from two ends: "bottom-up" or "top-down". The first view is based on the assumption that we are forecasting the variable components of the GDP growth rate (the dynamics of changes in the stock of factor inputs and changes in TFP), which result from its decomposition. This approach is adopted in the cautionary scenario. From this perspective, the forecasts of total real GDP growth obtained from the projection of changes in the stock of factor inputs need to be translated into forecasts of the catching-up rate. This requires taking into account changes in population, inflation and exchange rate (i.e. changes in purchasing power parity). The second view ("top-down") is based on the assumption that we are forecasting the GDP per capita growth rate at PPS, i.e. a dependent variable. We have taken this approach in the positive scenario and in the baseline scenario.

Positive scenario

Variant A in the positive scenario is the outcome of extrapolation of existing development trends from 2004–2024. Its results are presented in the third column of Table 9. For each of the CEE countries, as well as the EU-15, we calculated the average annual growth rate of nominal GDP per capita at PPS in the years 2004–2024, comparing its levels in 2024 and 2004. The growth rates calculated in this way may differ from the average rates of change of total real GDP, which is the primary measure of economic growth. They also take into account demographic changes and changes in price levels and exchange rates, which is reflected in changes in purchasing power parity (PPS).

Extrapolating the levels of GDP per capita at PPS in 2024 using the growth rates given in Table 9, we obtained the size of GDP per capita in 2035 compared to the EU-15 average. The results obtained are – generally speaking – favourable for CEE-11 as a whole. In this variant of the positive scenario, GDP per capita at PPS will exceed the level of income per capita in Western Europe by 2.0% in 10 years. The best performers will be Romania and Lithuania, the relatively least economically developed CEE-11 countries in 2004. In line with the convergence mechanism, they have achieved the fastest economic growth rate in the last 20 years, both in this group and in the EU as a whole. Under this scenario, these countries will outperform Western Europe in terms of per capita income by 25% and 20%, respectively, in 2035. Poland's performance is also positive – in 2035, the country will close its historical income gap with Western Europe and achieve GDP per capita at the EU-15 average.

A comparison of the CEE-11 cluster with the Western European models of capitalism shows that in the variant of our forecast considered here, countries embodying the patchwork model in 2035 will significantly outperform the Mediterranean model and, slightly, the Anglo-Saxon model. Only countries representing the Continental and Nordic models will have a higher level of income than the CEE-11 group.

Variant B of the positive scenario takes into account the IMF's expert forecasts. It assumes that in the years 2025–2029, the level of GDP per capita at PPS in the respective CEE-11 and EU-15 countries will be in line with the forecasts by this organisation. By contrast, it will increase between 2030 and 2035 at a rate consistent with the 2025–2029 average projected annual growth rate. To calculate the weighted averages, the IMF's demographic forecasts are used (for the years 2030–2035, the average population growth rate projected for 2025–2029 is adopted).

Table 9. Forecast of closing the income gap: positive scenario

Country	GDP per capita at PPS in 2024 (EU-15 = 100)	Variant A		Variant B
		Average annual rate of nominal GDP growth per capita at PPS in 2004–2024	GDP per capita at PPS in 2035 (EU-15 = 100)	GDP per capita at PPS in 2035 (EU-15 = 100)
Poland	74.6	5.4	100.2	96.0
Bulgaria	62.9	6.5	94.9	83.2
Croatia	73.0	4.8	92.1	89.1
Czechia	86.6	3.8	98.6	101.1
Estonia	75.2	5.0	97.0	84.6
Lithuania	83.2	6.1	120.1	101.0
Latvia	67.3	5.5	91.8	80.4
Romania	74.7	7.5	124.9	105.0
Slovakia	71.1	4.5	86.9	84.3
Slovenia	86.4	3.4	94.3	101.7
Hungary	73.1	4.2	87.2	93.5
Models of capitalism				
Patchwork*	75.2	5.5	102.0	96.1
Continental*	106.2	2.7	107.8	105.6
Mediterranean*	87.4	2.5	86.6	86.8
Nordic*	109.3	2.7	110.3	112.9
Anglo-Saxon*	103.2	2.3	100.6	104.6
EU-15*	100.0	2.6	100.0	100.0

* Population-weighted average.

Source: Authors' own work.

In variant B, the eight CEE-11 countries show slower convergence to the level of Western Europe compared to variant A (only Czechia, Slovenia and Hungary perform better). This variant predicts that the four CEE-11 economies (Czechia, Lithuania, Romania and Slovenia) will outperform Western Europe in terms of development level in 2035. In Poland, the income gap with the EU-15 average will be small in the final year of the forecast, at only 4.0%, compared to over 25% in 2024. The CEE-11 group, as a representative of the patchwork model of capitalism, will achieve a result similar to that of Poland and exhibit a level of development significantly higher (by 9 pp) than the Mediterranean model of capitalism. Despite a significant reduction in the development gap compared to 2024, it will still lag behind the Anglo-Saxon (8.5 pp), Continental (9.5 pp), and especially the Nordic (16.8 pp) models. When assessing the content of the optimistic scenario variant B, it should be borne in mind that it is politically biased to some extent, as the IMF forecasts are prepared by experts who may factor in the IMF's policy line and political priorities.

Baseline scenario

This scenario provides for a slowdown in the pace of income convergence witnessed over the past 20 years. We assume that in each CEE-11 country the slowdown will be of the same scale in relative (percentage) terms. Thus, it will amount to the percentage difference in the average pace of the CEE-15 catching up with the EU-15 between the periods 2014–2024 and 2004–2014 (based on weighted averages for the CEE-11). To be precise, during the latter period, the CEE-11 countries as a whole narrowed the income gap with the EU-15 by 16.4 pp, while in 2014–2024 the income gap decreased by 14.5 pp. This means that in the two consecutive decades, the pace of convergence of the entire CEE-11 group decreased by 11.6%. Therefore, we assume that this is exactly what the percentage slowdown in the pace of the CEE-11 countries catching up with the average level of GDP per capita in the EU-15 will be in 2025–2035. For example, in 2004–2024, Poland narrowed its income gap with Western Europe by 1.53 pp annually – when adjusted, this value will be 1.35 pp. The baseline scenario appears to be reasonably realistic given the absence of unexpected adverse exogenous shocks, such as those related to the protracted war in Ukraine, the pandemic, migration or demographic crisis, or political disturbances. This scenario reflects, among other things, the law of diminishing returns. With an increase in the level of income, the CEE countries have less leverage from the transfer and use of technology from Western Europe, as they themselves have already achieved relatively high standards of technological development. An increase in income and production also reduces the rate of return on capital. As a result, as in the period 2004–2024, a further slowdown in the pace of real convergence can also be expected in the coming years.

Table 10. Income gap closing forecast: baseline scenario

Country	GDP per capita at PPS in 2024 (EU-15 = 100)	Baseline scenario	
		Assumed annual pace of narrowing the income gap with EU-15	GDP per capita at PPS in 2035 (EU-15 = 100)
Poland	74.6	1.3	89.5
Bulgaria	62.9	1.5	78.9
Croatia	73.0	1.1	85.0
Czechia	86.6	0.8	95.2
Estonia	75.2	1.2	88.5
Lithuania	83.2	1.8	102.7
Latvia	67.3	1.3	81.3
Romania	74.7	2.0	96.6
Slovakia	71.1	0.9	81.4
Slovenia	86.4	0.5	92.3
Hungary	73.1	0.9	82.6
Models of capitalism			
Patchwork*	75.2	–	89.8

* Population-weighted average.

Source: Authors' own work.

The results for the baseline scenario are shown in Table 10. As can be seen, only Lithuania will outperform the EU-15 group in terms of the level of economic development within the timeframe of our forecast. In 2035, GDP per capita at PPS in Lithuania will be 2.7% higher than the per capita income of Western Europe. In Poland, the development gap with the EU-15 is expected to decrease by about 15 pp, but in 2035 it will still be significant and exceed 10%. Poland's performance will be close to the average for the entire group representing the patchwork model of capitalism. In the baseline scenario, all CEE-11 countries will narrow their income gap with Western Europe (by an average of 14.6 pp, and in the case of Romania by as much as 22 pp). Nevertheless, the process of bridging the gap in the level of development between these countries and the EU-15 will not be completed, with the exception of Lithuania, within the next decade.

Cautionary scenario

To build this scenario, we used the results of the economic growth account discussed in Part I of the study. The main premise of the cautionary scenario of our forecast is the increasing phenomenon of population ageing and the emergence of a secular tendency towards a decrease in the number of people of working age, as well as a decrease in the pace of technological progress. The results of this forecast are presented in Table 11.

Table 11. Income gap closing forecast: cautionary scenario

Kraj	GDP per capita at PPS in 2024 (EU-15 = 100)	GDP per capita at PPS in 2035 (EU-15 = 100)
Poland	74.6	80.2
Bulgaria	62.9	62.5
Croatia	73.0	71.1
Czechia	86.6	82.2
Estonia	75.2	64.3
Lithuania	83.2	86.6
Latvia	67.3	63.0
Romania	74.7	71.4
Slovakia	71.1	72.4
Slovenia	86.4	85.5
Hungary	73.1	55.5
Models of capitalism		
Patchwork*	75.2	74.2
Continental*	106.2	105.7
Mediterranean*	87.4	84.9
Nordic*	109.3	118.8
Anglo-Saxon*	103.2	104.6
EU-15*	100.0	100.0

* Population-weighted average.

Source: Authors' own work.

The starting point in the cautionary scenario is a forecast of total real GDP growth, based on economic growth accounting. The annual rates of change in total real GDP for each of the CEE-11 and EU-15 countries in 2025–2035 were calculated as the sum of: the adjusted average TFP growth rate for 2004–2024; the average rate of change in the physical capital stock in 2004–2024 multiplied by the share of physical capital remuneration in income (0.5); and the projected growth rate of the number of people of working age (15–64 years) in a given year multiplied by the share of labour remuneration in income (0.5). Projections of the number of people of working age come from the World Bank database. The adjustment of the TFP growth rate consists in a reduction of its forecast growth by 1 pp for the CEE-11 countries (for the EU-15 economies, the TFP growth rate did not change). Therefore, this adjustment takes into account the expected threats (mentioned in Part I of the study) to the sustainability of economic growth and institutional barriers resulting from the design and operation of patchwork capitalism, making it difficult for the CEE-11 countries to maintain the current pace of technological progress.

The growth projections for total real GDP growth were then converted into annual rates of change in real GDP per capita using the World Bank's population projections. This series was used in the next step to extrapolate the 2024 GDP per capita levels at PPS to 2025–2035. To take into account the fact that in the coming years there will be further nominal convergence in price levels between CEE and Western Europe, the resulting GDP per capita series is deflated by a single-base inflation index (base 2024 = 100), where the annual inflation rate is determined by its average level for each country from 2004–2024 (the value of GDP per capita in 2025 is deflated by an inflation rate covering one year, the 2026 value – an inflation rate covering 2 years, etc.).

In the cautionary scenario structured this way, the CEE-11 countries will see a reversal of the hitherto trends on the path of real income convergence and a decline in the relative level of economic development. As a consequence of the significant slowdown in economic growth (resulting from the overlapping effects of shrinking labour stock and slower technological progress), the CEE-11 group as a whole will experience a real income divergence from the EU-15 core countries – in 2035, the income gap of the CEE-11 countries will be on average 1 pp higher than in 2024. Their development gap with other models of capitalism, except the Mediterranean one, will also increase, especially relative to the Nordic model. Only three CEE-11 countries – Poland, Lithuania and Slovakia – will not experience income divergence. In the remaining eight countries, the income gap will increase in relation to Western Europe. Hungary will be most affected by the divergence process (an increase in the development gap by nearly 18 pp) and in 2035 will become the poorest country not only in the CEE-11 group, but also in the entire EU. The divergence process will be accompanied by an increase in the diversity of levels of economic development within the CEE-11 group. As can be read from the data presented in Table 11, the disparity of GDP per capita at PPS (as a percentage of the EU-15 average) between the most and least developed countries in this group will increase from 23.7 pp in 2024 (Czechia vs. Bulgaria) to over 31 pp (Lithuania vs. Hungary).

Finally, it is worth adding that the cautionary scenario variant presented in Table 11 is not the worst-case scenario. It assumes that the dynamics of changes in the physical capital stock over the next 11 years will be the same as before. However, this is by no means a foregone conclusion. It cannot be ruled out that the stock of physical capital in the economy will grow more slowly than in the last 20 years – for example, as a result of market saturation, increase in labour costs, further decline in the expected rate of return on capital, narrowing of the technological gap and consequently lower benefits from innovation, as well as intensifying competition for limited resources of the defence sector, which will discourage foreign investors from investing capital in the CEE-11 area. Such developments may further hamper the current process of income convergence between the CEE-11 and the EU-15 over the forecast timeframe, and even accelerate the divergence process signalled in the cautionary scenario in Table 11.

Conclusions and recommendations

The scenarios presented above for future paths of economic growth and real convergence of the CEE-11 countries and possible lines of transformation of patchwork capitalism in the years 2025–2035 provide rationale for the recommendations formulated in this part of the study, the implementation of which will reduce the probability of the cautionary scenarios materialising (and thus increase the chances of the baseline or even the optimistic scenario coming true), and at the same time will stop the process of progressive "patchworkisation" of the model of capitalism prevailing in the CEE-11 countries. The overarching goal of the recommendations presented in the field of both economic policy and the institutional environment of the economies of the CEE-11 countries is to change the sources of their institutional comparative advantage by departing from the current model of economic development and the model of international specialisation towards a circular, knowledge-based and environmentally sustainable economy, as well as quickly and flexibly responding to challenges resulting from adverse asymmetric external shocks in a poly-crisis environment. Achieving these goals should make it possible to avoid the middle-income trap, maintain the current, relatively fast path of real income convergence, and consequently change the current status of the semi-periphery and the transition of the CEE-11 countries to the EU "core".

However, it should be borne in mind that formulating any recommendations in the area of economic activity is a major challenge, primarily due to the subject matter to which they refer. This is because in the case of economic phenomena sometimes the very publication of an alarmist forecast has a sobering effect on political authorities and economic entities, which significantly reduces the probability of its materialisation. Therefore, the key message of our recommendations is to make their recipients, i.e. political and economic decision-makers, aware of the unprecedented scale and pace of the growing number of overlapping threats, which may, in the near future, prevent Poland and the other CEE-11 countries from remaining on the path of rapid economic growth and real income convergence. The quantitative effects of the accumulation of these risks on growth and convergence are shown in the cautionary scenario of our forecast. They imply the need to drive a fundamental change in economic policy and strategy, and to rebuild the institutional architecture of the economy on an equally unprecedented scale, in addition to being under strong pressure of time and facing other existential challenges (including the threat of war). Therefore, our message behind the recommendations presented below is that there is also hope for decision-makers to quickly come to their senses and undertake the necessary reform measures equally fast.

It is also worth noting that comprehensive remodelling of the institutional architecture of the economy is possible mainly – due to the very nature of institutions – in the medium and long term. Nevertheless, in the timeframe of our forecast, the priority should be to reduce to a minimum the presence of patchwork features of the socio-economic order prevailing in Poland and other CEE countries through appropriate transformations of formal institutions and their entire architecture. At the same time, a long-term strategy of economic development should be developed, aimed at changing the pattern of international competitiveness of the economies of these countries towards a growing role of innovation and specialisation in production with a high share of value added. These targets should be supported in particular by the following actions/changes:

a) institutions:
   - review the existing institutional architecture from the point of view of coherence and complementarity of its component formal institutions;
   - develop and implement a programme for the remodelling of formal institutions, aimed at increasing the coherence and complementarity of the entire institutional architecture and strengthening its fabric;
   - create a mechanism to ensure the unconditional enforcement of the existing formal institutions (rules of the game);
   - design and implement a system of constitutional safeguards, preventing the arbitrary interpretation of legal norms by politicians and eliminating "institutional voluntarism";
   - introduce institutional barriers limiting the scale of "rent-seeking" and state capture by politicians;
   - implement a comprehensive reform of the healthcare system, which would significantly increase the accessibility of healthcare and improve the quality of medical services, and at the same time increase the system's resilience to unanticipated pandemic-type shocks;
   - introduce institutional solutions that "civilise" the inflow of foreign capital and subject its activities to evaluation from the point of view of the strate-

gic development goals of the national economy (and thus eliminate another weakness of patchwork capitalism as an "open access order");
- control entropy inflow from abroad (including the hitherto free import of toxic waste and rubbish).

b) economic development strategy:
- develop and implement a plan for gradually switching the lever of economic development and change its structure towards an increase in the share of highly processed products and services, with a high content of technological progress and value added, which – especially in Poland – will not be possible without fiscal consolidation; the latter, on the one hand, will make it possible to reduce the deficit of the public finance sector (which reached its historical high in Poland in 2024 in both nominal and real terms), which will automatically translate into an increase in the rate of savings and investments, and on the other hand – by limiting the scale of transfers – will free up funds that can be allocated to growth and development-spurring activities;
- strengthen the development function of government, especially in R&D;
- reduce the scale of government failure, particularly as a provider of public and socially desirable goods (including healthcare and education);
- introduce tax solutions aimed at permanently increasing the propensity to save and raising the investment rate, creating conditions for accelerated economic growth.
- shift towards promoting professional activity and an increase in the labour factor stock, through the extension of the working life, active labour market policy and the opening of economies to the influx of foreign workers.

References

Acemoğlu, D., Robinson, J. (2014). *Dlaczego narody przegrywają. Źródła władzy, pomyślności i ubóstwa*. Warsaw: Zysk i S-ka.

Acemoğlu, D., Robinson, J. (2019). *The Narrow Corridor. States, Societies, and the Fate of Liberty*. New York: Penguin Press.

Amable, B. (2003). *The Diversity of Modern Capitalism*. Oxford: Oxford University Press.

Braudel, F. (1999). *Historia i trwanie*. Warsaw: Czytelnik.

Czerniak, A. (2023). Coordination Mechanisms in Patchwork Capitalism – Example of the Housing Area, *Warsaw Forum of Economic Sociology*, 12(25), in press.

David, P.A. (1994). Why Are Institutions the "Carriers of History"? Path Dependence and the Evolution of Conventions, Organizations and Institution, *Structural Change and Economic Dynamics*, 5, pp. 205–220.

Draghi, M. (2024). *The Future of European Competitiveness: Report by Mario Draghi*, https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en (accessed: 25.04.2025).

Engerman, S.L., Sokoloff K.L. (2005). Institutional and Non-Institutional Explanations of Economic Differences. In: *Handbook of New Institutional Economics* (pp. 639–665), M.M. Shirley, C. Ménard (Eds.). Dordrecht: Springer.

European Commission (2025). *European Innovation Scoreboard*, https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard (accessed: 25.04.2025).

Eurostat (2025a). *[Home]*, ec.europa.eu/Eurostat (accessed: 25.04.2025).

Eurostat (2025b). *Database*, https://ec.europa.eu/eurostat/data/database (accessed: 25.04.2025).

Ferrazzi, M., Schanz, J., Wolski, M. (2025). Growth and Competitiveness in Central, Eastern and South-Eastern Europe: The Role of Innovation, *EIB Working Papers*, 2025/01. DOI: 10.2867/4566543.

Gardawski, J., Rapacki, R. (2021). Patchwork Capitalism in Central and Eastern Europe – A New Conceptualization, *Warsaw Forum of Economic Sociology*, 12(24), pp. 7–104.

Hall, P.A., Soskice, D. (2001). *Varieties of Capitalism*. Oxford: Oxford University Press.

ILO (2025). *Ilostat Database*, https://ilo.primo.exlibrisgroup.com/discovery/fulldisplay/alma994954493102676/41ILO_INST:41ILO_V2 (accessed: 25.04.2025).

IMF (2024). *World Economic Outlook Database*, October, https://www.imf.org/en/Publications/WEO/weo-database/2025/april (accessed: 25.04.2025).

King, R.G., Levine, R., (1994). Capital Fundamentalism, Economic Development, and Economic Growth, *Carnegie-Rochester Conference Series on Public Policy*, 40, pp. 259–292.

Klein, P.G. (2000). New Institutional Economics. In: *Encyclopedia of Law and Economics* (pp. 456–489), B. Bouckeart, B. De Geest (Eds.). Aldershott: Edward Elgar.

Landes, D. (2005). *Bogactwo i nędza narodów. Dlaczego jedni są tak bogaci, a inni tak ubodzy*. Warsaw: Warszawskie Wydawnictwo Literackie MUZA.

Lawrence, M., Janzwood, S., Homer-Dixon, T. (2022). *What Is a Global Polycrisis?*, https://cascadeinstitute.org/technical-paper/what-is-a-global-polycrisis/ (accessed: 30.01.2024).

Lissowska, M. (2020). *Beliefs and Preferences of a Society as a Background for Shaping Institutional Structures* (manuscript). Warsaw: SGH Warsaw School of Economics.

Maszczyk, P., Lissowska, M., Próchniak, M., Rapacki, R., Sulejewicz, A. (2023). Development Trajectories of CEE Countries – A Tentative Assessment of the Effects of the COVID-19 Pandemic and the War in Ukraine. In: *Report of the SGH Warsaw School of Economics and the Economic Forum 2023* (pp. 13–39), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (Eds.). Warsaw: SGH Warsaw School of Economics.

Maszczyk, P., Próchniak, M., Rapacki, R. (2024). Development Trajectories in Central and Eastern European Countries in 2004–20123 – Sources of the Institutional Comparative Advantage and Their Evolution in Patchwork Capitalism. In: *Report of the SGH Warsaw School of Economics and the Economic Forum 2024* (pp. 15–52), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (Eds.). Warsaw: SGH Warsaw School of Economics.

Mączyńska, E., Pysz, P. (2016). Społeczna gospodarka rynkowa i jej współczesne znaczenie, *Biuletyn PTE*, 2(73), pp. 16–22.

Mrozowicki, A., Gardawski, J., Burski, J., Rapacki, R. (2025). Patchwork Capitalism and the Management of Interlinked Crises by Essential Public Services in Poland, *International Labour Review*, 1(164), pp. 1–19.

North, D.C. (2005). Institutions and the Performance of Economies Over Time. In: *Handbook of New Institutional Economics* (pp. 21–30), C. Ménard, M.M. Shirley (Eds.). Dordrecht: Springer.

Nölke, A., Vliegenthart, A. (2009). Enlarging the Varieties of Capitalism: The Emergence of Dependent Market Economies in East Central Europe. *World Politics*, 61(4), pp. 670–702.

Osińska, M., Malaga, K. Lach, B. (2025). Investigating Relationships Between Economic Freedom, Growth, and Development in CEE Countries, *Journal of Institutional Economics*, 21(e16), pp. 1–19.

Pontara, N., Medic, P., Relic, A., Record, R. (2025). *An Economic Agenda to Accelerate Convergence of the Western Balkans with the European Union*. Washington: World Bank.

Próchniak, M., Rapacki, R. (2024). *Economic Growth and Real Convergence in Central and Eastern Europe – Lessons for the Future Enlargement of the EU*. Stockholm: Swedish Institute for European Policy Studies (SIEPS).

Próchniak, M., Lissowska, M., Maszczyk, P., Rapacki, R., Towalski, R. (2022). Differentiation of Inflation Rates in the European Union vs. Labour Markets and Economic Growth – Lessons from the COVID-19 Pandemic. In: *Report of the SGH Warsaw School of Economics and the Economic Forum 2022* (pp. 13–49), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (Eds.). Warsaw: SGH Publishing House.

Rapacki, R., Maszczyk, P., Lissowska, M., Próchniak, M., Sulejewicz, A. (2025). Patchwork Capitalism and Economic Development Trajectories of CEE11 Countries in 2004–2022, *Eastern European Economics*, https://www.tandfonline.com/doi/full/10.1080/00128775.2025.2499043?src=exp-la (accessed: 25.06.2025).

Rapacki, R. (Ed., in collaboration with A. Czerniak). (2019). *Diversity of Patchwork Capitalism in Central and Eastern Europe*. Abingdon–New York: Routledge.

Rapacki, R. (Ed.), Próchniak, M., Czerniak, A., Gardawski, J., Horbaczewska, B., Karbowski, A., Maszczyk, P., Towalski, R. (2019). *Kapitalizm patchworkowy w Polsce i Europie Środkowo-Wschodniej*. Warsaw: PWE.

Shirley, M.M. (2005). Institutions and Development. In: *Handbook of New Institutional Economics* (pp. 611–638), M.M. Shirley, C. Ménard (Eds.). Dordrecht: Springer.

WEF (2023). *Annual Report 2022–2023*, https://www.weforum.org/publications/annual-report-2022-2023/ (accessed: 25.04.2025).

Welfe, W. (2001). Czynniki wzrostu potencjału gospodarczego Polski, *Ekonomista*, 2, pp. 177–200.

Williamson, O.E. (2000). The New Institutional Economics: Taking Stock, Looking Ahead, *Journal of Economic Literature*, 38(3), pp. 595–613.

World Bank (2025a). *World Development Indicators Database*, https://databank.worldbank.org/source/world-development-indicators (accessed:25.04.2025).

World Bank (2025b). *Worldwide Governance Indicators*, https://databank.worldbank.org/source/worldwide-governance-indicators (accessed:25.04.2025).

Worldometers (2025). *Population*, https://www.worldometers.info/population/ (accessed: 25.04.2025).

IMPACT OF AI TECHNOLOGY ON ECONOMIC GROWTH – CHALLENGES AND RECOMMENDATIONS

Michał Bernardelli
Dominika Bosek-Rak
Cezary Jaroni
Bogumił Kamiński
Ewelina Kędzior
Paweł Kubicki
Albert Tomaszewski

DOI: 10.33119/978-83-8030-742-1.55_92

Abstract

This report examines the transformative potential of Artificial Intelligence (AI), particularly generative AI (GenAI), on economic growth, with a specific focus on Poland and the Central and Eastern Europe (CEE) region. AI presents a significant opportunity, potentially boosting Poland's annual GDP by 5–8% primarily through enhanced productivity across various sectors. However, the report highlights a considerable adoption gap, with Poland lagging behind the EU average in AI implementation (5.9% vs. 13.5% of firms) and overall digital maturity.

Based on a mixed-methods approach, including surveys of Warsaw Stock Exchange (GPW) listed companies and SME participants in the "Skills of Tomorrow: AI" programme, alongside desk research, the study reveals distinct adoption patterns. Large Polish companies demonstrate high awareness and management engagement with AI, yet face significant barriers including unclear return on investment, high costs, system integration challenges, skill gaps, and security/ethical concerns, often resulting in implementation levels lagging behind initial enthusiasm. In contrast, SMEs show promising, albeit often spontaneous and bottom-up, adoption driven by individual "AI pioneers" focusing on automating routine tasks, enhancing creativity, and improving communication.

Key cross-cutting challenges hindering broader AI adoption in Poland include the difficulty in quantifying business benefits, a significant digital skills gap across society, potential security and ethical risks (including shadow AI), and an underdeveloped external support ecosystem (R&D institutions, consultancies, public funding). The report concludes with targeted recommendations for key stakeholders.

Authors

Michał Bernardelli – SGH Professor, Collegium of Economic Analysis. Dean of Graduate Studies, SGH Warsaw School of Economics. Graduated from the University of Warsaw in mathematics and computer science. In 2008, earned his doctoral degree in mathematics, and in 2020 a post-doctoral degree in economics. For more than 20 years, consultant, manager and participant of many commercial and R&D projects in the fields of econometric modelling and artificial intelligence. The interdisciplinary nature of his research involves mainly the use of IT and mathematical equipment to solve problems related to data analysis and mining, in particular big data and predictive and optimisation methods. Author of over 80 scientific articles as well as several monographs.

Dominika Bosek-Rak – PhD, Assistant Professor, Department of Management Theory, SGH Warsaw School of Economics. Head of Postgraduate Studies in Digital Transformation. Her research interests include strategic management, digital transformation, artificial intelligence and digitalisation in the financial sector.

Cezary Jaroni – Product Marketing Manager at Google, SGH graduate. Responsible for leading the global Grow with Google initiative in Poland and extensive education in AI competence. Leader of the "Skills of Tomorrow: AI" programme, the largest educational programme on artificial intelligence for the SME sector in Poland. Responsible for the rollout of Gemini, Google's conversational AI, on the Polish market. Over the past six years, he has created and managed development programmes such as "Skills of Tomorrow", "Innovation Designers" and "Grow Your Career with Google Cloud".

Bogumił Kamiński – Professor, Head of the Decision Support and Analysis Unit, SGH Warsaw School of Economics. Director of the Intercollegiate Centre for Artificial Intelligence and Digital Platforms – AI Lab. Chairman of the Committee on Statistics and Econometrics, Polish Academy of Sciences. Author of over 100 scientific papers on the theory and applications of advanced data analysis and artificial intelligence methods. Boasts 25 years' experience in the implementation of analytical solutions to improve the operation of enterprises and state institutions.

Ewelina Kędzior – employee of the Intercollegiate Centre for Artificial Intelligence and Digital Platforms – AI Lab, SGH Warsaw School of Economics. Graduated in computer science and econometrics from the Warsaw University of Life Sciences and in quantitative methods in economics and information systems from the SGH Warsaw School of Economics. For over five years, has been involved with the SGH Warsaw School of Economics, where she is actively engaged in academic and organisational activities. Founder and former president of the Data Science Student Research Society and former president for finance and administration at the Statistics Student Research Society. Coordinator of many projects and co-organiser of events in the field of advanced data analytics and artificial intelligence.

Paweł Kubicki – Professor at SGH, Head of the Department of Social Policy, SGH Warsaw School of Economics. Member of the Committee on Labour and Social Policy, Polish Academy of Sciences. At SGH, he is also the Rector's Representative for Parameterisation and Chairman of the Academic Council on Political and Administration Sciences, and as part of his activities at the SGH AI Lab, studies the use of artificial intelligence in public policy. In recent years, his research and publishing activity has focused on public policy failures, as exemplified by his co-editing of the book *Routledge International Handbook of Failure*.

Albert Tomaszewski – PhD, Assistant Professor, Department of Strategic Management, SGH Warsaw School of Economics. Head of Annual Postgraduate Management Studies. Secretary of the Committee on Organisation and Management Sciences, Polish Academy of Sciences. Expert in the field of managerial and entrepreneurial education. Head and member of several research teams on startup ecosystems, the impact of new technologies on organisations, strategy, and crisis resilience. Mentor in acceleration and incubation programmes for startups, promoter of entrepreneurship.

This study seeks answers to key questions on main issues related to the implementation of artificial intelligence (AI) in the Polish economy.

- **Trends and technologies**: What are the most important global technology trends related to artificial intelligence, with a focus on generative artificial intelligence (GenAI) and its potential?
- **Impact on the economy and the labour market**: What is the estimated global and regional (Central and Eastern Europe, CEE) impact of AI on economic growth (GDP) and how can it transform the labour market? Which professions are most exposed to automation, and in which industries is an increase in demand expected?
- **Poland's position**: What is the current level of AI technology adoption and digital maturity in Poland compared to the European Union (EU) and the CEE region, and what are the forecasts for the potential impact of AI on the Polish economy and individual sectors?
- **Perspective of large companies**: How do Polish listed companies perceive and implement AI? What barriers (including costs, unclear benefits, system integration, competences, security) do they face in this area and what is the level of involvement of the management compared to the scale of actual implementations?
- **Perspective of small and medium-sized enterprises (SMEs):** How do micro-, small and medium-sized enterprises in Poland (based on the example of the surveyed "AI pioneers") start using AI tools? What are the benefits and challenges and what role do grassroots initiatives play in the adoption process?
- **Key challenges for Poland**: What are the key cross-cutting systemic and organisational barriers that inhibit a faster and more effective process of implementing AI in the Polish economy?
- **Recommendations for business**: What actions should be taken by management boards and managers of enterprises (both large and SMEs) in the areas of strategy, technology, people management, security and ethics to effectively implement AI and reap business benefits from it?

- **Recommendations for public policy**: What actions should policymakers take to create an environment conducive to the development and implementation of AI in Poland, including support for the innovation ecosystem, human capital development, investments in infrastructure, and the creation of an appropriate legal and regulatory framework?
- **Recommendations for the business environment**: What role can and should academia, consultancies and technology providers play in supporting enterprises in the process of implementing and using artificial intelligence?

Methodology

The study uses an approach that combines quantitative and qualitative analyses. Data collection involved:

- surveys – two original surveys were carried out:
  - a survey involving the management of 160 companies listed on the Warsaw Stock Exchange (WSE) on attitudes, implementations and barriers related to the use of AI;
  - a multi-wave survey (recruitment, expectations, evaluation, follow-up parts) among participants of the "Skills of Tomorrow: AI" programme, focusing on the perspective of SMEs (specialists, owners) in the context of the use and implementation of AI;
- desk research encompassing:
  - reports of consulting firms and international organisations (e.g. Implement Consulting Group, Deloitte, WEF, OECD);
  - statistics and indicators published by national and international institutions (e.g. Eurostat, DESI);
  - market data (e.g. Fortune Business Insights, Binance Square);
- analysis of source data – the authors also used original source data collected by members of the research team on the Polish economy and various aspects of AI implementation.

AI landscape – global trends and technologies

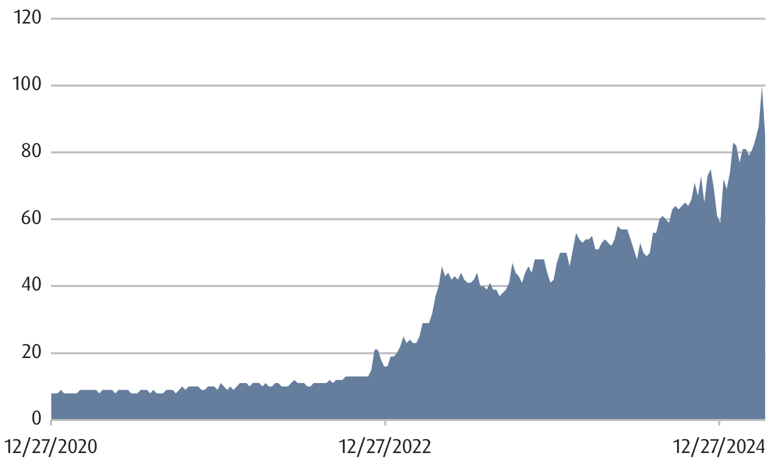
Artificial intelligence is defined as a branch of computer science that aims to create computer systems capable of performing tasks that require human intelligence. Imitation of human cognitive abilities is carried out through advanced algorithms and mathematical models. In recent years, mainly due to media reports, the perception of AI has been expanded to include a generative aspect. This extension implies an increase in the capabilities and application scope of the technologies developed compared to its previous forms.

Generative artificial intelligence (GenAI) is defined by the OECD as a technology that enables the creation of content, such as text, images, audio or video, upon receipt of a user request [Lorenc et al., 2023]. Due to the short history of this concept, its conceptualisation has not yet been completed, which favours the emergence of alternative attempts a describing it [Bernardelli, 2025]. However, it has received significant interest, as evidenced by the non-linear increase in the number of queries about "AI" in Google Search between 2021 and 2023 (Figure 1).

Regardless of definitional nuances, GenAI is seen as a technology with revolutionary potential, comparable to historical breakthroughs such as the invention of the steam engine, electrification, computerisation, or the fourth industrial revolution (Industry 4.0). The impact of this technological transformation on the development of the economy is multifaceted and will be discussed in detail further on in the study.

A key feature of GenAI is its ability to generate new and original content, which significantly differentiates it from traditional AI systems that rely heavily on reproducing existing patterns. In the vast majority of cases, this is achieved thanks to large language models (LLMs), which can process huge sets of information and generate responses in natural language. They are a key element in the growth of GenAI by providing precise answers to questions in fields previously based on expert knowledge.

Figure 1. Interest in the keyword "AI" in Google Search in 2021–2025 (number of queries)



Source: Authors' own compilation based on Google [2025].

The main areas of application of GenAI include the automation of tasks previously considered non-routine or requiring a creative approach. These certainly include the generation and processing of images, text, music, video and structured or unstructured data, which are an integral part of activities in areas such as medicine, transport, finance, education, entertainment and marketing.

The increase in GenAI's application capabilities and its ability to automate tasks that were previously hard to algorithmise are leading to a profound transformation of the labour market. Demand for some professions is forecasted to decline significantly or completely disappear. At the same time, new specialisations are emerging and existing occupations are being transformed to increase efficiency through the implementation of GenAI. Changes in the labour market are another factor that plays a key role in the absorption of GenAI by the economies of individual countries.

The growing popularity of GenAI is closely correlated with the growing demand for computer hardware to meet the computing requirements characteristic of this type of technology. Processors and graphics cards are being designed that process data much more effectively and faster as part of artificial neural networks. This demand includes not only IT infrastructure but is also associated with a significant increase in electricity consumption. Further development of GenAI and even maintaining the current level of its use given the growing public interest, requires significantly greater energy resources to be available.

Major factors closely related to the development of GenAI include ethical issues, security challenges and potential threats resulting from its inadequate use. Due to the wide range and multifaceted nature of issues related to AI technologies, their detailed description is beyond the scope of this study. Hence, an attempt is made to focus on the impact of AI on the development of the economy and to raise only those issues that currently pose the greatest challenge in connection with the rapid implementation of trends based mainly on GenAI.

AI in the economy – its potential and impact on the labour market

The dynamic development of technologies based on artificial intelligence, especially generative AI, is currently becoming one of the key factors driving the future of economies around the world. Artificial intelligence has become an integral part of both corporate business strategies and public awareness. In the CEE region, as well as in Poland and the EU, AI is no longer just the subject of research and testing but is increasingly becoming a tool used in practice not only in the public but also in the private sector. In the face of growing pressure to increase competitiveness, the development of digitalisation, process optimisation and adaptation to structural changes in the labour market, AI is an important element of the development strategies of many countries. Precise measurement of progress in this field and the degree of use of AI faces methodological difficulties. However, if we consider individual factors independently, we can try to show growing trends in the absorption of AI technologies in many areas of the economy.

Starting with the purely technological development of generative AI, with particular emphasis on large language models, the number of models implemented, or their quality, efficiency or level of sophistication can be considered as an indicator of progress. As the number of parameters in these models increases, their ability to solve increasingly complex problems also grows.

An analysis of successive versions of GPT (generative pretrained transformer) models developed by OpenAI shows a clear progress compared to the 2018 GPT-1 model, with 117 million parameters. The next release, GPT-2(2019), already had 1.5 billion parameters, and GPT-3(2020) featured as many as 175 billion parameters. Three years later, a version of GPT-4 was made available, with an estimated number of parameters in the hundreds of billions.[1]

The dynamic growth in popularity of GenAI is reflected in the statistics on the number of users. By comparison, it took Netflix 3.5 years, Twitter 2 years, and Facebook 10 months to reach one million users. ChatGPT, launched on 30 November 2022, reached this threshold in just 5 days [AIPRM, 2024].

Due to the increased interest in GenAI, sales of processors for LLMs increased significantly, becoming one of the key segments of the computer technology market. The most commonly used types of processors are GPUs (graphics processing units) and TPUs (tensor processing units). In recent years, the GPU market has been dominated by NVIDIA, which is now the market leader in processors for training large AI models. The GPUs provided by this manufacturer are widely used by artificial intelligence companies, as well as by big tech companies such as OpenAI, Google or Microsoft. TPUs, on the other hand, are specialised integrated circuits, developed by Google in response to the need to speed up calculations in machine learning tasks, including the training of LLMs. According to the Fortune Business Insights report [2025], the value of the AI processor market is predicted to grow to USD 91.18 billion (approximately 18.5% per year) by 2030.

The LLM training process takes place in data centres consisting of hundreds of thousands of GPUs, which require significant energy resources and huge amounts of water to cool the IT infrastructure. The annual power consumption for this process

1 The exact number of parameters has not been officially disclosed by OpenAI.

is estimated at hundreds of gigawatt hours, which exceeds the power consumption demand of some smaller countries [Olawade et al., 2024]. It is not just the training process that is cost-intensive in terms of resources. The operation of artificial intelligence systems also involves significant energy costs. It is estimated that the generation of responses by LLMs is several or even tens of times higher in terms of power demand than obtaining answers from classic search engines [Baeldung, 2024].

In CEE countries, including Poland, AI technologies are gaining importance as potential tools for accelerating economic growth in relation to more developed EU economies. A high share of industrial sectors, a growing number of technology companies and increasing demand for the digitalisation of public services create favourable conditions for the implementation of solutions based on artificial intelligence. Generative AI is particularly effective in automating knowledge-intensive tasks, e.g. in the IT, financial and business services sectors. The greatest economic potential of this tool can be seen in public administration, production and business services. At the same time, the region faces challenges in the area of digital competences, the availability of infrastructure and the uneven pace of implementation of new technologies.

From the EU's perspective, the use of AI is not only intended to serve economic growth but also to increase technological sovereignty, the resilience of public systems and support the green transition. The implementation of AI is treated as a key element of digital transformation, aimed at the development of infrastructure, strengthening the competences of society and supporting innovative enterprises, etc.

Generative AI is a potential source of economic growth for CEE countries, which could reach up to EUR 90–100 billion annually in the next ten years thanks to the dissemination of this tool. This corresponds to a GDP growth of about 5% per year in the region [Implement Consulting Group, 2024]. The main sources of this growth are based on three complementary factors.

The largest part of the growth represents the increased productivity of employees supported by GenAI tools (around EUR 80–85 billion per year). A second equally important factor is the use of the time saved for new value-added tasks and the shifting of priorities (around EUR 15–20 billion per year). The final value of GenAI's impact on GDP growth was adjusted for the estimated losses resulting from job losses or the need to retrain some of the workers affected by automation (about EUR 5 billion per year).

From the point of view of economic potential, however, the pace and scale of implementation are important. In the case of delay in GenAI implementation by five years, the annual benefits to the region's GDP could fall from 5% to just 1%, which would mean a reduction in value added from EUR 90–100 billion to around EUR 10–15 billion per year. At the same time, the leapfrog scenario, under which AI implementation is accelerated to the level seen in the EU's most digitally advanced countries, could increase the region's annual GDP growth to 8%, which would likely translate into EUR 135–145 billion in additional value per year. However, accelerated digital transformation would require a rapid development of key pillars of AI adoption, such as technological infrastructure, human capital and a coherent government strategy focused on innovation.

Table 1. Potential annual GDP growth paths depending on GenAI implementation level

Country	Late adoption scenario	Widespread adoption scenario	Leapfrog scenario
Bulgaria	~ EUR 0.5 bn	EUR 4–5 bn	EUR 6–7 bn
	1%	5%	8%
Croatia	~ EUR 0.5 bn	EUR 3–4 bn	EUR 5–6 bn
	1%	5%	8%
Czechia	EUR 1–2 bn	EUR 14–16 bn	EUR 20–23 bn
	1%	5%	8%
Lithuania	~ EUR 0.5 bn	EUR 3–4 bn	EUR 4–5 bn
	1%	5%	7%
Poland	EUR 4–5 bn	EUR 35–40 bn	EUR 50–55 bn
	1%	5%	8%
Romania	EUR 1–2 bn	EUR 14–16 bn	EUR 20–22 bn
	1%	5%	7%
Slovenia	~ EUR 0.5 bn	EUR 3–4 bn	EUR 4–5 bn
	1%	5%	8%
Hungary	~ EUR 1 bn	EUR 8–10 bn	EUR 12–14 bn
	1%	5%	8%
CEE countries	EUR 10–15 bn	EUR 90–100 bn	EUR 135–145 bn
	1%	5%	8%

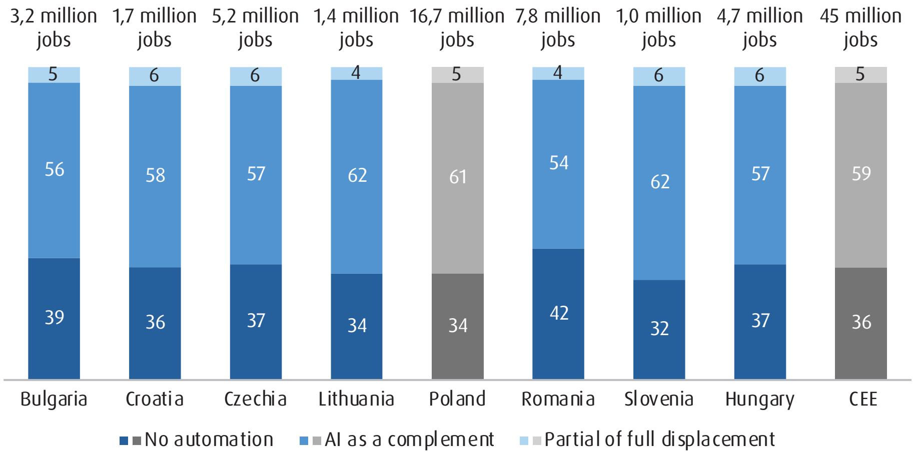
Source: Authors' own compilation based on Implement Consulting Group [2024] report.

The number of individuals and businesses using GenAI's capabilities is growing exponentially. In 2024, 92% of Fortune 500 companies had already used an OpenAI product [Binance Square, 2024]. According to the *State of Generative AI in the Enterprise* report by consulting firm Deloitte [2024], the following departments are the most advanced in terms of the use of GenAI: IT (28% of responses), operations (11%), marketing (10%) and customer service (8%).

The great interest in AI translates into the labour market. According to the World Economic Forum's *Future of Jobs Report 2025*, artificial intelligence will be a major driver shaping the labour market by 2030, surpassing other factors influencing job creation and destruction [WEF, 2025].

Over the next five years, advances in AI and information processing technologies are expected to create 19 million new jobs while displacing 9 million jobs, which means a net positive balance [Daco, 2024; Rege, Hemachandran, 2024].

Figure 2. Share of jobs exposed to automation by the use of GenAI (% of total employment by country)



Source: Authors' own compilation based on Implement Consulting Group [2024] report.

According to the Implement Consulting Group [2024] report, it is estimated that about 59% of jobs will use GenAI technology, which will assist workers in selected tasks – especially those related to content creation (text, code, images, etc.), data analysis, design or solving complex problems (Figure 2). This applies in particular to office and creative professions, and not – as was the case with earlier stages of automation – manual workers. Only about 5% of jobs (converted into about 2 million places) are considered to be highly exposed to partial or full displacement by automation. This applies to routine and repetitive professions, such as clerical support workers, contact centre operators or translators, where a large part of their duties can be taken over by intelligent systems.

Despite the previously mentioned risk of partial job losses, the labour market in CEE countries is expected to be able to fully compensate for any losses in employment in the longer term. Generative AI, while increasing productivity in most professions, will simultaneously create a demand for new roles and competences.

The sources of new jobs will include the increase in general demand in the economy, the development of completely new roles related to the application and operation of AI (e.g. prompt engineers, data trainers, content creators), as well as the increase in demand in the same occupations that will be transformed thanks to AI and become more effective and scalable. According to estimates, even with the accelerated and widespread implementation of generative AI within a decade, the number of people who need to be re-employed (120,000–240,000 per year) remains much lower than the expected number of job openings looking forward to 2035 (about 1.6 million per year).

There is a clearly growing trend in the use of AI. On the one hand, the rapid development of this tool causes difficulties in its precise quantification, and on the other hand, it poses a challenge in assessing the effects of a sociological, technological, economic and legal nature. That is why it is so important to conduct systematic research on the impact of AI on the development of the economy.

Poland on the AI map

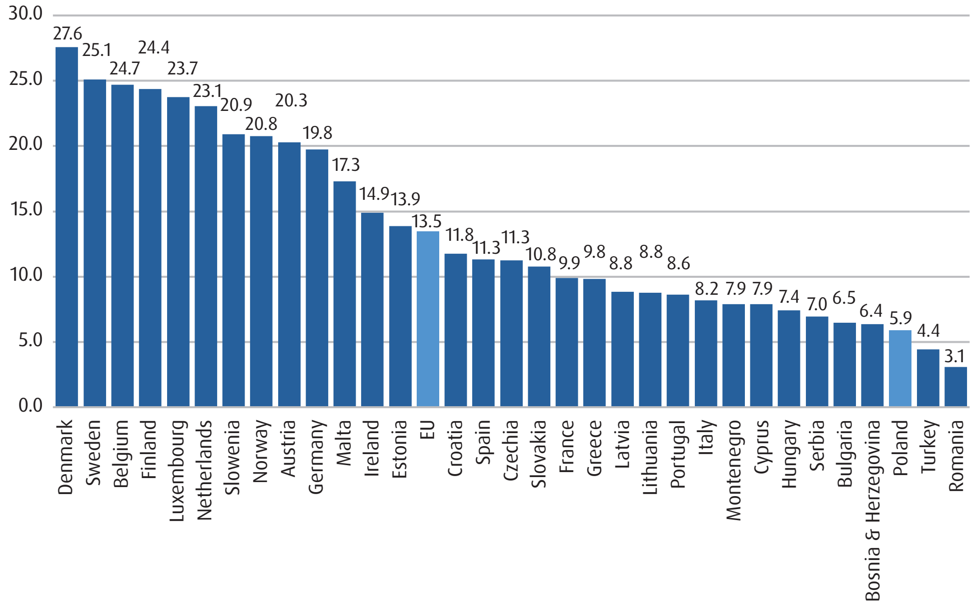
The study *Sztuczna inteligencja w życiu Polaków* [Artificial Intelligence in the Lives of Poles] carried out by Maison & Partners [2024] shows that 56% of Poles under 25 use ChatGPT, while 42% use tools based on AI technology and are aware of it. Despite the general increase in interest in artificial intelligence, Poland ranks one of the last in the EU in terms of its adoption. According to Eurostat data, in 2024, only 5.9% of Polish companies employing at least 10 people decided to adopt AI (Figure 3).

Despite the clear economic potential associated with AI adoption, the current indicators of Poland's digital maturity point to significant gaps that may limit the pace and scale of advanced technology deployment. EU research showing the readiness of economies and societies for digitalisation shows that Poland ranks below the EU average in most of the categories analysed [DESI, 2024]. This is especially true in areas considered to be the foundations of digital transformation, such as the use of data analytics, the availability of cloud solutions, and the level of digital skills in society [DESI, 2024].

Only 5.9% of companies in Poland declare the use of technologies based on artificial intelligence, while the EU average is 13.5%. The use of more complex technologies, including AI, data analytics and cloud, in Poland is 51.8%, which is also below the EU average (54.6%) and significantly falls short of the EU's target of at least 75% of enterprises using these technologies by 2030. SMEs in particular show a low level of maturity in the adoption of advanced technologies, which is largely due to limitations in terms of access to financial resources, infrastructure and specialist knowledge necessary to deploy innovative solutions.

Over the next ten years, generative AI can also contribute to increasing Poland's annual GDP by EUR 35–40 billion, which corresponds to a growth of 5%. The largest contribution to this increase will come from improving the productivity of 61% of employees whose work will be supported by AI tools. Only 5% of jobs are considered to be exposed to automation, which is in line with the average for CEE countries. Under the leapfrog adoption scenario, the growth potential could increase to EUR 50–55 billion per year (+8% of GDP), while delaying adoption by five years could reduce this effect to a mere EUR 4–5 billion (+1% of GDP).

Figure 3. Percentage of companies with at least 10 employees that have adopted AI-based solutions (%)



Source: Authors' own compilation based on Eurostat [2025] report.

A significant share (75%) of GenAI's application potential in Poland is concentrated in the service sectors, especially in knowledge-based business services and in trade, transport and tourism. Each of these sectors has the potential to generate up to EUR 10 billion in extra value added over a decade. In the public sector (administration, education, health), the estimated contribution is around EUR 6 billion, and in industry, construction and energy, EUR 5 billion.

Over the last 15 years, the Polish economy has created over 940,000 new jobs, with the largest increases in employment recorded in the service sectors, tourism and the public sector. It is estimated that the impact of generative GenAI on occupations most exposed to automation will result in the opening and closure of 45,000–90,000 jobs, which corresponds to 8–16% of the projected annual number of job offers. As a result, the impact of AI on the Polish labour market remains relatively small compared to the natural employment dynamics witnessed in recent years.

What remains a major challenge in the context of effective digital transformation is the insufficient level of digital competences in Polish society – both among citizens and in the workforce. In 2023, only 44.3% of people had at least basic digital skills, compared to the EU average of 55.6%.

Lower values are also recorded in the case of indicators representing advanced digital skills and the share of information and communication technology (ICT) specialists in the labour market – in Poland, it amounts to 4.3% of the total workforce, compared to the EU average of 4.8%. In the context of the ongoing digital transformation and the growing importance of AI-based technologies, the skills gap is a serious barrier to the effective adoption of innovative solutions. In response to the challenges identified, the European Commission recommends intensifying activities for the development of digital competences of society, in particular by strengthening ICT education and training. It is also recommended to increase support for SMEs in the deployment of advanced technologies such as artificial intelligence, cloud computing and data analytics. In addition, the European Commission points to the need for further investment in digital infrastructure, especially in the areas of broadband Internet and 5G networks, in order to ensure equal access to digital services throughout the territory of the country.

Poland undertakes many activities supporting digital transformation and the implementation of advanced technologies, both as part of national policy and through active participation in EU initiatives. Under the National Recovery Plan (NRP), Poland has allocated 21% of its total budget (i.e. EUR 7.4 billion) for digital policy measures, including broadband development, improving digital competences, digitisation of public services, e-health and cybersecurity. An additional EUR 5.7 billion from cohesion policy funds (8% of the total budget) has been earmarked for the country's digital transformation.

The final scale of benefits resulting from AI adoption will be largely determined by the government's ability to overcome structural barriers, create conditions conducive to innovation and build trust in new technologies. However, to fully leverage this potential, coordinated action is needed in five key areas:

- R&D investment,
- transparent regulations,
- widespread availability of technology,
- human capital development,
- and infrastructure development.

It is therefore necessary to support innovation by funding research projects, creating transparent legislation to protect privacy and copyright, as well as the widespread availability of dedicated tools for both SMEs and the public sector in AI adoption. The development of digital competences in society and the provision of appropriate technological facilities, including computing infrastructure supporting the deployment and development of advanced AI systems is also an indispensible part of this process.

Business perspective – AI deployment, use and perception in Polish companies

Artificial intelligence is a technology that significantly improves labour productivity, has the potential to automate processes and support employees in performing their tasks – depending on the sector, up to 70% of working time can be transformed by AI. In this part of the study, the results of our own research will be presented, which allow this phenomenon to be captured at an early stage of development.

The information obtained will be discussed, clustered into two important groups of enterprises:

a) **listed companies**, whose major goal is to maximise shareholder value, reflected both in the increase in share prices and in dividends paid; this value is determined, among other things, by the company's ability to increase revenues and effectively manage costs; AI-based tools have the potential to influence these areas; research conducted on a sample of 160 companies was intended to provide a better understanding of how AI technology is perceived and implemented in these entities;

b) **SMEs**, which account for about 45% of Poland's GDP; this group comprises over 2.3 million entities, which is a challenge to the change implementation process; an opportunity to enhance knowledge about attitudes and ways of using AI was provided by the "Skills of Tomorrow: AI" project, under which quantitative and qualitative research was conducted, with several thousand respondents participating.

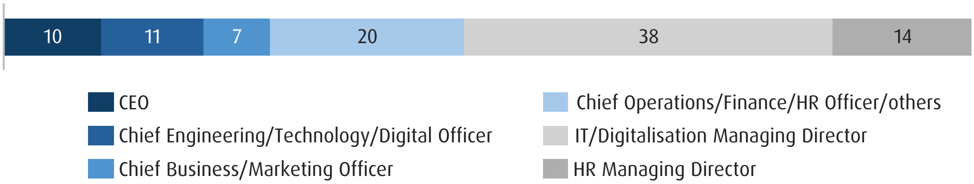
Listed companies' perspective

Objective and description of the survey

In April 2025, a survey was conducted among the management staff representing 160 companies listed on the Warsaw Stock Exchange. A total of 61% of the sample were men and 39% were women; 5% of respondents were under 30 years age, 45%

were aged 30–39, 43% were aged 40–49 and 7% were over 50 years old. Those invited to participate in the survey were executives (Figure 4) who declared that they were well versed in their company's approach to AI adoption.

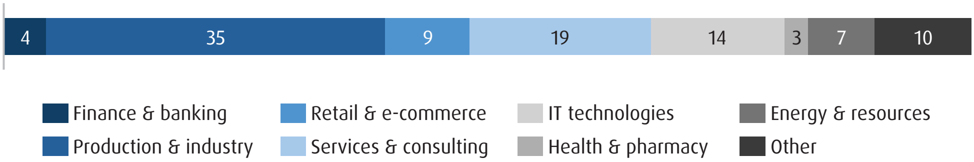
Figure 4. Positions held by respondents (%)



Source: Authors' own work.

The representativeness of the companies was also taken care of – the respondents were representatives of various sectors (Figure 5). In addition, the sample includes companies listed under indices for both the largest companies (WIG20: 2 companies, WIG40: 5 companies, WIG80: 15 companies) and smaller ones – 138 companies. Such a share of smaller companies fosters a better understanding of the phenomena taking place in the market. Business declarations and decisions of the largest companies are usually discussed in the public space, even though they are a definite minority among all entities.

Figure 5. Sectors represented by the companies surveyed (%)



Source: Authors' own work.

Artificial intelligence is a significant topic for Polish companies. As many as 63% of respondents believe that their sector will be transformed by this technology to a significant or very significant extent. At the same time, only 27% believe that they are keeping up with these changes. The aim of the survey was to capture the approaches, attitudes, barriers and difficulties faced by Polish listed companies in adopting AI. Such a diagnosis will allow relevant recommendations to be formulated.

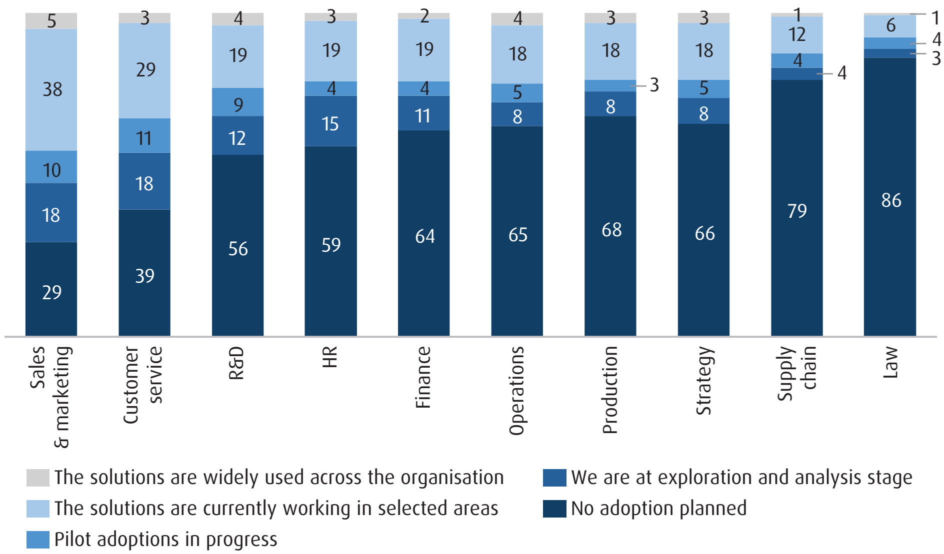
AI adoption level

Almost all but one of the 160 companies surveyed are active in the field of AI, which means that they have already made at least preliminary plans and analyses of potential deployments in selected areas of the organisation. However, it may be worrying that 25% of them have still not gone beyond this initial stage – only 75% of companies declared pilot deployments in at least one area. As many as 38% of companies are still in the analysis and pilot phase, which means that only 62% of organisations have actual, working deployments in at least one area.

Against the background of global research presented by Stanford University in the *AI Index Report* (conducted in spring 2024, i.e. a year earlier), which found that 80% of companies in Europe had implemented AI in at least one area [Stanford Institute for Human-Centered Artificial Intelligence, 2025], Poland's result is significantly lower. This means that in the long run, Polish companies may become less competitive than their European competitors.

The maturity of individual areas in enterprises in terms of AI deployment also varies (Figure 6).

Figure 6. AI deployments in Polish listed companies (%)



Source: Authors' own work.

By far the highest activity can be observed in the areas of sales, marketing and customer service, i.e. on the revenue-generating side. On the other hand, in back-office areas (e.g. supply chain, operations, manufacturing, HR), more than half of the surveyed companies are not planning to use AI solutions, which is worrying due to the fact that successful deployments in those areas would potentially bring significant cost reductions. With no will to engage in such work, these companies are doomed to see much slower improvements in operational performance.

Unclear benefits of AI adoption

However, this should not come as a surprise, as research shows that there is still a lack of understanding of the potential of artificial intelligence in the context of achieving a competitive advantage in the market. In the medium term, only 39% of managers see an opportunity to make significant cost reductions with AI, and only 36% expect to increase revenue as a result of these deployments. In addition, 59% of companies indicate that high costs are a significant barrier to the use of AI technology.

Certainly, a better understanding of the impact of digital changes on the financial and operational performance of companies would translate into a business case and ROI-based decisions to launch such projects, but only 38% of companies do so in the case of AI. The above difficulties may result from the relatively small scale of operations of listed companies in Poland. Most of them operate locally or regionally, which may not be sufficient to achieve measurable business benefits from deployments involving high financial and organisational costs.

The first step – awareness of the importance of AI for the organisation

Despite the difficulties in identifying the real benefits of AI adoption, managers do see the need to monitor the development of this technology. In most companies, the CEO is personally involved in the development and promotion of this type of solutions. As many as 59% of respondents say that they try to monitor the areas of potential AI adoption in their companies on an ongoing basis, 48% analyse what skills are needed in the area of artificial intelligence and conduct appropriate recruitment, and 41% have set up a dedicated team for AI adoption. Most companies have also modified their strategies and made organisational changes to take into account the impact of AI on their business.

Managers highly optimistic

High awareness in the organisation is related to the evident personal commitment of senior management to the promotion of AI-based solutions. All respondents use generative AI tools at least occasionally (e.g. Chat GPT, Gemini, Copilot), and 35% do so daily. Two-thirds of them have attended AI training in the last six months, and 91% declare their willingness to continue learning in this area. As many as 60% also encourage their subordinates to use AI tools.

This enthusiasm is combined with great, sometimes excessive, optimism. Almost half, 49%, of the managers surveyed trust the results they receive with the use of generative AI tools, although they should be approached with a great deal of caution. As many as 66% say they understand exactly how GenAI tools work, and 41% believe that AI makes fair and transparent decisions. Therefore, there is a low level of critical approach to tools that are still imperfect, their algorithms are a "black box" and they still make mistakes, and the results obtained require additional human verification [HBR, 2024]. The lack of such an approach can lead to low satisfaction with the use of these tools and expose companies and their employees to various risks.

Cybersecurity in theory – not necessarily in practice

The results indicate a significant degree of understanding of security risks. The majority of respondents have cybersecurity concerns in the context of the development of generative AI, and 75% say they always thoroughly check data security issues before allowing employees to use generative AI tools. At the same time, only 10% prohibit employees from using publicly available applications using GenAI. Usually, such tools do not guarantee data security, so it is a good practice to disseminate rules of secure and ethical use of AI tools in the organisation. Unfortunately, only 21% of companies have such a document in place, and as many as 58% do not see such a need. This is particularly worrying due to the development of the shadow AI phenomenon [PARP, 2025], where employees do not always inform their superiors about the use of generative artificial intelligence tools at work. In addition, not all employees are aware that the data provided for AI processing can be used to train publicly available models, which in a sense causes the company to lose intellectual property, and if this involves personal or customer data, the company is exposed to high reputational, legal and financial risks. Given that 93% of leaders say they are inspired by ideas suggested by their subordinates, it is worth recommending that employees take bottom-up initiatives related to AI adoption, especially since some companies (29%) already have a system of incentives for employees who are pioneers in using this type of tools.

AI will not take away jobs

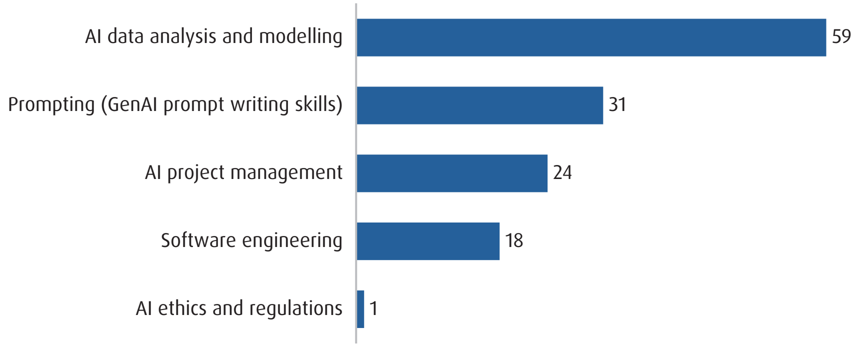
AI enthusiasm is combined with a lack of concern that the development of this technology will take jobs away from managers. Only 2% of respondents consider such a scenario, as it is commonly said that AI agents will be able to perform managerial tasks, but only those more of an operational and tactical nature, while leadership, empathy and creativity as leadership competences will remain the domain of humans [MIT Sloan, 2025]. Managers are equally optimistic about the labour market. Although generative artificial intelligence is supposed to enable significant automation of many tasks and support employees in their performance, only 8% of respondents say that employees in Poland are afraid of losing their jobs due to the implementation of this technology. Neither do respondents expect a decrease in job satisfaction due to the introduction of AI (only 14% of them are of the opposite opinion), and 62% even say that employees will be able to focus on creative tasks. This optimism is justified by demographic forecasts. According to current estimates, by 2035, up to 2.1 million employees may disappear from the labour market in Poland [PIE, 2024], so AI may save the labour market, provided that employees manage to reinvent themselves in the new reality.

Need for personnel training

A quarter of managers reported that the lack of technological competence among employees is a significant obstacle to the effective implementation of AI solutions. Artificial intelligence training has not yet become mainstream, with only 53% of companies declaring that they offer such training to employees, while 61% have already trained at least half of their staff at a basic level. At the same time, research conducted among representatives of the financial industry in Poland indicates that employees who have access to good quality GenAI training provided by their employer show higher levels of job satisfaction [Accenture, 2024]. In addition, the development of AI is leading to an increase in the demand for personnel specialising in this area (Figure 7).

There is a particular shortage of people involved in data analysis and AI modelling, which is also reflected in the World Economic Forum report, which identified analytical thinking as a key skill for employees [WEF, 2025]. AI prompting and project management came ahead of software engineering. The underestimation of ethical and regulatory issues, which are as important as technological ones, may be worrying.

Figure 7. Demand for AI competence in companies (%)



Source: Authors' own work.

Technologically ready

What should be considered a positive signal is that although artificial intelligence is a technological topic, managers do not point to technological aspects in companies as a key barrier to its development. Data and cloud computing are the foundation of successful AI deployments. Managers do not experience problems with data availability or management, and they do not complain about a lack of cloud solutions (each of these components was considered a barrier by less than 10% of respondents). Also, according to senior managers, technical debt, defined as the consequences of technological decisions that prioritise the rapid implementation of solutions at the expense of their long-term optimisation, is a problem in only 4% of companies, while as many as 91% of entities are working on better data management in the company. At the same time, more than half of respondents report difficulties in integrating AI-based systems into existing platforms. It seems that the companies are aware of the technological challenges and are actively working on solutions related to the implementation of artificial intelligence.

No support ecosystem

The survey shows that the lack of support for companies from external entities may be a problem in Poland. Only 36% of respondents said that their company could easily benefit from third-party vendors' support in implementing AI. Only 18% confirmed they experienced help from external entities (e.g. universities, research institutes) in activities related to the development of AI, and only 12% received support from public funds for the implementation of this technology. Perhaps, therefore, fostering an additional activity of the respective links in the AI ecosystem would allow faster and more effective deployments.

Wrap-up

AI deployments by Polish listed companies are commonly initiated, but in many cases they are limited to the analysis and pilot phase. Companies show high awareness of the importance of AI and the personal commitment of management, but the lack of a critical approach to the quality of the results generated by AI tools and incomplete data security expose them to significant risks. Unclear financial benefits, high deployment costs, a shortage of technological competence, and poor support from an external ecosystem remain key barriers. There are also noticeable shortcomings in the development of artificial intelligence security and ethics policies.

SME perspective

Survey description

The survey on how Polish micro-, small and medium-sized enterprises deploy and use AI was carried out as part of a joint project by Google and the SGH Warsaw School of Economics under the honorary patronage of the Ministry of Digital Affairs titled "Skills of Tomorrow: AI". The aim of the programme was to prepare 10,000 professionals and SME owners to deploy AI in their companies through a five-week online course, focusing on the practical applications of AI in business. The programme was aimed at people who could act as AI pioneers and initiate a change in the way they work in their organisations so that they could use the potential of AI to a greater extent. The selection of participants for the programme provided for an analysis of their motivation, where the key criterion was the willingness to share the acquired knowledge with others. Preparations for the implementation of the programme began in the first quarter of 2024, recruitment for the course was launched on 17 December 2024, and enrolment lasted until 23 January 2025.

In the end, due to the great interest in the course and applications from almost 40,000 potential candidates, 19,747 people were accepted for the course, i.e. almost twice as many as initially assumed. The full five-week programme consisted of 25 courses, including 19 obligatory ones. Significant support in learning was provided by a community set up on the Discord platform (over 12,000 active users), and the average rating of the programme was 4.9 (on a scale of 0–5). Of the company representatives who started their studies, as many as 86% (17,031) completed at least one course, and 74% (14,733) completed the entire programme.

Among almost 20,000 participants, women prevailed (58%), as did people with higher education (82%) and relatively younger persons, with as many as 99% under 55 years of age, including 45% aged 26–35. The participants included people from all over the country, with a slight overrepresentation (in relation to the residential structure of the population in Poland) of residents of the Mazowieckie Voivodeship (28%) and cities with more than 500,000 inhabitants (42%). The participants represented the diverse structure of the labour market – both in terms of employment status or the size of the company, as well as the position held.

What seems important is the simultaneous fairly common use of digital tools in everyday life (91%), including daily or almost daily (53%), generally good (38%) and average (39%) proficiency in the use of AI, and the belief that AI already has a very large (39%) or noticeable (55%) impact on the lives of project participants.

Parallel to the programme, SGH conducted surveys with the participation of its participants, which consisted of:

- a mandatory recruitment survey completed upon registration for the programme (40,000 people): data was collected between 17 December 2024 and 23 January 2025;
- a survey on expectations towards AI completed at the start of the programme (2455 people): data was collected between 27 January 2025 and 4 March 2025;
- an evaluation survey upon completion of the five-week course (969 people): data was collected between 19 March and 8 April 2025;
- a follow-up survey with open-ended questions on how to use the acquired knowledge in the company (91 people): data was collected between 2 and 10 April 2025.

One of the goals of the last two editions of the survey was to explore how SME owners and professionals used AI and how they prepared their organisations for AI-related changes. The information obtained in pursuing this goal is presented below.

Potential AI benefits and areas of use

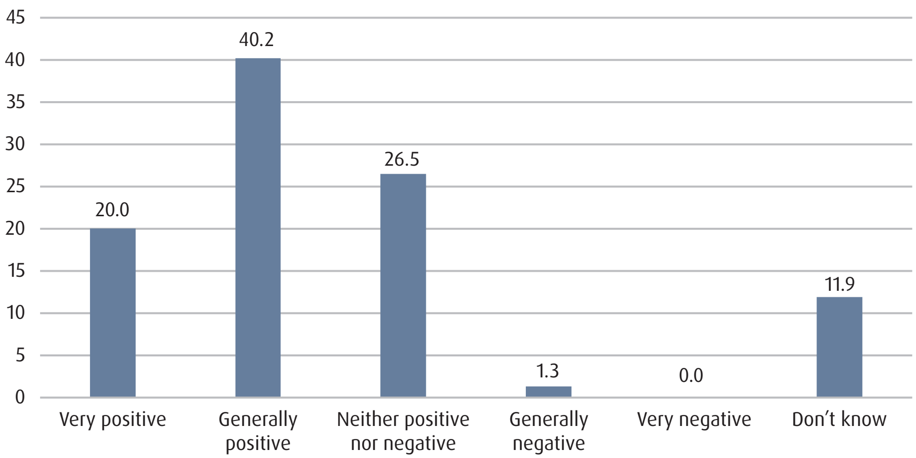
As shown by the data from the evaluation survey conducted after the end of the training programme, most of the representatives of the SME sector who had learned about AI tools expressed a positive view of the impact of this technology on the organisation. Of the survey participants, 60.2% rated the impact of AI as positive, with 20% finding it very positive and 40.2% considering it generally positive. This suggests that there is a very high potential among representatives of the SME sector to reap the benefits of using AI.

A significant proportion of respondents, i.e. 26.5%, assessed the impact of AI as neutral, which may indicate that there are no noticeable changes in the functioning of their organisation after AI adoption. It may also suggest that some companies are in the early stages of implementing the technology and have not yet fully experienced its benefits.

At the same time, it should be noted that negative opinions were rare. Only 1.3% of respondents rated the impact of AI as generally negative, which may be due to concerns about automation, job losses, or difficulties in integrating new technologies into current software. Importantly, none of the participants considered the impact of AI to be very negative, which proves that there are no serious problems related to its implementation.

Additionally, 11.9% of respondents had no opinion about the impact of AI on their organisation, which may be due to insufficient knowledge of the technology or its application in their companies.

Figure 8. Assessment of the impact of AI on the company (%)



Source: Authors' own work.

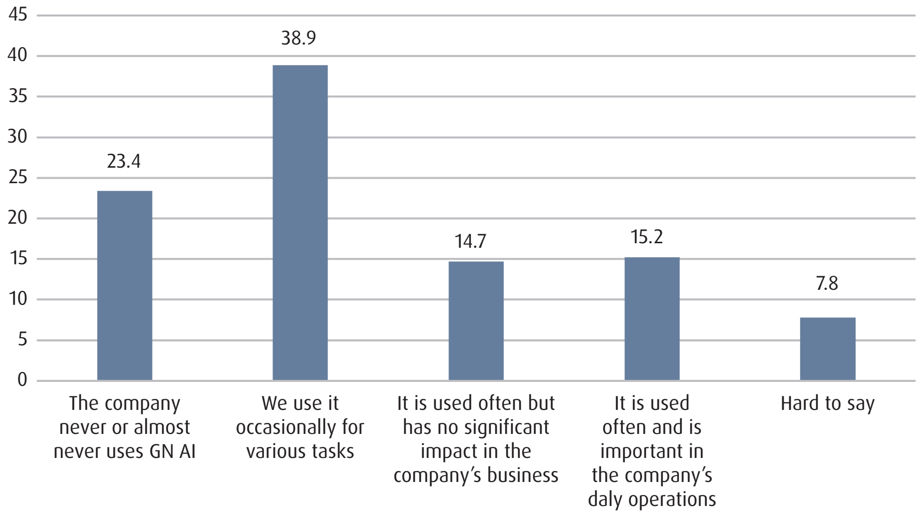
The answers given to the question about the level of use of generative AI indicate that there is no single way to use artificial intelligence in companies from this group. Only 23.4% of all respondents said that their company never or almost never used generative AI. In total, almost 70% of respondents reported that their organisations used artificial intelligence tools, but the level of their use varied.

The largest group of respondents (38.9%) indicated that their company occasionally used generative AI for various tasks. This suggests that it is often used in a random manner, possibly for specific processes or projects. Generative AI is not a key element of the activity of this group of entrepreneurs, as it is used by them on an occasional basis.

Only 14.7% of respondents stated that generative AI was often used in their company but was not important for its operations. In these companies, the technology is used on a regular basis but in areas that are not crucial to the organisation's development and functioning.

A large proportion of survey participants (15.2%) said that generative AI was often used in their company and it was important in its daily functioning. These included companies that had managed to integrate generative AI into key operations and reap significant benefits.

Figure 9. Assessment of AI use in the company (%)



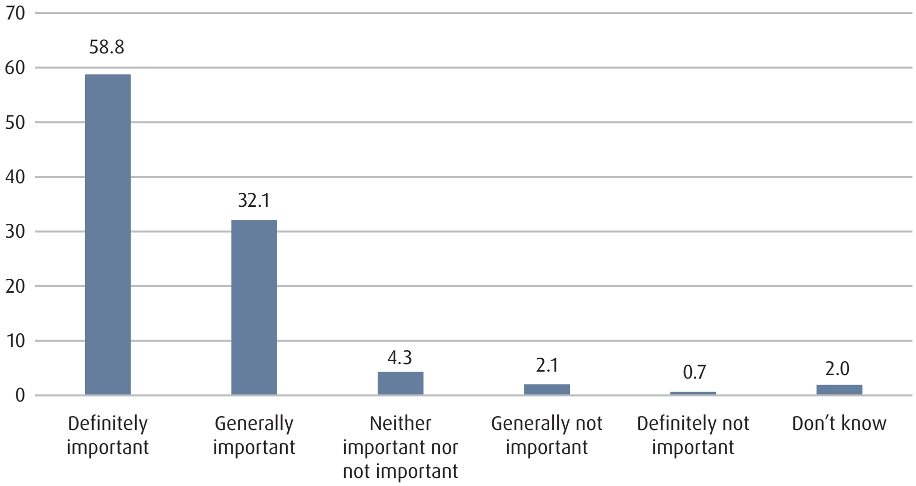
Source: Authors' own work.

Respondents estimated that the importance of AI tools in their industry would increase over the next 10 years. As many as 58.8% of them believed that AI tools would play a decisive role in their industry. The vast majority of representatives of the SME sector were able to see the potential of AI in transforming and improving business processes.

Another large group of respondents (32.1%) estimated that AI tools would be generally important.

Only 4.3% of survey participants believed that AI tools would be of neutral significance. Even fewer, 2.1%, assessed that AI tools would be generally not important, and only 0.7% considered them definitely not important.

Figure 10. Assessment of the role of AI tools in industries and sectors (%)



Source: Authors' own work.

Areas of AI impact on the organisation

In open-ended questions, survey participants were asked to provide information on the areas where AI has the greatest impact on their organisations and daily work. The answers often concerned areas related to automation and reduction of the time to perform routine tasks, creativity and decision-making, as well as collaboration and communication.

A frequently cited example was the use of generative AI tools to write marketing messages and emails.

> Thanks to AI, I started automating many routine activities – from creating marketing content, through developing concepts for new products, to communicating with customers in a more structured way.
>
> *Sole proprietor of a service business*

> With AI, I can focus on the more strategic and creative aspects of my work. I can now spend more time interpreting data and drawing conclusions instead of tedious collecting and organising it.
>
> *Specialist in a company with 10–49 employees,*
> *e-commerce and digital marketing business*

In addition to the benefits of task automation, participants also use AI to enhance their creativity, treating generative AI tools as a partner for brainstorming and discussing ideas.

> AI has become the tool that gives me the most benefits when I combine it with my creativity. Thanks to AI, I was able to make design decisions faster, consult ideas and develop creativity.
>
> *Specialist in a company with 2–9 employees, technology and innovation business*

> AI also supports me in content planning and brainstorming – it inspires, accelerates and expands our capabilities.
>
> *Specialist in a company with 10–49 employees, e-commerce and digital marketing business*

Some of the respondents also pointed to the use of tools used to create AI agents to automate part of the work.

> I've built gems that really and significantly save my time, e.g. a survey analyst helps me analyse the results of surveys in the company, create summaries and drawings. Significant time savings.
>
> *Manager in a company with 10–49 employees, technology business*

Prospects for AI adoption in SMEs

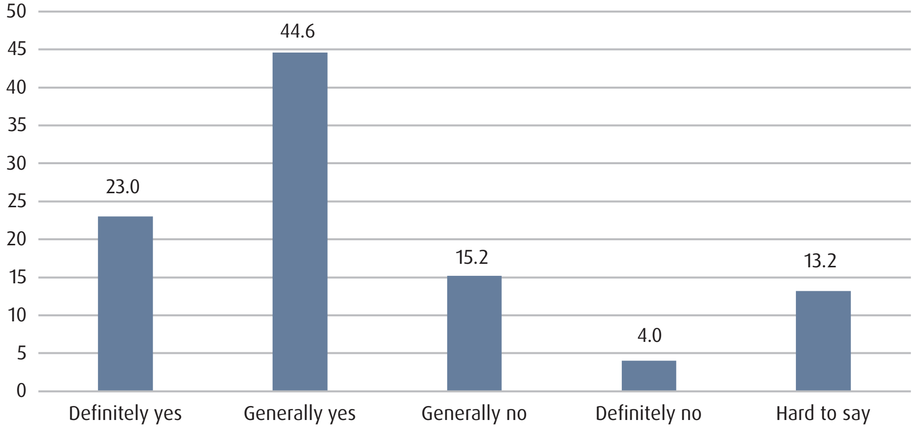
The group of SME representatives surveyed are optimistic about the possibilities of using AI techniques in their organisations. In total, 67.6% of survey participants were of the opinion that they worked in an organisation that had favourable conditions for AI techniques to be adopted. Only 15.2% of respondents declared that they generally disagreed with such a statement, and even fewer, only 4%, definitely disagreed with it.

This belief corresponds to the declarations regarding the readiness of course participants to use AI techniques in organisations and to adopt them in their work environment.

As many as 59.4% said they definitely felt the need for the adoption of AI tools in their work and organisation. This suggests that the majority of respondents see significant benefits that AI can bring in terms of efficiency, innovation and competitiveness. In addition, 34.9% of respondents generally agreed with this statement, indicating general acceptance and understanding of the need to adopt AI.

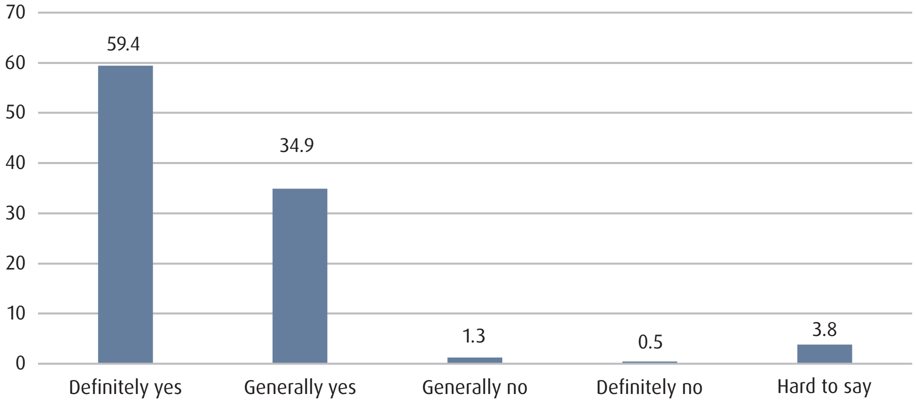
Negative opinions were extremely rare. Only 1.3% of respondents generally felt the need to adopt AI tools, and only 0.5% said they definitely did not feel such need.

Figure 11. Assessment of whether companies have favourable conditions for the adoption of AI tools (%)



Source: Authors' own work.

Figure 12. Assessment of whether there is need to adopt AI tools at work (%)

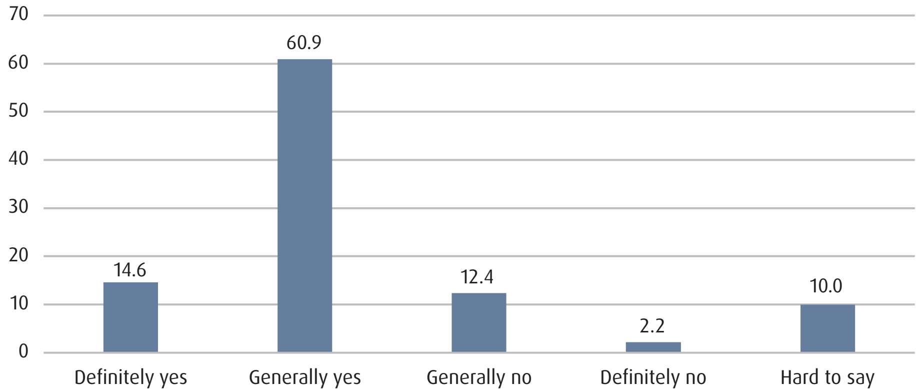


Source: Authors' own work.

In total, 75.5% of respondents agreed that they had sufficient knowledge to adopt AI tools in their company. There were much fewer negative opinions. A total of 12.4% of respondents tended to disagree that they had sufficient knowledge to adopt AI tools, and only 2.2% of survey participants definitely disagreed with this statement, which may suggest serious concerns or lack of knowledge about AI technology.

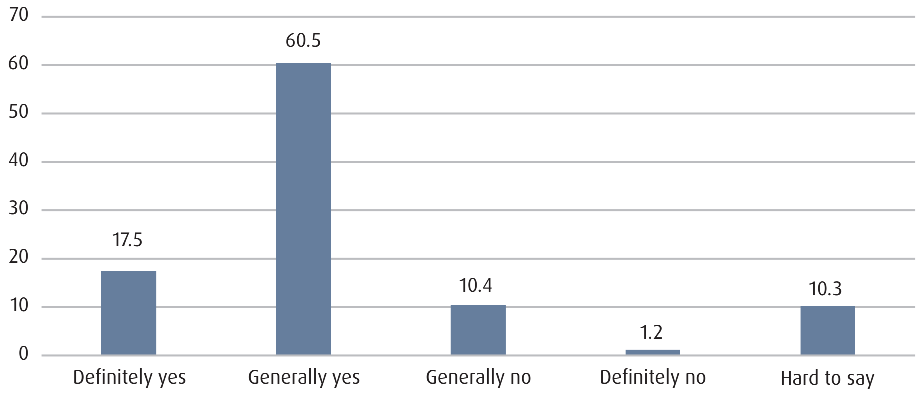
In terms of assessing practical skills, the answers were distributed in a very similar way. As many as 78% of respondents admitted they had practical skills needed to adopt AI tools in their company. On the other hand, only 10.4% of respondents stated they generally did not have such skills, and only 1.2% of survey participants definitely disagreed with this statement.

Figure 13. Assessment of whether respondents have knowledge needed to adopt AI tools in the company (%)



Source: Authors' own work.

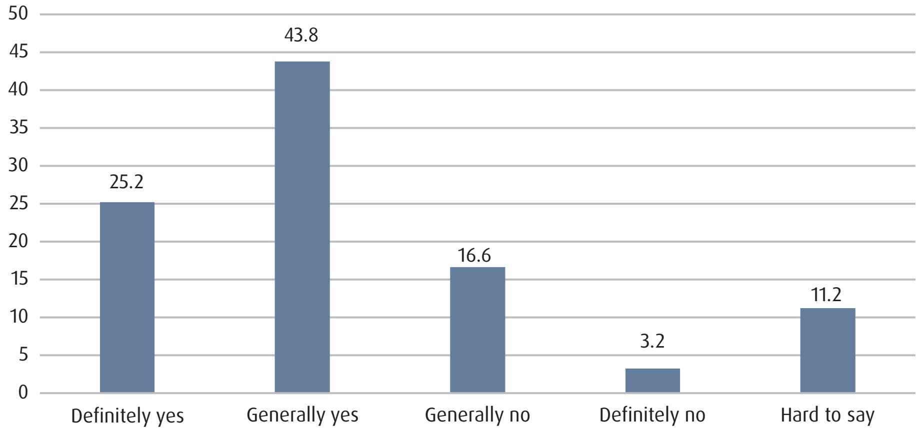
Figure 14. Assessment of whether respondent have skills needed to adopt AI tools in the company (%)



Source: Authors' own work.

A total of 25.2% of respondents definitely felt up to leading the adoption of AI tools in their organisation. Another group of respondents (43.8%) declared they generally felt up to acting as a leader. Significantly fewer respondents presented a negative assessment. Only 16.6% did not feel up to leading and 3.2% of the survey participants definitely did not feel up to leading the adoption of AI.

Figure 15. Assessment of whether respondents are ready to lead AI adoption in the company (%)



Source: Authors' own work.

AI pioneer model

It is evident from the data presented that there is potential for the deployment of AI solutions in SMEs based on the pioneer model. According to its assumptions, to deliver knowledge and skills to such a large group of entities (over 2.3 million), it is necessary to identify and influence individuals who are opinion leaders in their communities. These people can be the first to demonstrate the benefits of using AI in an organisation and teach others how to do it.

Examples of such dissemination activities were collected as part of an additional survey on the use of AI in companies and changes introduced after participation in the programme.

> Yes, I share my AI knowledge with others. After I saw the benefits of using AI in my work, I decided to pass this knowledge on to my colleagues. I arranged training sessions where I explained how AI can streamline project management and improve team efficiency.
>
> *Owner of a company with 2–9 employees, e-commerce and digital marketing business*

> Yes, I try to share my knowledge about AI with others. In my organisation, I often arrange meetings where I discuss various aspects of artificial intelligence and its applications. I also recommend tools and learning materials, and if someone needs support, I am happy to help them understand more difficult issues.
>
> *Intern in a company with 10–49 employees, service business*

Conclusions on SME surveys

The conclusions of the surveys presented are limited by the fact that the participants of the "Skills of Tomorrow: AI" programme are not a representative reflection of the average Polish SME sector and are pioneers of the digital revolution, who use digital tools relatively more often than others. At the same time, this means that a group with greater awareness of the importance of the upcoming changes and the need to use the acquired skills in their own companies was surveyed.

Given this reservation, it can be concluded that the above information indicates a high readiness of representatives of the SME sector in Poland to implement AI technologies. The vast majority of respondents rate the impact of AI on their organisations as positive, and many companies are already using AI tools, albeit to varying degrees. Companies also see the potential of artificial intelligence to increase efficiency, innovation and competitiveness, which translates into an optimistic view of the future of this technology in their sectors.

At the same time, it should be noted that the phenomenon of AI adoption in the SME sector has been so far a largely spontaneous and bottom-up exercise. Representatives of companies in various positions initiate AI adoption processes themselves, with differences in scope, often sharing their knowledge and experience with others. These can be both business owners and managers, people in specialist positions, and even interns. What seems significant is the important and sometimes even crucial role of opinion leaders, who play a large role in popularising and educating about the benefits of AI. This fosters a better understanding and uptake of AI in companies.

The impact of AI technology on the SME sector in the long term remains a topic for discussion. Bottom-up initiatives affect the way employees perform their tasks. We know relatively little about the extent to which the business itself and the value proposition for customers of SMEs will change under the influence of artificial intelligence. This highlights the need not only for systemic initiatives that will strengthen the absorption of AI technologies in this sector but also for long-term research to describe the changes triggered by AI implementation in the long term. The answer to this challenge is a series of case studies planned under the "Skills of Tomorrow: AI" programme, scheduled to take place in late May and early June 2025.

To sum up, the SME sector in Poland exhibits high readiness for the adoption of AI technologies, which is the result of both positive experiences and spontaneous initiatives taken by entrepreneurs themselves. The high level of acceptance and understanding of AI among SME representatives suggests that this technology will play an increasingly important role in the development and transformation of this sector, contributing to its further growth and innovation. What poses a challenge is the need for systemic actions that could significantly accelerate the adoption of AI in this type of entities and increase the effectiveness of adoption.

Conclusions and recommendations

The research presented in this study shows the significant transformative potential of artificial intelligence, especially generative intelligence (GenAI), for the Polish economy, which can contribute to GDP growth by up to 5–8% per year. At the same time, they made it possible to diagnose a significant adaptation gap in Poland compared to the EU, particularly visible in the low percentage of companies deploying AI (5.9% in Poland vs. 13.5% of the EU average) and lower digital maturity indicators. Surveys reveal a discrepancy between the enthusiasm and awareness of the need for change among the management (especially in large companies) and the actual, often limited, level of adoption. In the SME sector, promising initiatives to use AI are witnessed, although often bottom-up and spontaneous, which are hampered by competence and financial barriers and the lack of systemic support. Key challenges include ambiguities about ROI, skills gap, safety and ethical risks, and an underdeveloped support ecosystem. Accelerating the process of AI adoption and fully leveraging its potential requires coordinated action by companies, policy-makers and business environment institutions. The following recommendations indicate key lines of action for these groups.

Recommendations for corporate executive staff

Strategy and business value

Prioritise large AI deployments based on in-depth business case analysis. Instead of following the bandwagon, companies should make decisions about AI deployments based on reliable cost-and-benefit analyses. According to surveys carried out with listed companies, currently less than 40% of companies use this approach, which can lead to inefficient investments and disappointment with technology, especially in large deployment projects. It is crucial to identify areas where AI can bring measurable value – whether by reducing costs and increasing revenue, or improving operational efficiency.

Integrate AI into the company's business strategy and organisational changes. AI deployment should not be treated as an isolated technological project but as an integral part of the company's development strategy. This requires not only investment in technology but also willingness to implement business processes, organisational structures and work culture, as declared by the majority of the listed companies surveyed. Effective integration will ensure that AI supports the achievement of the company's long-term strategic goals.

For SMEs – start with identifying specific achievable benefits. Small and medium-sized enterprises, which often have limited resources, should start their AI journey with deployments that bring quick and measurable benefits. According to a study carried out with the participation of SMEs, this involves solutions such as the automation of repetitive administrative tasks, as well as the use of AI tools to create marketing content or improve communication with customers. Only after gaining experience and building trust in the technology is it worth exploring more advanced applications (such as building AI agents), which can lead to a deeper transformation of the business model.

Ethics, security and responsible deployment

Build a culture of critical and responsible approach to AI. Enthusiasm for the capabilities of AI should not obscure the need for healthy scepticism. Managers and employees need to be aware of the limitations of using available AI tools, the potential for errors ("hallucinations"), and the need to validate the content and results they generate. Research shows that executives are overly optimistic and confident about AI, which means critical thinking must be actively promoted.

Implement formal policies for the secure and ethical use of AI. In the face of the growing use of AI tools by employees, often without the knowledge of their superiors (the shadow AI phenomenon), it becomes crucial to develop and implement clear rules for their use. These policies should cover the protection of data (corporate, customer, personal), intellectual property, transparency and avoidance of bias. The lack of such regulations, found in most of the listed companies surveyed, exposes companies to serious legal, financial and reputational risks.

Verify security details before making tools available to employees. Despite declared awareness of the importance of data security, many companies do not prohibit employees from using free AI tools, which do not always guarantee an adequate level of protection. Before deploying or permitting the use of any AI tool, companies must carefully analyse its privacy policy, how it processes data and its security mechanisms to minimise the risk of information leakage.

People, competences and organisational culture

Invest in AI training programmes (reskilling, upskilling). The skills gap is one of the main barriers to the implementation of AI in Poland. Companies need to invest in developing their employees' skills at all levels – from building confidence in working with AI technology, through raising awareness of more advanced opportunities and various forms of AI-related risks, to specialised training in data analysis, AI modelling, prompt engineering, and AI project management. Research shows a high demand for such initiatives. Access to training is a basic tool for implementing AI in business and it can also have a positive impact on employee satisfaction, giving the opportunity to overcome the fear of the consequences of technology adoption.

Support grassroots initiatives and "AI pioneers". Employees who themselves explore AI tools and share knowledge are valuable ambassadors for change in the organisation, as observed in a survey involving SMEs. Managers should support such initiatives, e.g. through incentive schemes (used by some listed companies) and the creation of space for experimentation and experience sharing, which will form part of established security and ethics rules.

Communicate the impact of AI on employee roles and manage concerns. Although managers participating in the survey of listed companies do not see their employees as being concerned about losing their jobs, AI-related transformation will inevitably contribute to a change in roles and required competences. Open communication about planned deployments, potential impact on tasks and jobs, as well as upskilling and reskilling opportunities that the company offers to employees in connection with adapting to the new reality is crucial.

Technology and deployments

Proactively address the challenges of AI system integration. One of major technical difficulties, reported by more than half of respondents from listed companies, is the integration of new AI solutions with existing IT systems. Companies should plan their deployments with this challenge in mind, investing in the right APIs, upgrading their infrastructure or choosing AI solutions that integrate more easily with the platforms they already use.

Leverage existing technology readiness. On the positive side is that the readiness of listed companies to manage data and cloud computing, which are the basis for effective AI deployments is rated relatively high. Companies should leverage these resources by ensuring the quality, availability and security of the data that will feed AI systems, and by focusing on the scalability and flexibility of the cloud for deploying and training AI models. Also in SME surveys, respondents indicate that companies are ready to implement AI tools.

Recommendations for public policymakers

Building the support ecosystem

Strengthen and coordinate financial support instruments for AI applications. The low level of use of public funds for AI deployment and financial barriers encountered particularly by SMEs, indicate the need for more accessible and better tailored support instruments. Dedicated grants, preferential loans or tax relief for AI investment should be considered, as well as simplification of application procedures to encourage businesses, especially from the SME sector, to take risks involved in the deployment of this technology on a larger scale.

Set up platforms for cooperation between business, academia and providers. Poor perception of support from the external ecosystem inhibits the transfer of knowledge and technology. The state should initiate and support the creation of AI platforms, clusters or competence centres that will facilitate networking, exchange of experience and implementation of joint projects between enterprises (of different sizes), academia and providers of AI solutions.

Support R&D in the field of AI geared towards the needs of the economy. For Poland to be able to not only deploy but also create innovative AI solutions, it is necessary to strategically support research and development in this field. Public funding should be allocated to research projects responding to the specific challenges of the Polish economy and key sectors, as well as to building national competences in the development and application of advanced AI technologies.

Human capital development

Intensify activities to improve digital competences and develop AI. Poles' low digital competence levels compared to the EU are a fundamental barrier on the path to digital transformation. Systemic actions are needed, including the modernisation of curricula at all stages of education, the promotion of lifelong learning in digital technologies and AI, and support for initiatives to raise digital awareness in society.

Support reskilling and upskilling programmes. The transformation of the labour market through the use of AI will require the retraining of a significant part of the workforce. Public policy should actively support the creation and funding of training programmes that will enable employees to acquire new skills desirable in the AI era, minimising the risk of technological unemployment and facilitating adaptation to changing labour market demands.

Disseminate knowledge among micro-, small and medium-sized enterprises in the pioneer model. The SME sector is very large (over 2.3 million entities). Training on this scale is a great challenge. A way to accelerate knowledge dissemination is to target training at people who are ready to disseminate knowledge in their workplace and environment. In addition, good practices in bottom-up knowledge sharing should be promoted.

Infrastructure and regulations

Continue investing in digital infrastructure. Access to fast and reliable Internet (broadband, 5G) is a prerequisite for the development and use of advanced AI applications. The state should continue to invest in the expansion of digital infrastructure, especially in areas with lower levels of access, to ensure a level playing field for digital development across the country.

Create a transparent and flexible legal framework for AI. The dynamic development of AI requires adequate regulations that, on the one hand, will protect fundamental rights and values (privacy, security, tolerance, intellectual property), and on the other hand, will not unduly inhibit innovation. Poland should actively participate in the creation of European and international legal standards (e.g. AI Act), while ensuring their rational implementation at the national level.

Promote ethical standards and build public trust. The acceptance and efficient use of AI depend on public trust in the technology. Collaborating with business and social organisations as well as the academic community, the state should promote standards for the ethical development and use of AI, conduct social dialogue on the benefits and specific risks, and support initiatives that increase the transparency and comprehensibility of AI systems.

Recommendations for business environment institutions (academia, consultancies, providers)

Collaboration and knowledge transfer

Actively seek opportunities to collaborate with businesses. Academic and research institutions should intensify their efforts to commercialise research results and transfer knowledge to business. Collaboration mechanisms (e.g. joint R&D projects, internships, implementation doctorate programmes) should be developed to facilitate access to state-of-the-art achievements in the field of AI and help solve specific business problems, to enable the building of partnerships.

Create educational programmes tailored to the needs of the market. Universities and other educational institutions should update their curricula on an ongoing basis to respond to the dynamically changing needs of the labour market in the AI era. Fields of study and specialist courses preparing graduates to work with AI technologies should be developed, as well as flexible forms of lifelong learning should be offered for those already active in the labour market.

Solutions and services

Develop available solutions and consulting services for SMEs. Technology providers and professional consultants should create an offer of AI solutions and services that is tailored to the specific needs and financial capabilities of SMEs. Difficulties in finding suitable providers point to a market gap that can be filled, offering, for example, more affordable subscription models, low-code/no-code tools or specialist advice on the selection and implementation of AI.

Focus on supporting activities related to overcoming deployment barriers. Business environment institutions can play a key role in helping companies overcome specific technical and organisational barriers. These activities can include support in the integration of AI systems, consulting in the field of data management, assistance in developing an implementation strategy, or training for employees, contributing to increasing the effectiveness of AI projects in enterprises.

Summary

Taking full advantage of the transformative potential of artificial intelligence in the Polish economy requires synergy of activities and the involvement of all key stakeholders. Companies must both boldly and prudently invest in AI, integrating it into their strategy and taking care of competence development. Policymakers should create an enabling regulatory environment, invest in infrastructure and human capital, and build an effective ecosystem of support. Business environment institutions have an important role to play in the transfer of knowledge and the provision of dedicated solutions. Only a joint effort will allow Poland to catch up with AI leaders and turn the revolution in this field into real economic and social benefits. Due to the dynamics of technological change, it will also be crucial to constantly monitor progress, evaluate the actions taken and flexibly adapt the strategy to emerging new challenges and opportunities.

References

Accenture (2024). *Czas na gen AI. Czy branża wykorzysta tę szansę?*, https://www.accenture.com/content/dam/accenture/final/accenture-com/document-3/accenture-czas-na-gen-ai-branza-finansowa.pdf#zoom=40 (accessed: 30.04.2025).

AIPRM (2024). *100+ ChatGPT Statistics 2024*, https://www.aiprm.com/chatgpt-statistics/ (accessed: 30.04.2025).

Baeldung (2024). *Energy Consumption of ChatGPT Responses*, https://www.baeldung.com/cs/chatgpt-large-language-models-power-consumption (accessed: 30.04.2025).

Bernardelli, M. (2025). Generatywne modele sztucznej inteligencji w funkcjonowaniu przedsiębiorstw. In: *AI Spring 2024. Sztuczna inteligencja w przedsiębiorstwach i gospodarce* (in press), T. Doligalski, D. Kaszyński (Eds.). Warsaw: SGH Publishing House.

Binance Square (2024). *Sam Altman propaguje masowe przyjęcie ChatGPT wśród firm z listy Fortune 500: raport*, https://www.binance.com/pl/square/post/6676169359089?ref=516042411 (accessed: 30.04.2025).

Daco, G. (2024). *How GenAI Will Impact the Labor Marke*t, EY Parthenon, https://www.ey.com/en_gl/insights/ai/how-gen-ai-will-impact-the-labor-market (accessed: 30.04.2025).

Deloitte (2024). *The State of Generative AI in the Enterprise*, https://www2.deloitte.com/us/en/pages/consulting/articles/state-of-generative-ai-in-enterprise.html (accessed: 30.04.2025).

European Commission (2025). *Digital Decade 2024: Country Reports*, https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-country-reports (accessed: 30.04.2025).

Eurostat (2025). *Usage of AI Technologies Increasing in EU Enterprises*, https://ec.europa.eu/eurostat/fr/web/products-eurostat-news/-/ddn-20250123-3 (accessed: 30.04.2025).

Fortune Business Insights (2025). *Digital Transformation Market*, https://www.fortunebusinessinsights.com/digital-transformation-market-104878 (accessed: 30.04.2025).

Google (2025). *Google Trends*, https://trends.google.com/ (accessed: 30.04.2025).

Harvard Business Review (2024). *Generative AI: The Insights You Need from Harvard Business Review*. Harvard Business Review Press.

Implement Consulting Group (2024). *The Economic Opportunity of Generative AI in CEE*, https://implementconsultinggroup.com/article/the-economic-opportunity-of-generative-ai-in-cee (accessed: 30.04.2025).

Lorenz, Ph., Perset, K., Berryhil, J. (2023). Initial Policy Considerations for Generative Artificial Intelligence, *OECD Artificial Intelligence Papers*, 1. DOI: 10.1787/fae2d1e6-en.

Maison & Partners (2024). *Polacy o sztucznej inteligencji AD 2024*, https://think-tank.pl/polacy-o-sztucznej-inteligencji-ad-2024/ (accessed: 30.04.2025).

MIT Sloan (2025). *New MIT Sloan Research Suggests That AI Is More Likely to Complement, Not Replace, Human Workers*, https://mitsloan.mit.edu/press/new-mit-sloan-research-suggests-ai-more-likely-to-complement-not-replace-human-workers (accessed: 30.04.2025).

Olawade, A., Chevrot, T., Witkowski, M., Monperrus, M., Baudry, B. (2024). *Green My LLM: Studying the Key Factors Affecting the Energy Consumption of Code Assistants*, https://arxiv.org/html/2411.11892v1 (accessed: 30.04.2025).

PARP (2025). *Czym jest shadow AI i czy firmy powinny się go obawiać?*, parp.gov.pl/component/content/article/88414:czym-jest-shadow-ai-i-czy-firmy-powinny-sie-go-obawiac (accessed: 30.04.2025).

PIE (2024). *Przy obecnych trendach demograficznych do 2035 r. zatrudnienie w Polsce może spaść o ponad 12 proc.*, https://pie.net.pl/przy-obecnych-trendach-demograficznych-do-2035-r-zatrudnienie-w-polsce-moze-spasc-o-ponad-12-proc/ (accessed: 30.04.2025).

Rege, M., Hemachandran, K. (2024). *Generative AI's Real-World Impact on Job Markets*, https://www.manjeetrege.com/publication.html (accessed: 30.04.2025).

Stanford Institute for Human-Centered Artificial Intelligence (2025). *The 2025 AI Index Report*, https://hai.stanford.edu/ai-index/2025-ai-index-report (accessed: 30.04.2025).

WEF (2025). *Future of Jobs Report 2025*, https://reports.weforum.org/docs/WEF_Future_of_Jobs_Report_2025.pdf (accessed: 30.04.2025).

Barbara Cieślik
Sławomir Dudek
Grzegorz Konat
Marcin Łupiński
Katarzyna Majchrzak
Łukasz Olejnik
Tomasz Przybyciński
Marek Radzikowski
Ewa Ratuszny
Marek Rocki
Konrad Walczyk

ECONOMIC SITUATION IN CENTRAL AND EASTERN EUROPE

DOI: 10.33119/978-83-8030-742-1.93_204

Content partner: ZUS SOCIAL INSURANCE INSTITUTION

Abstract

In 2024, the countries of Central and Eastern Europe (CEE) faced challenges resulting from the geopolitical tensions, energy crisis and high costs of climate policy. Although most economies in the region began to recover after the shocks of COVID-19 pandemic and outbreak of war in Ukraine, some – like Hungary, Slovakia and Slovenia – entered a downward phase of the business cycle. Poland, the largest economy in the CEE, recorded an explicit rebound, with the yearly 2.9% GDP growth and private consumption growth of 3.1% (constant prices). Private consumption grew throughout the region, driven by rising incomes of households and declining inflation which stabilised at a relatively low level in most countries. Household sentiment was on the rise till mid-2024, afterwards it began to deteriorate, mainly due to the geopolitical uncertainty. Investment declined in both EU and most CEE countries, except for Poland and Croatia. The manufacturing industry was characterised by stagnation or decline, especially in the large economies of the region. A noticeable improvement in this respect was observed only in smaller countries such as Montenegro, Lithuania and Serbia. The construction industry, although growing thanks to the EU funding, struggled with high costs and lack of skilled labour. The labour market continued to see a downward trend in unemployment rates, which hit their record lowest levels in Czechia and Poland (2.6%). In general, despite signs of recovery, the CEE economies remain vulnerable to global uncertainty, particularly related to the US policy and escalating international conflicts, which affects investment caution and weaker sentiment in the manufacturing sector.

Authors

Barbara Cieślik – PhD, Assistant Professor, Research Institute for Economic Development, SGH Warsaw School of Economics. Her current research interests include seasonality in demography (in birth and death processes) and the economy as well as the economic situation in the financial sector. Used to analyse the motor insurance market for several years.

Sławomir Dudek – PhD, Assistant Professor, Research Institute for Economic Development, SGH Warsaw School of Economics. Has been dealing with the issue of cyclical fluctuations in the economy for two decades. His research interests focus on household behaviour. Co-author of a unique consumer finance market research project carried out by the Institute of Economic Development of the SGH Warsaw School of Economics in cooperation with the Association of Financial Enterprises.

Grzegorz Konat – PhD, Assistant Professor, Research Institute for Economic Development, SGH Warsaw School of Economics. His research interests focus on the history of economic thought.

Katarzyna Majchrzak – Professor at SGH, Head of the Research Institute for Economic Development, SGH Warsaw School of Economics. Member of the Scientific Council of the Discipline of Management and Quality Sciences at the SGH Warsaw School of Economics and the Scientific Society of Praxeology. Has extensive experience gained in the management and supervisory bodies of companies, including PKN ORLEN, UniCredit Group (Pekao SA, Pekao Investment Banking), EDF Group, Polish Aviation Group, LOT Polish Airlines and Western Investment Fund NFI.

Łukasz Olejnik – PhD, Assistant Professor, Research Institute for Economic Development, SGH Warsaw School of Economics. A long-time employee of the National Bank of Poland, winner of the Alexander von Humboldt Foundation scholarship awarded to young scientists for a research stay in Germany. His research interests include fiscal policy, public finance and macroeconomic modelling.

Tomasz Przybyciński – Professor at SGH, Research Institute for Economic Development, SGH Warsaw School of Economics. His research focuses on the institutional determinants of economic development in Poland, but also in the European and global context.

Marek Radzikowski – PhD, Assistant Professor, Research Institute for Economic Development, SGH Warsaw School of Economics. Graduated from the SGH Warsaw School of Economics (with distinction) and CEMS. Studied at the Department of Economics at MIT and at the Rotterdam School of Management. Participant of scholarship programmes organised by the Fulbright Foundation and the Minister of National Education. Chief advisor to the Minister of Finance Jacek Rostowski. Co-founder of FOR. Also worked at the National Bank of Poland as an assistant to President Leszek Balcerowicz and secretary of the Macroeconomic Council. Currently, a Vice-President of PKO BP (since 2024).

Ewa Ratuszny – PhD, Assistant Professor, Research Institute for Economic Development, SGH Warsaw School of Economics. Has been researching cyclical fluctuations in the Polish economy for five years. Her research interests focus on resilient estimation, market risk modelling and cyclical nature of capital requirements.

Marek Rocki – Professor, Chairman of the Consultative Council of the Research Institute for Economic Development, SGH Warsaw School of Economics. His research interests include the use of soft modelling in business cycle research. He has experience gained in supervisory boards of such joint-stock companies as Netia, School and Pedagogical Publishing House, HOOP, Millenium, Forte, PPW Rzeczpospolita, Presspublica, AXA PTE, J.W. Construction, Cognor or Makarony Polskie.

Konrad Walczyk – PhD, Deputy Head of the Research Institute for Economic Development, SGH Warsaw School of Economics. Has been dealing with business cycle and theory of taxation for 25 years. Conducts research on the business situation in the manufacturing industry and agriculture, coordinates business cycle research carried out at the Institute. Participant of many sci-

entific projects financed by the State Committee for Scientific Research, National Science Centre, National Centre for Research and Development. Coordinator of scientific projects conducted by the Institute of Public Finance.

After the political transformation and accession to the EU, the Central and Eastern European countries were included in global value chains as subcontractors. It resulted from the inflow of foreign direct investment and transfer of Western manufacturing technologies. Consequently, exports increased significantly; many companies began to develop dynamically and a Central European manufacturing core was created. It included Austria, Czechia, Poland, Slovakia and Hungary, with Germany playing a leading role. First of all, the production of transport and electronic equipment and metallurgical, mechanical and chemical industries developed [Radło, 2024, p. 12; Radło, Sagan, 2021, pp. 345–346].

The situation of the Central European manufacturing core changed significantly after the full-scale aggression of the Russian Federation against Ukraine in 2022 and the outbreak of economic war between Russia and the Euro-Atlantic zone. The Russian Federation tried to take advantage of the EU dependence on imports of energy resources and lead to a sharp increase in their prices and then to economic and social destabilisation of the EU countries. The idea was to persuade them to suspend the military, economic and political aid to Ukraine. In this context, high costs of climate and energy policy pursued by the EU became an additional problem, which significantly weakened its competitiveness [Księżopolski, 2022, pp. 24–25, 2024, pp. 24–26; Radło, 2022, pp. 20–22, 2024, pp. 12–14].

The increase in the price of natural gas, which was previously a cheap source of energy for the German economy, strongly reduced its domestic demand and had a very negative impact on the competitiveness of industry. The position of German companies in global value chains also deteriorated due to the expansion of Chinese manufacturers. They drove European manufacturers out of the market, which painfully affected, for example, the German automotive sector. Similar problems concerned numerous sub-suppliers from the CEE countries, for whom diversification of sales markets turned out to be a great challenge [Radło, 2024, pp. 12–14].

The tightening of financing conditions additionally hindered recovery in the CEE countries. There were fears that the so-far model of development of many countries in the region had been exhausted and that it was necessary to develop a new expansion strategy. Therefore, it was suggested that internal growth drivers of an institutional and structural nature should be activated. It would mean, for example, a more flexible and pragmatic regulatory approach combined with a redefinition of its position in the global economy, moving away from relying on cheap human labour, deepening know-how and introducing innovations. In addition, it would be advisable to shape our own export specialisations in modern sectors of high development potential. In this way, it would be possible to significantly advance in value chains and improve development prospects [Bartosiak, 2025; MPC, 2025, pp. 5–6; Radło, 2024, pp. 12–14].

In these circumstances, 2024 saw a slight recovery in the economic situation in the EU countries and non-EU CEE countries. In the EU, the average quarterly growth rate of real GDP (seasonally unadjusted year-on-year changes,) amounted to 1% last year – more than twice as much as in 2023. Real GDP grew by 1.3% and 1.5%, respectively. One of the main reasons for the economic recovery of the European economy was adaptation processes consisting in the adjustment of prices on energy markets, resulting from the desire to provide alternative sources of supply and the use of less energy-intensive technologies, which curbed inflationary processes. At the same time, enterprises and households were adjusting to the higher costs of bank and non-bank debt financing. Along with the decrease in the inflation rate, the predictions of business entities and households began to move towards a reduction in future interest rates on credit and loans. It is noteworthy that in most European economies the situation on local labour markets could be considered good. The second half of 2024, however, made the geopolitical risk explicit. It resulted from the deterioration of military situation in eastern Ukraine and the development of conflict in the Middle East as well as the outcome of the presidential and parliamentary elections in the US.

The subject of the study is the analysis of economic situation in 15 CEE economies: Bosnia and Herzegovina (BH), Bulgaria (BG), Croatia (HR), Montenegro (ME), Czechia (CZ), Estonia (EE), Lithuania (LT), Latvia (LV), North Macedonia (MK), Poland (PL), Romania (RO), Serbia (SB), Slovakia (SK), Slovenia (SI) and Hungary (HU) in 2024. The main indicators describing the macroeconomic situation of the countries of the region analysed included GDP, investments, private consumption, sold production of the manufacturing industry and construction, retail sales and business sentiment indicators, developed on the basis of the results of the business survey using the test method. They reflect the opinions and sentiment of business activity participants.

Our goal was to assess the current state of the region economy and changes in the economic situation in the CEE countries in 2024 in comparison with previous years and the European economy as well as to indicate the reasons for the current situation and potential directions of economic development of the 15 in the near future.

Due to the fact that the variables included in the analysis (except for business sentiment indicators) follow the trend (upward or downward) in all economies of the region; the business cycle analysis, the results of which are discussed below, consists in the assessment of cyclical fluctuations as understood by Lucas [1975, p. 1113; 1977, p. 7], i.e. as deviations from the trend. The reference variables in the event of changes in the economic situation in the region are relevant macroeconomic indicators, describing the situation in the EU as a whole (EU27).

GDP and economic barometer

Taking into account the aforementioned geopolitical and economic tensions, which originate primarily in the immediate vicinity of the region, it can be concluded that the CEE economies coped with the challenges they faced in 2024. A year before, Poland, the fifth EU economy and the largest in the region,[1] brushed with recession – the real y/y GDP growth amounted to only 0.1% (seasonally unadjusted, Eurostat data). Such a low economic growth resulted from a decline in consumer demand; private consumption decreased by 0.3% y/y (in constant prices, seasonally unadjusted, Eurostat data).[2] Poland's real GDP growth was lower than in the EU as a whole (0.4% y/y). The most frequently mentioned reasons for the economic slowdown in Poland include increase in energy prices due to the Russian invasion of Ukraine as well as outflow of foreign capital caused by the war and deterioration of consumer sentiment [see, e.g. Druchin et al., 2024]. The year 2024 saw a gradual improvement in the economic situation in Poland. GDP growth in constant prices for the whole year amounted to 2.9% y/y (vs 1.0% y/y in the EU), and private consumption increased by 3.1% y/y in real terms (1.3% y/y in the EU).[3]

The economic situation in the CEE countries in 2024 varied, as assessed in relation to the real GDP. The highest average quarterly real GDP growth in 2024 (seasonally unadjusted, Eurostat data), at 3.9% y/y, was recorded in Serbia. In Croatia it amount-

1 In 2024, Poland's GDP (in EUR millions) accounted for 35.1% of the total GDP (in EUR millions) of the CEE countries analysed. This share was more than double of that of Romania's GDP (14.8%). Poland was followed in this ranking be Czechia (13.3%), Hungary (8.6%), Slovakia (5.4%), Bulgaria (4.3%), Croatia (3.6%), Serbia (3.4%), Lithuania (3.3%), Slovenia (2.8%), Latvia (1.7%), Estonia (1.6%), Bosnia and Herzegovina (1.1%), North Macedonia (0.6%) and Montenegro (0.3%; authors' own calculations based on Eurostat data).

2 Over the past 30 years, it has been the third case of this sort (after 2013 and 2020, the COVID year) when real private consumption decreased throughout the year.

3 The increase in real wages in the enterprise sector in Poland was clearly higher, amounting to approx. 7.6% (average growth rate of nominal wages in the enterprise sector in 2024 divided by the private consumption deflator for 2024) [GUS, 2025c], while the salaries of employees of a significant part of the general government sector at the beginning of the year increased by 20% in nominal terms (or by 30% in the case of teachers). Thus, despite a relatively high increase in households disposable incomes, the increase in their consumption was much lower, mainly due to the recovery of their savings (in the first three quarters of 2024 they amounted to an average of 4.8% compared to –0.1% in the corresponding period of the previous year; authors' own calculations based on Eurostat data).

ed to 3.8% y/y, in Montenegro – 3.3% y/y, in Poland and Lithuania – 2.8% y/y each, in Bulgaria and North Macedonia – 2.7% y/y, in Bosnia and Herzegovina – 2.5% y/y, in Slovakia – 2.1% y/y, in Slovenia – 1.6% y/y, and in Czechia, Romania and Hungary – 1.1%, 0.9% and 0.6% y/y, respectively. Two Baltic States, Estonia and Latvia, recorded a decline in real GDP on an annual basis of 0.3% and 0.5% respectively (quarterly average). In Estonia, 2024 was another year of negative GDP growth (in constant prices).

The differences in the economic situation of each CEE country are reflected in the changes in the ESI Business Climate Barometer. For the 27 EU countries, the average monthly growth in 2024 was a total of 1.6 pts y/y, and in Poland 2.3 pts y/y. Among the CEE countries, only in Serbia and Hungary the average monthly increase in ESI was higher than in Poland and amounted to 2.5 pts and 2.8 pts y/y, respectively. An average monthly increase in the business sentiment barometer was also recorded in Slovakia and Estonia (1.8 pts y/y each), Lithuania (by 1.2 pts y/y each), Romania and Slovenia (1.0 pts y/y each), Czechia and Latvia (by 0.8 pts y/y each) and Croatia (by 0.2 pts y/y). In Bulgaria, the ESI decreased by 0.2 pts y/y.

As in 2023, despite positive annual dynamics, the ESI Barometer in most CEE countries remained below 100 points at the end of 2024: in Poland, it was 97.1 pts, in Estonia – 88.5 pts, in Hungary – 90.9 pts, in Czechia – 95.9 pts, in Slovenia – 96.7 pts, in Slovakia – 97.3 pts, in Latvia – 97.4 pts, and in Romania – 99.6 pts (in the EU 95.8 pts).

Household consumption

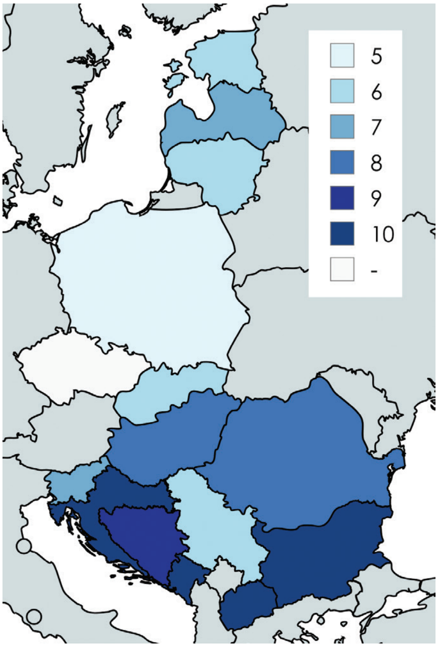
The situation of households in the CEE countries in recent years has been shaped by the overlapping economic crises. They determined both the economic situation and the everyday life of the region's inhabitants, including their consumer spending. The COVID-19 pandemic, directly or indirectly, caused a strong economic shock, which included two waves – the first occurred in Q2 2019; and the second at the turn of 2021. At that time, the largest decline in real consumption was recorded (i.e. in Q2 2020) in Latvia (17.4% q/q, data seasonally adjusted and smoothed), and the smallest in Bulgaria (3.6% q/q; Table 1). Among the Visegrad Group countries, the deepest decline took place in Poland (11.3% q/q) as well as in the Balkans – in Montenegro (16.1% q/q). In the EU, it amounted to 11.7% q/q. A sustained return to pre-crisis levels (i.e. from the fourth quarter of 2019) took eight quarters in the EU (counting from the first quarter of 2020). On average, the CEE countries recovered their consumption after 7.7 quarters – Poland was the earliest, after five quarters (Figure 1). Only in Czechia does the level of consumption remain lower than before the COVID-19 pandemic.

Table 1. Changes in private consumption in constant prices (%, data seasonally unadjusted)

Country	COVID-19 (Q2/Q1)	2024/2019	2024 (y/y)
EU	−11.7	3.7	1.3
CZ	−8.7	−3.2	2.1
HU	−10.1	14.5	5.1
PL	−11.3	10.8	3.1
SK	−4.3	8.2	2.6
EE	−10.5	7.3	−0.4
LT	−8.5	10.0	3.5
LV	−17.4	7.8	0.5
BH	b.d.	5.6	2.2
BG	−3.6	18.8	4.2
HR	−14.2	22.6	5.8
ME	−16.1	26.0	8.7
MK	−10.3	13.3	1.3
RO	−11.3	18.3	6.0
SB	−11.8	14.3	4.2
SI	−12.7	10.8	1.6

Source: Authors' own compilation based on Eurostat data.

Figure 1. Number of quarters needed to recover from the COVID crisis (data seasonally adjusted and smoothed)



Before economies overcame the difficulties resulting from the changes in supply chains related to the COVID-19 pandemic, the energy crisis and the war in Ukraine broke out. These events, combined with the expansionary monetary policy during the COVID crisis, led to a sharp increase in prices. In response to rising inflation, central banks tightened monetary policy by raising interest rates, which stopped private consumption growth in 2022–2023 (except for Montenegro, where consumption began to grow strongly and continuously at the end of the COVID crisis). In 2024, the situation in the CEE countries began to improve gradually, despite catastrophic floods in some countries in the region.[4] The average quarterly growth rate of real consumption in CEE amounted to over 3.4% y/y (1.25% y/y in the EU; data seasonally unadjusted); the best result in this respect was achieved by Montenegro – 8.5% y/y. Growth above 5% y/y was recorded in Romania (6.15% y/y), Croatia (5.8% y/y) and Hungary

[4] In September 2024, heavy rainfall, caused by the Genoa low, led to extensive floods in Poland, Czechia, Romania and Slovakia.

(5.1% y/y). In Poland, it was 3.15% y/y. In the countries of the region, the smallest average increase in real private consumption was recorded in Latvia (0.6% y/y), and in Estonia the change in this indicator was negative (–0.4% y/y).

Despite the accumulating crises, private consumption in the CEE countries at the end of 2024 was much higher than before the COVID crisis (i.e. in 2019), except for Czechia, where consumption did not return to the level at the end of 2019, but, on the contrary, turned out to be lower by 3.2% (Table 1). The highest increase was recorded in Montenegro (by 26%) and Croatia (by 22.6%), and the lowest in Bosnia and Herzegovina (by 5.6%). For comparison, in the EU it was 3.7%. However, it should be borne in mind that the trend resulting from the convergence process in the Balkan countries is stronger than in other economies in the region, which is related not only to changes in private consumption but also to other macroeconomic indicators. For this reason, cyclical fluctuations in consumption should be analysed after the trend is removed. Consumption fluctuations around the trend (growth cycle) in the CEE countries over the past five years are similar to and correlated with consumption fluctuations in the EU. 2020 saw a lower turning point (in the COVID crisis), followed by a spontaneous increase, lasting until mid-2022 at the latest. As a result of the outbreak of war in Ukraine, the energy crisis and the acceleration of inflation, consumption entered a downward phase again. Since the second half of 2023, we have seen an upward trend in most CEE countries and the EU (except for Bosnia and Herzegovina, Estonia, Latvia and Slovenia).

The synchronicity of cyclical fluctuations in households sentiment is much greater than the synchronicity of cyclical fluctuations in their real consumption. After the turmoil caused by the pandemic and the inflation crisis, consumer sentiment in all countries in the region showed an upward trend at the end of 2022. It was not until the second half of 2024 that pessimism returned. In almost all countries of the region (except for North Macedonia), the indicators of the household condition index (CSI, 2015 = 100, seasonally adjusted data) decreased at a greater or lesser pace. A downward trend also emerged in the EU. The deterioration of sentiment was probably due to uncertainty related primarily to the prolonged armed conflict in Ukraine and the US elections.

Investments

After a decrease in fixed capital formation of 5.0% y/y as a result of the COVID-19 pandemic, which occurred in the EU in 2020, and their recovery in the next three years, the level of investment collapsed again in 2024. This decline should be considered significant (–1.8% y/y), as evidenced by the fact that since 1996, larger declines in investment in the EU (apart from the already mentioned 2020) occurred only in 2009 (as a result of the global financial and economic crisis) and in 2012–2013 (as a result of the so-called sovereign debt crisis in the euro area). The decline in investment in 2024 should be linked to weaker EU growth in 2023–2024 as a result of heightened economic uncertainty and other (e.g. trade) effects of Russia's invasion of Ukraine, rising inflation and high interest rates.

The situation in the CEE countries in 2024 was similar. The decline in investments affected almost all EU countries in the region, with the exception of Croatia, which recorded an increase in investments by 9.9% y/y, and Poland, where they increased by 1.5% y/y. The largest decline in investment in 2024 was recorded in Hungary – it amounted to 11.1% y/y. Estonia and Latvia also recorded significant declines in investments, by 6.9% and 6.7% y/y, respectively. The situation in the Balkan countries was different in this respect than in the EU CEE countries, as Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia recorded an increase in investments in 2024, reaching 2.2%, 9.3%, 4.4% and 6.5% y/y, respectively.

Despite the ongoing economic growth in the EU in 2024 (compared to 2023), quarterly increases in investments (y/y, constant prices, seasonally adjusted and smoothed data) still do not indicate the end of their cyclical downward phase. In the EU, the decline in investment in Q4 2024 (–2.2% y/y) was lower than in Q2 2024. (–3.0% y/y), but higher than in Q3 (–1.7% y/y). Each of the CEE countries recorded a decline in investment in the last two quarters of 2024,[5] except for Croatia, which enjoyed increases in each of these quarters; Lithuania, which after a decline in Q3, recorded a slight increase in Q4 and Poland, where after 14 quarters of uninterrupted investment growth in Q4 2024, there was a slight decrease (by 0.7% y/y) and in Montenegro and Serbia, where investments grew in each quarter of 2024. It is not possible to say whether the decline in investments in Poland in Q4 2020 was a temporary event or a harbinger of a reversal of the upward trend. Given the improving economic growth forecasts by, for example, the European Commission [European Commission, 2024], the former seems more likely.

With regard the share of investment in GDP, it decreased in the EU from 22% to 21.2% between 2019 and 2024. During this period, the highest increases were recorded in North Macedonia (by 2.8 pp), Romania (by 2.6 pp), Bosnia and Herzegovina (by 2.0 pp) and Croatia (by 1.8 pp), and the largest decreases were recorded in Montenegro (by 7.1 pp), Hungary (–3.7 pp) and Poland (–1.7 pp). The largest share of investment in GDP in 2024 was achieved by Czechia (26.2%), Estonia (26.1%) and

---

5 No data are available for Bosnia and Herzegovina and North Macedonia.

Romania (25.7%), and the smallest – despite positive investment dynamics in recent years in absolute terms – was achieved by Poland (17.4%), Bulgaria (17.9%) and Slovenia (20.1%).

To sum up, 2024 brought a weakening of investment activity both in the EU as a whole and in most CEE countries. The dynamics of investments in recent quarters does not indicate the end of their downward trend. However, the projected acceleration in real GDP growth may bring a recovery in investment.

Inflation

After a significant decrease in the value of the Harmonised Consumer Price Index (HICP) in the EU in 2023, when it decreased from 10% y/y in January to 3.4% y/y in December 2023. In 2024, it stabilised at a relatively low, "healthy" level for the economy of between 3.1% y/y (January) and 2.1% y/y (September). The pace of change in HICP in 2024 varied across the CEE countries. On average, the lowest HICP values were recorded in Lithuania, where it fell from 1.1% y/y in January to 0.4% y/y in March and April, before rising again to 1.1% y/y in July and decreasing to 0.4% y/y in September. In December 2024, it increased to 1.9% y/y, and then to 3.4% y/y in January and 3.2% y/y in February 2025. In Latvia, the amplitude of inflation rate fluctuations was higher, with HICP falling from 1.1% y/yin January 2024 to 0.0% y/y in May, but it started to show an upward trend in the second half of the year, reaching 3.4% y/y in December and 3.1% y/y and 3.7% y/y in January and February 2025, respectively. In these two countries (as the only ones in the region), inflation remained consistently below HICP calculated for the EU in 2024 (except for December in the case of Latvia). It is worth noting that Lithuania and Latvia, together with Estonia and Bulgaria, experienced a record-high inflation (in some months above 20% y/y) in 2022–2023. In addition, inflation temporarily lower than in the EU in 2024 was also recorded by Slovenia (from May to December), Montenegro (from August to December), Bulgaria (in April and from September to December), Slovakia (from April to June) and Czechia (from January to March, and in June and July).

In Romania, HICP in 2024 was twice as high as in the EU, and in January-October it was also the highest in the entire CEE region (in November and December, higher inflation rates were recorded only in North Macedonia). Despite this, Romania's HICP followed a downward trend for most of the year, from 7.3% in January to 4.8% in September, before rising again to 5.5% at the end of 2024. Inflation rates were almost as high (as in Romania) in Serbia (in January, February and September), Montenegro (in March and April) and the aforementioned North Macedonia (in November and

December). The countries where HICP values differed from the level of this indicator for the EU by no more than 1.0 pp throughout 2024 were Czechia and Bulgaria. In Poland, the HICP inflation rate was 4.5% in January 2024. It was the highest value in 2024, falling to 2.7% in March, fluctuating between 2.8% and 4.2% in the following months, to reach 3.9% at the end of the year.

The average HICP level in 2024 in both the EU and CEE countries was slightly higher than in 2014–2020. Despite the stabilised inflation levels in the CEE countries observed in 2024, the data for January and February 2025 are not optimistic – in all economies of the region, except Slovenia, inflation rates are clearly higher than in the EU and in many of them are showing an upward trend.

Unemployment

Across the EU and most countries in the region, 2024 was a period of declining unemployment. Only in Estonia and Romania was the unemployment rate[6] in December 2024 higher than a year before, by 0.8 pp and 0.3 pp, respectively, amounting to 7.8% and 5.6%. In Estonia, the upward trend in unemployment has been ongoing since the beginning of 2023. In Romania, it was observed in Q2 2024; in Hungary there was a slight increase in unemployment (0.2 pp) in Q3 2024. Q4 2024 brought an improvement in the situation on the labour market and at the end of the year the unemployment rate fell almost to the level of December 2023, reaching 4.4% (4.3% a year earlier). Unemployment in Slovenia was similar, in January it reached 3.5% and rose to 4.1% for seven consecutive months. In Q4, there was a rapid decline in the unemployment rate to 3.4% – 0.1 p.p. lower than in December 2023. In Slovenia, however, unlike in Hungary, the increase in the unemployment rate in the first half of the year was a disruption of a long-term downward trend. In Hungary, on the other hand, the upward trend began at the outbreak of the war in Ukraine and no changes were observed in this regard in 2024. In Czechia and Latvia, unemployment remained stable throughout the year, at 2.7–2.8% and 6.8–6.9% respectively. In all these countries, there were signs of improvement in the situation at the beginning of 2025. In other economies, the unemployment rate continued its downward trend throughout the year, which began after the end of the COVID crisis[7] (with the exception of Lithuania, where the upper turning point in the unemployment cycle took place at the turn of 2024). The largest declines were recorded in Croatia (from 5.6% in December 2023

6 Eurostat calculates unemployment rate as defined by the International Labour Administration (ILO).

7 Actually, after the debt crisis in the eurozone was over. The COVID crisis was only a short-term disruption of this trend.

to 4.6% in December 2024) and Bosnia and Herzegovina (from 13.3% to 12.4%), and the smallest in Poland (of 0.3 pp – from 3.0% to 2.7%). The unemployment rate in the EU (as a whole) decreased by the same amount, standing at 5.8% at the end of 2024.

With the exception of Bosnia and Herzegovina and the Baltic States, unemployment in the CEE countries is lower than the EU average. Currently, (February 2025), the lowest unemployment rates in the region are recorded in Czechia and Poland – 2.6% each, and slightly higher in Slovenia – 3.2%, while in the EU it is 5.7%. The highest unemployment rate is recorded in Bosnia and Herzegovina, where the value of this indicator is 12.4%. However, the downward trend in unemployment in this country is very strong – over the last four years, the average monthly rate of decline in unemployment exceeded 0.1 pp.

Manufacturing industry

Although the manufacturing industry is less important for the economy, it remains its main sector – it generates between 11.4% (Latvia) and 22.4% (Slovakia) of total value added (15.6% in the EU)[8] and accounts for 12.2% (Latvia) to 24.5% (Czechia) of all employees in the economy (13.7% in the EU).[9] The share of industrial manufacturing in total exports ranges from 64% (Montenegro) to over 97% (Czechia and Slovakia),[10] so it is the main channel for economic shocks. Changes in the business climate in the manufacturing industry have a fundamental impact on general economic fluctuations. For these reasons, the analysis of the business climate in the manufacturing industry plays a leading role in the diagnosis of the general economic situation in the CEE countries (and not only).

The year 2024 did not bring the expected economic recovery in the manufacturing industry of the EU and those countries whose manufacturing is strongly linked to the EU economy, i.e. Czechia, Poland, Romania, Slovakia and Hungary. Throughout the year, the downward trend continued, uninterruptedly from the beginning of 2022 (in Czechia and Slovakia from mid-2023). The value of the index of sold production of the manufacturing industry (2015 = 100, data seasonally adjusted and smoothed) in these economies decreased in December 2024 compared to December 2023 by 1.5 pp the EU, 3.2 pp in Czechia, 0.1 pp in Poland, 2.9 pp in Romania, 0.9 pp in Slovakia and 9.9 pp in Hungary. Strong annual declines took place especially between May and July. However, the picture of the situation in manufacturing

8 Eurostat data for 2024.

9 Eurostat data for 2024.

10 World Bank data for 2024.

industry in this group of countries is not uniform. In Hungary, the slump in industrial production was the strongest – the average monthly decline in the value of the index in 2024 was 4.8 pp y/y. The downward trend in the EU was moderately strong – the index values decreased by an average of 2.7 pp y/y on a monthly basis. In Czechia, even less – 0.7 pp. The situation in the manufacturing industry in Poland is completely different. Although the values of the cyclical component of the index began to fall in April 2022, the values of the "raw" index fluctuated around the level of 109 points in 2024, deviating by no more than 1.4 pp, and the average monthly y/y increase in the index value was in fact positive, but close to zero – it amounted to 0.4 pp. This creeping index movement started at the beginning of 2022. For three years, the Polish manufacturing industry has been experiencing stagnation and the leading indicator of industrial sentiment does not signal a change in it.

The second group consists of countries in which in 2024 an upward trend in the manufacturing industry strengthened (Montenegro, Lithuania, Serbia), developed (Croatia, North Macedonia, Slovenia) or appeared (Bulgaria, Estonia, Latvia). The largest increase in the annual value of the index was recorded in Montenegro, where it amounted to 28.9 points, with an average monthly increase of 10.6 pp y/y. However, the case of Montenegro should be considered special – after the global financial and economic crisis of 2007–2009, the manufacturing industry has not returned to its previous level of production and is in a sideways trend, remaining at the level of 97 points. Moreover, unlike all other economies in the region, Montenegro recorded a very high amplitude and frequency of fluctuations in industrial production. The situation in the Montenegrin manufacturing industry is therefore very unstable and at the same time it is in a permanent collapse. In the other two countries where we can observe an upward trend for a long time, i.e. Lithuania and Serbia, its pace is also high – in December 2024, the value of the index increased by 9.0 and 5.3 pts y/y, respectively, and the average monthly increase was 4.9 and 4.3 pts y/y, respectively. In Slovenia, the upward trend in the manufacturing industry is clearly crystallized – only in Q1 2019 it was 2015 percent that it was not the case that the GDP industry was in the first quarter of 2015. Last year, negative annual increases in the value of the sold production index were recorded, and in the second half of the year they exceeded 5 pts. In Croatia and North Macedonia, the average monthly year-on-year increases in the index value were negative, but higher than in 2023. The manufacturing industry in these countries is gaining rapid momentum – even despite the deteriorating producer sentiment (measured by the economic situation index). In the other countries of this group, i.e. Bulgaria, Estonia and Latvia, the year 2024 brought an end to a downward trend that lasted more than three years. The signs of improvement are not yet clear, but they are sufficiently clear. Negative average monthly increases in the index – amounting to, respectively: 3.4 pts, 4.1 pts and 2.4 pts y/y – remained at levels twice as high as in the previous year.

In most economies, the economic situation indicator in the manufacturing industry (ICI, 2015 = 100, seasonally adjusted data) indicates an improvement in the situation in the sector in the first months of 2025. Very clear, optimistic signals were recorded in Bulgaria, where producer sentiment has been improving continuously since the end of the COVID crisis, as well as in Montenegro (since mid-2023), Estonia (since mid-2023), Lithuania (since Q1 2023), Latvia (since the beginning of 2023), Slovenia (since the beginning of 2024) and Slovakia (since Q1 2023). In Czechia and Serbia, the ICI indications are not clear. Although the cyclical component of the index is in an upward phase, the readings from recent months oscillate around the set level (1.0 pts in Serbia and –8.0 pts in Czechia), so they do not indicate a further improvement in sentiment. A similar situation occurs in Romania – the cyclical component of the ICI is in a downward phase, but the values of the non-detrendised indicator fluctuate around the set level, which is –0.7 points. The fluctuations themselves do not exceed 1.8 pts and this state of affairs has remained unchanged for four years. In such cases, i.e. when a characteristic cyclical variability has occurred in a time series for a sufficiently long period of time, and then the value of the variable observed in time has stabilised for a sufficiently long time, the parametric methods of estimating the cyclical component (here: the Christiano–Fitzgerald filter) fail, because they allow to observe the apparent cycle in the period of lack of variation. Another methodological problem, known as the "end-of-trial problem", appears in the case of Croatia. Again, the Christiano–Fitzgerald filter points to a downward phase in the course of the cyclical component of the economic situation index in the manufacturing industry in 2024, but the analysis of its value in the second half of the year shows that the conclusion about a downward trend in producer sentiment would not pass the Bry–Bosch test. This is due to the increase in the value of ICI in Croatia at the end of the year. Similarly, in North Macedonia, the decline in sentiment, which began in the second half of 2022, lasted at least until mid-2024. However, the latest indications of the ICI are not explicit. On their basis, it is impossible to assess whether there has been a recovery in producer sentiment or whether we deal with a continuation of the downward trend. The formal criteria for the occurrence of a lower turning point in the cycle were not met. On the other hand, in Hungary (as well as in the EU as a whole), the economic situation indicator, which measures sentiment in the manufacturing industry, has been undergoing a strong downward trend since the beginning of 2022, just like its quantitative counterpart, i.e. the sold production index. In December 2024, the ICI for both economies reached its lowest level since the COVID crisis and the third (in the EU – the fourth) lowest result in the history of measurements. In Poland, throughout

2023 and in Q1 2024, producer sentiment was gradually improving. Since Q2 2024, however, we have observed alternating increases and decreases in the value of the economic situation indicator, forming a downward trend.

In general, the situation in the manufacturing industry of the CEE region is diverse. The largest economies in the region are facing a slowdown or stagnation in industry, which is probably related to the downturn at their Western trading partners' (i.e. in the economically leading EU countries) and the uncertainty in the global macroeconomic environment that has persisted for years. This uncertainty, shaped by overlapping crisis episodes, disrupts the cyclical rhythm of economic development, suppressing growth impulses and making the interpretation of the situation difficult. In some cases, especially in the Baltic States, an upward trend in industrial production became more stable in 2024, which is also visible in the course of the sentiment index. However, the latest results of industrial surveys (since the beginning of 2025) prompt caution in assessing the sustainability of this trend.

Construction

Construction is almost as important to the economy as manufacturing industry. It accounts for 3.9% (Montenegro) and 8.5% (Slovakia) of value added (5.6% in the EU) and 5.5% (Serbia) and 9.6% (Romania) of total employment (6.7% in the EU).[11] In 2024, the construction sector in the CEE region developed amid high macroeconomic uncertainty, an unfavourable geopolitical situation, a shortage of skilled labour and a strong impact from increased production costs (mainly construction materials). Despite this, the upward trend began in previous years continued in most countries. The value of the construction-assembly production index (2015 = 100, data seasonally adjusted and smoothed) in December 2024 increased compared to December 2023 in Bulgaria, Croatia, Czechia, North Macedonia, Slovenia and Slovakia by 3.1, 12.2, 8.1, 24.1, 2.5 and 4.2 pts, respectively. Only Poland, Romania and Hungary recorded declines in value of the index, 15, 21.9 and 4.1 pts, respectively (in the EU, 0.9 pts). The downward trend has been maintained in these three countries since mid-2023.

An important pro-development impulse for the sector in 2024 was provided by infrastructure investments, financed, for example, from EU funds (also NRP). These included construction of hotel infrastructure and revitalisation of urban spaces (Croatia), modernisation of transport systems and digital and green transition (Estonia),

---

11 Eurostat data for 2024.

projects supporting energy efficiency and green transition (Lithuania), modernisation of public buildings, roads and energy networks (Latvia), expansion of road and rail networks (Romania), thermal modernisation of buildings and improvement of road safety (Poland) and development of engineering and housing construction (Slovakia) [GUS (Statistics Poland), 2025b; JLL, 2025; MFiPR (Ministry of Development Funds and Regional Policy), 2024; ZBP (Polish Bank Association), 2024].

Despite this relatively good situation in the construction industry, the industry sentiment was sombre. The construction economic situation index (CCI, 2015 = 100, seasonally adjusted) remained negative or close to zero throughout the year in most countries in the region (except for Croatia, Montenegro and Slovenia). In most of them, a downward trend strengthened or emerged. Only Czechia, North Macedonia, Slovakia and Hungary recorded a sustained or consolidating trend towards improved sentiment. In Lithuania and Latvia, the economic situation indicator has been in a sideways trend for three years. Although between December 2023 and December 2024, the value of the economic situation indicator increased in most countries (the highest in Czechia – by 8.4 pts, and in Lithuania – by 5.5 pts), only in some cases was the average monthly increase in the value of CCI positive – the largest in North Macedonia (6.2 pts) and Montenegro (5.1 pts).

Retail sales and economic situation in trade

Wholesale and retail trade accounts for between 9.9% (in Czechia and Slovakia) and 16.2% (North Macedonia) of the total value added in the economy (10.2% in the EU), ranging from 10.3% (Slovenia) to 14.3% (Slovakia) of total employment (12.2% in the EU).[12] Therefore, it is, next to the manufacturing industry and construction, a key sector for the economy. These three sectors account for about half[13] of the value added generated in the CEE economies.

In Poland, the largest economy in the region, the general economic upturn in 2024 did not translate into an improvement in trade. In Q1 2024, the value of the business indicator in trade (IRG SGH) amounted to 2.0 pts, in Q2 2024 – 3.3 pts, and in Q3 – 3.0 pts. This means that the improvement in trade was negligible at that time. In Q4 the value of the indicator fell to the level of –0.5 pts. The economic situation in Polish trade in 2024 was quite stable. It is confirmed by the retail sales data, as for the whole

12 Eurostat data for 2021. There are no data available for Montenegro.

13 In the EU, less than a third. Despite a three-decade convergence of Central European economies, their production structure still lags behind the structure of value added creation in Western European countries, in which services play a much greater role.

year its growth amounted to 2.7% in constant prices. The largest decreases recorded included the following groups textiles, clothing, footwear (–12.4%), furniture, electronics, household appliances (–5.1%) and food, beverages and tobacco products (–0.7%), while the highest increases were recorded in groups such as solid, liquid and gas fuels (7.2%), other (12.8%) and motor vehicles, motorcycles, parts (19.6%) [GUS, 2025a]. The volume of retail sales in December 2024 (according to the Eurostat methodology) was higher by approx. 0.8% compared to December 2023.

Similar changes occurred in most CEE countries. In the first half of 2024, the value of the trade economic situation indicator (RCI, 2015 = 100, seasonally adjusted data) for the entire EU fell by 1.8 pts. Lower values of the indicator were recorded in Czechia – by 6.3 pts, Croatia – by 4.5, Latvia – by 4.3, Slovakia – by 1.8, Romania – by 1.7, Estonia – by 0.9 and Hungary – by 0.7 pts. On the other hand, increases were recorded in Lithuania – by 5.6, Slovenia – by 4.2, North Macedonia – by 3.1, Serbia – by 2.3 and Bulgaria – by 0.8 pts. The second half of the year was a period of trade recovery for most EU and CEE countries. The value of the RCI index increased in the EU – by 3.6 pts, in North Macedonia – by 15.6, in Croatia – by 6.2, in Latvia – by 4.5, in Slovakia – by 4.4, in Czechia – by 3.5, in Estonia – by 1.8, in Slovenia – by 0.9, in Bulgaria – by 0.6 and in Romania – by 0.1 pts. Declines were recorded in Serbia – by 0.3 and in Lithuania – by 2.8 pts. In the second half of the year, the largest deterioration in trade took place in Hungary – the decline in the value of RCI amounted to 11.9 points, while in the last quarter of the year it reached 8.6 points. The reason for this state of affairs was most likely the general economic slowdown – in Q3 2019. In Q2 2024, Hungary's real GDP declined by 0.8% y/y. The improvement in sentiment in the second half of the year was reflected in Eurostat data; while in the first half of the year the volume of retail sales in EU countries increased by 0.4% y/y, in the second half of the year it was already 1.8% y/y.

Conclusions and recommendations

The economic situation in CEE was quite diverse in 2024. Most economies continued the upward trend that emerged in early 2023 after the shock caused by the Russian invasion of Ukraine and the consequences for international trade caused by the imposition of economic sanctions on Russia and Belarus by the EU and the US had faded. However, in some countries of the region (Croatia, Latvia, Romania, Serbia, Slovakia, Slovenia and Hungary), the 2023 recovery stopped at the turn of 2024 and the business cycle downward phase began or even strengthened. At the end of the year, numerous signs of economic deterioration were observed in those countries that recorded accelerated economic growth in 2024 They are in line with the indications of the KOF/FGV Global Leading Economic Barometer,[14] whose latest readings herald the onset of a global recession.

In almost all countries in the region, household consumption was on the rise in 2024, following an increase in their incomes and decrease in inflation. Only in Estonia did the level of private consumption remain unchanged for two years, continuing its downward trend, while in Latvia real consumption increased in absolute terms, but its cyclical component did not fluctuate. In Q4 2024, most CEE countries showed signs of a reversal of the upward trend. The decline in consumption towards the end of the year was undoubtedly due to the deterioration in household sentiment (CSI), most likely caused by an unclear economic outlook, largely determined by developments in the political environment and uncertainty about the economic policy response. In particular, it is about the geopolitical strategy adopted by the new US government, which has far-reaching consequences for global socio-economic development. Donald Trump's trade conflict, and even more so the uncertainty about the direction of his trade and military policy, the response of world economic leaders to it and the impact of these factors on international trade, production strategies of transnational corporations and allocation of capital, have been a serious burden on the global economy. The economic programme developed in the EU in response to the decisions of the White House, which is intended to provide a strong fiscal impulse, should contribute to the clarification of prospects. This should be conducive to economic recovery, primarily in the production sectors of economies, and especially in the defence industry and related industries. Through the transmission mechanism, including the foreign trade transmission mechanism, this should stimulate investment in production equipment in the first place, and indirectly also in private consumption. Military projects should also, directly or indirectly, support construction investments in the next few years. However, before this happens, the current risk factors imply downward trends. The main one is uncertainty about how the global trade conflict will develop, how effective the fiscal stimulus in Europe will be and how conflicts such as the wars in Ukraine and the Middle East will intensify, affecting commodity prices and international trade. This uncertainty is spreading across economies and is most likely the cause of stagnation, for example, in industry and construction in the region.

In the long term, much depends on whether, facing ambitious challenges, the CEE countries will be able to develop a new model of expansion on their own. In particular, it is a matter of triggering internal institutional and structural growth drivers.

14 A composite leading indicator of the global economic situation, developed by the KOF Konjunkturforschungsstelle in Zurich in cooperation with the Fundação Getulio Vargas from Rio de Janeiro on the basis of over a thousand economic indicators.

A more flexible and pragmatic regulatory approach is needed. Knowledge and innovation need to be developed faster. In this way, it is possible to more effectively build export specialisations in modern sectors with high development potential and pursue domestic interests.

ANNEX

Appendix 1. Description of variables

The main quantitative macroeconomic indicators selected for the analysis

- GDP, constant prices 2015 = 100, Q1 1995–Q4 2024 (quarterly data), no data for Montenegro;
- household consumption (CONS), constant prices 2015 = 100, Q1 1995–Q4 2024 (quarterly data);
- investments (INV), constant prices 2015 = 100, Q1 1995–Q4 2024 (quarterly data), no data for North Macedonia;
- sold production of the manufacturing industry (IP), constant prices 2015 = 100, January 2000–January 2025 (monthly data);
- sold construction-assembly production (BLD), constant prices 2015 = 100, January 2000 – December 2024 (monthly data), no data for: Estonia, Lithuania, Latvia, Serbia, Bosnia and Herzegovina and Montenegro;
- retail sales (TRD), constant prices 2015 = 100, January 2000–January 2025 (monthly data);
- inflation rate (INFL), i.e. the Harmonised Index of Consumer Price Growth (HICP), January 1998–February 2025 (monthly data), no data available for Bosnia and Herzegovina;
- unemployment rate (UA), January 2000–February 2025 (monthly data), no data available for Montenegro, North Macedonia and Serbia; and qualitative data from research conducted with the economic sentiment test method [Eurostat, 2025]:
- Economic Barometer (ESI), January 1996–January 2025 (monthly data), no data for Bosnia and Herzegovina;
- Household Condition Index (CSI), May 2001–January 2025 (monthly data), no data available for Bosnia and Herzegovina;
- economic situation index in the manufacturing industry (ICI), January 2000–January 2025 (monthly data), no data for Bosnia and Herzegovina;

- economic situation index in construction (CCI), January 1998–January 2025 (monthly data), no data for Bosnia and Herzegovina;
- economic situation index in trade (RCI), January 2000–January 2025 (monthly data), no data for Bosnia and Herzegovina.

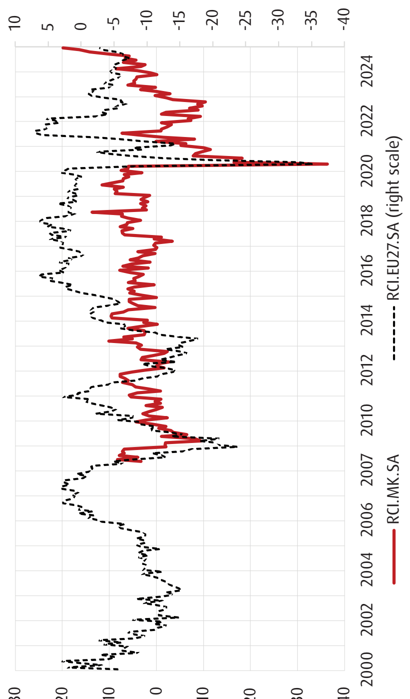
Data are taken from the Eurostat database (https://ec.europa.eu/eurostat/data/database) as seasonally adjusted (SA) or seasonally and calendar effects adjusted (SCA) series, where available, with the exception of the HICP inflation rate, the time series of which was available in crude form. The cyclical components (C) were estimated with the Christiano–Fitzgerald method.

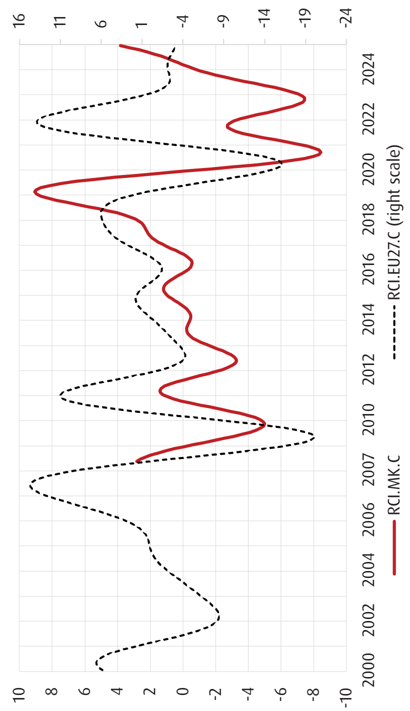
On the charts included in the Annex, adjusted series and their cyclical components are described as follows: [indicator code], [country code], [transformation or series code]. For example, GDP.BG. C is the cyclical component of the single-core GDP index of Bulgaria in 2015 (average) prices, ICI.PL. C is the cyclical component of the economic situation index in the manufacturing industry in Poland.

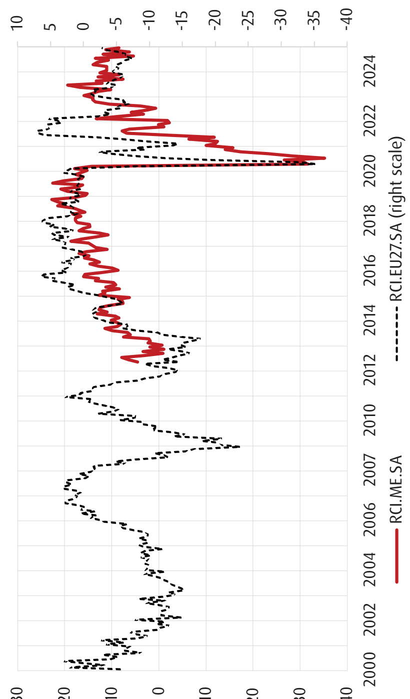
The charts are presented in the order in which the individual variables are discussed in the text, and within each variable – in the order corresponding to the division into subregions: the Visegrad Group countries (Poland, Czechia, Hungary, Slovakia), Romania and Bulgaria, the Baltic countries (Lithuania, Latvia, Estonia), the Balkan countries (Slovenia, Croatia, Serbia, Bosnia and Herzegovina, North Macedonia, Montenegro).

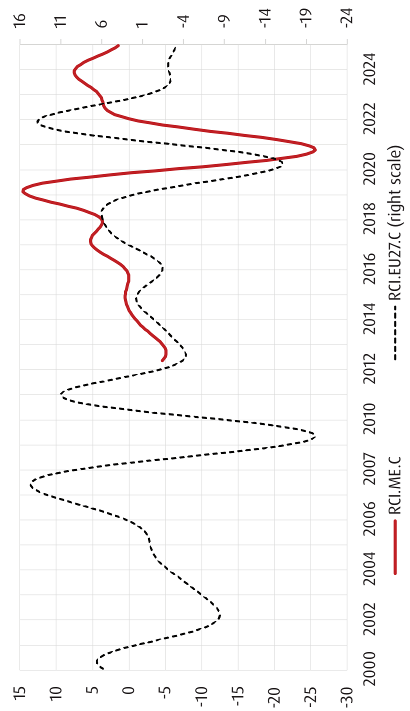
Appendix 2. Graphic documentation

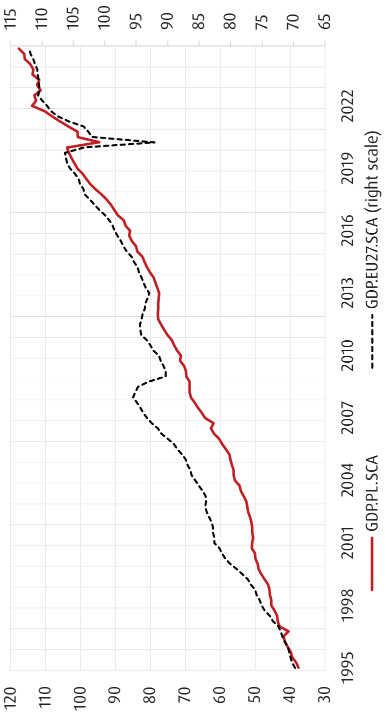
GDP

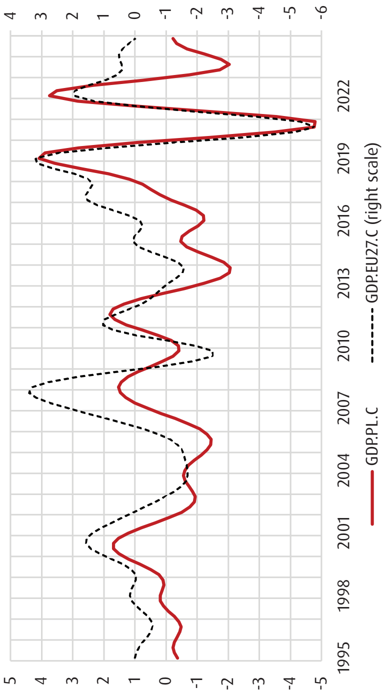


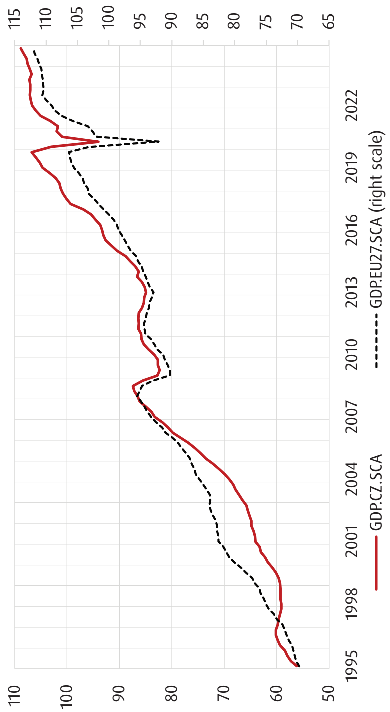


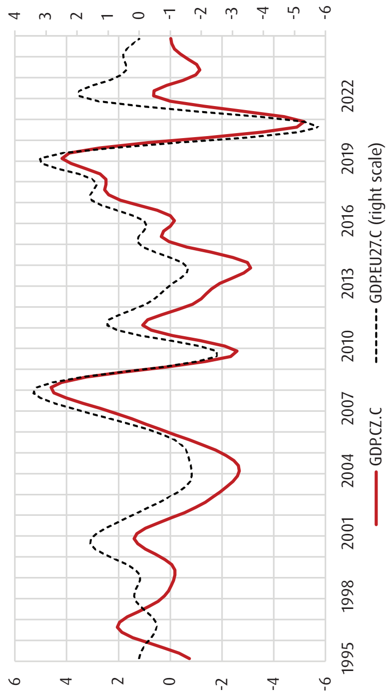


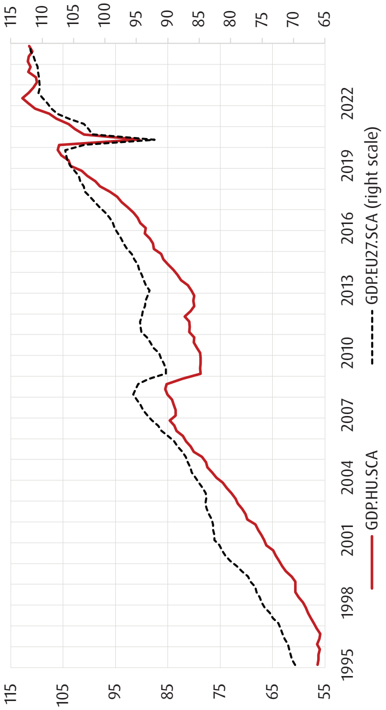


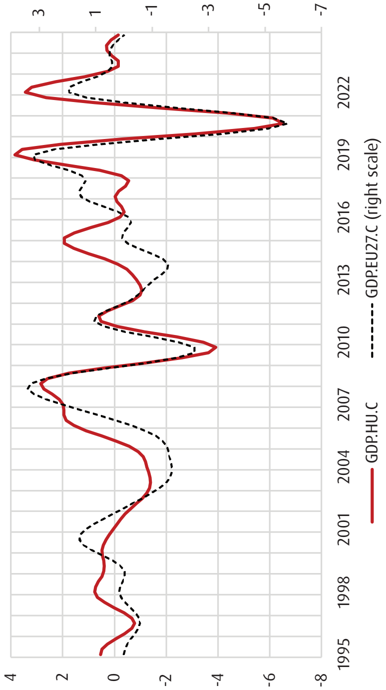

GDP.PL.SCA
GDP.EU27.SCA (right scale)

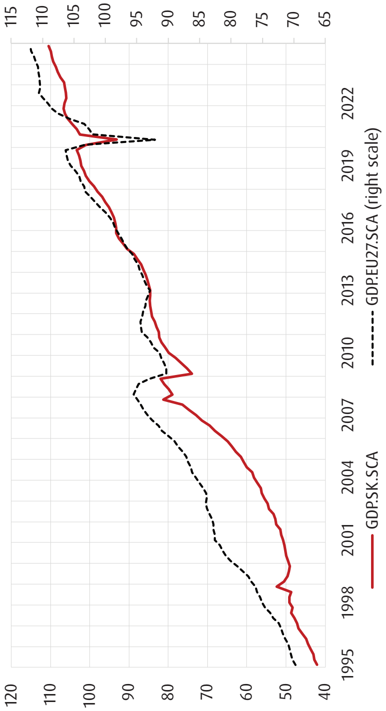

GDP.PL.C
GDP.EU27.C (right scale)

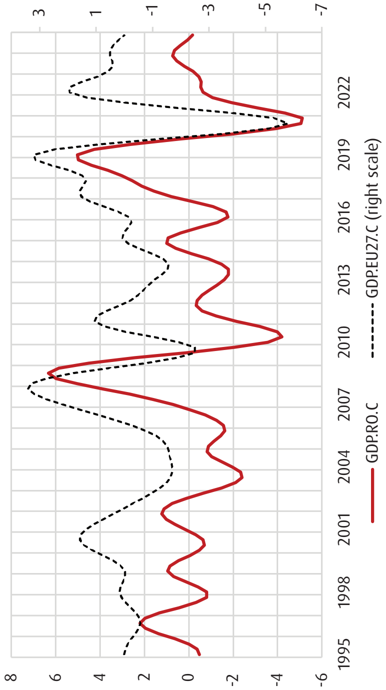

GDP.CZ.SCA
GDP.EU27.SCA (right scale)

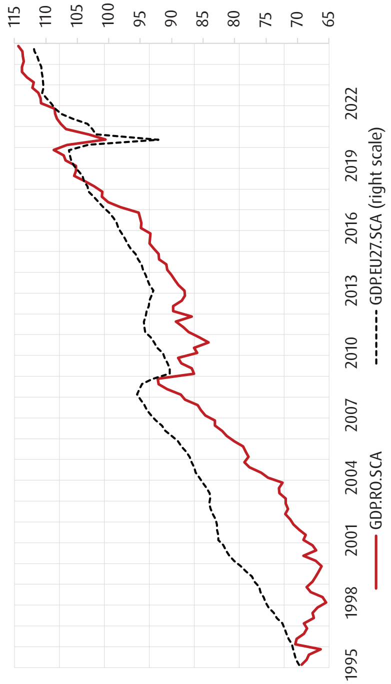

GDP.CZ.C
GDP.EU27.C (right scale)

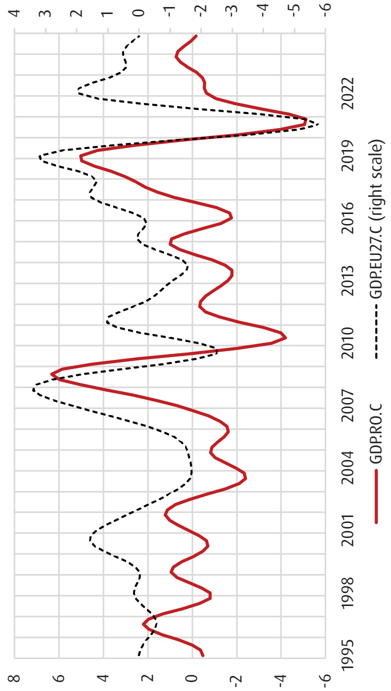

GDP.HU.SCA
GDP.EU27.SCA (right scale)

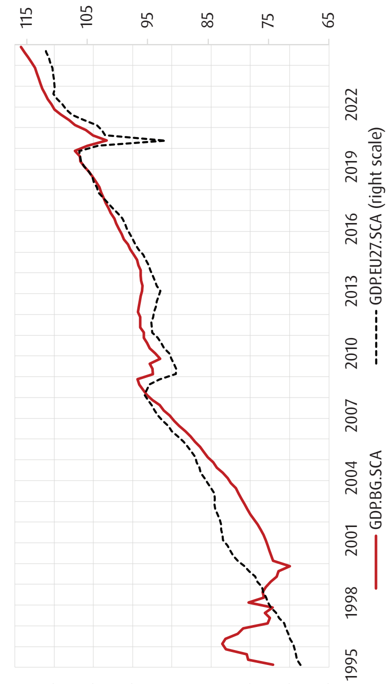

GDP.HU.C
GDP.EU27.C (right scale)

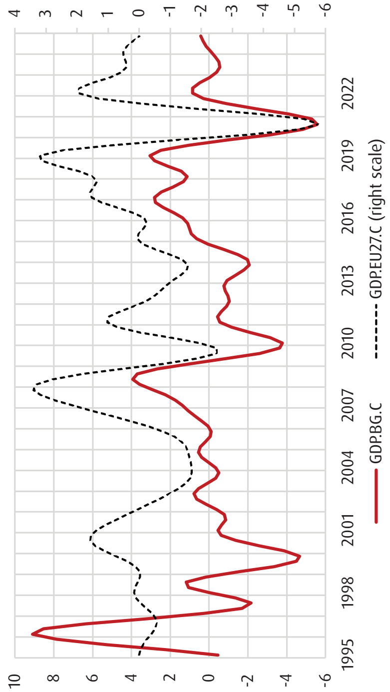

GDP.SK.SCA
GDP.EU27.SCA (right scale)

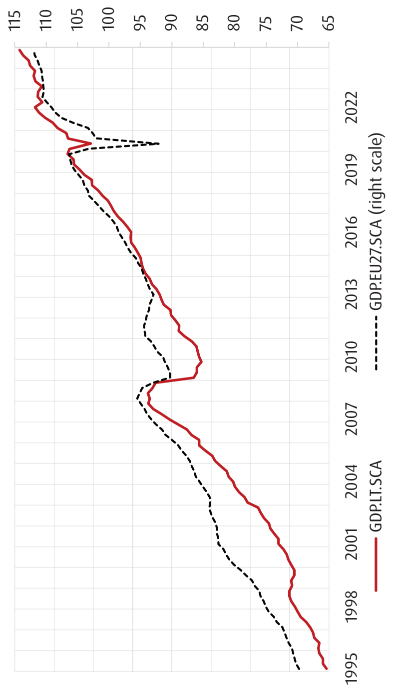

GDP.RO.C
GDP.EU27.C (right scale)

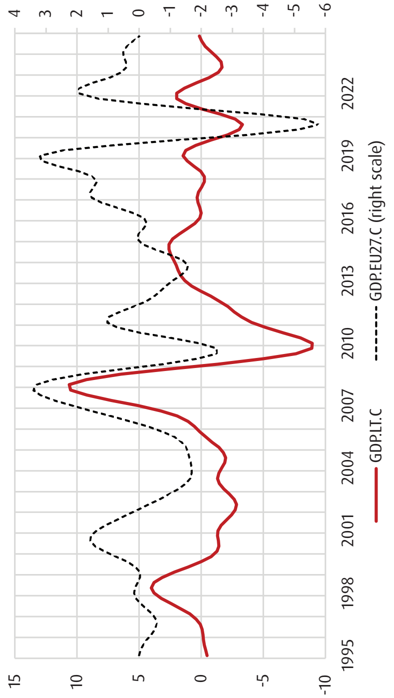

GDP.RO.SCA
GDP.EU27.SCA (right scale)
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022

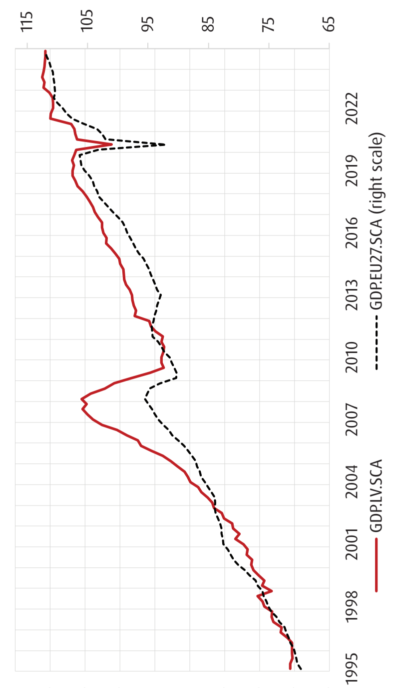

GDP.RO.C
GDP.EU27.C (right scale)
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022

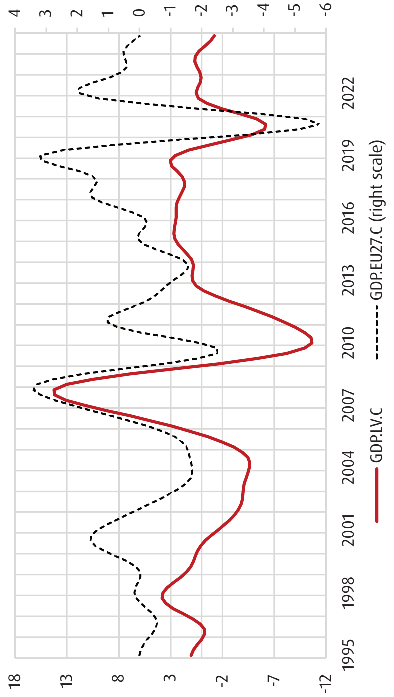

GDP.BG.SCA
GDP.EU27.SCA (right scale)
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022

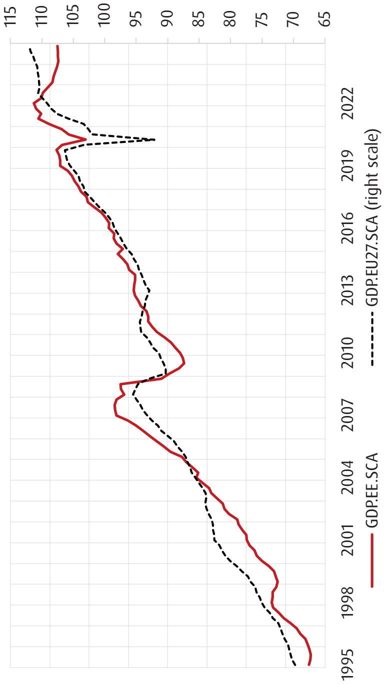

GDP.BG.C
GDP.EU27.C (right scale)
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022

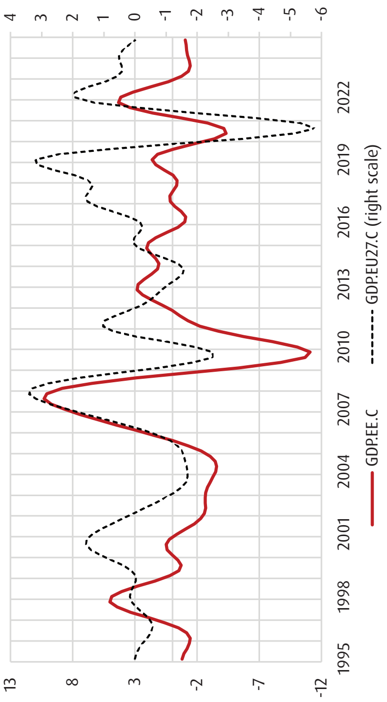

GDP.LT.SCA
GDP.EU27.SCA (right scale)

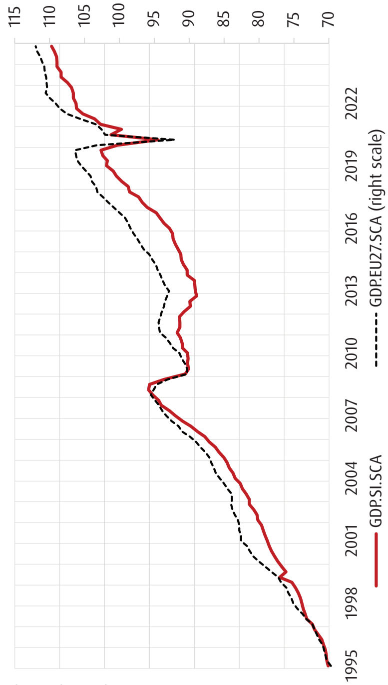

GDP.LT.C
GDP.EU27.C (right scale)

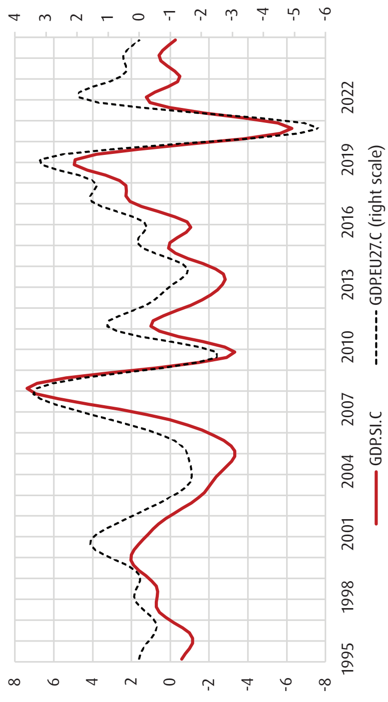

GDP.LV.SCA
GDP.EU27.SCA (right scale)

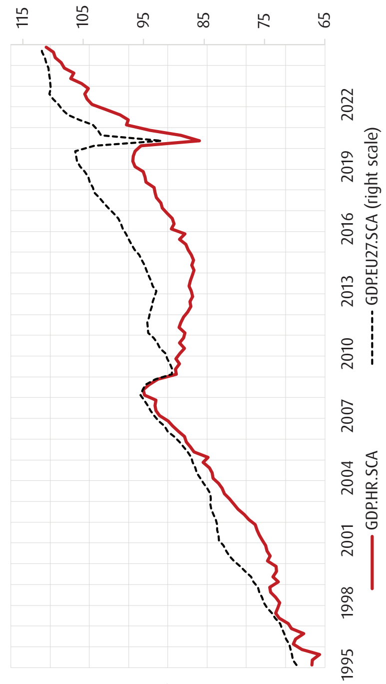

GDP.LV.C
GDP.EU27.C (right scale)

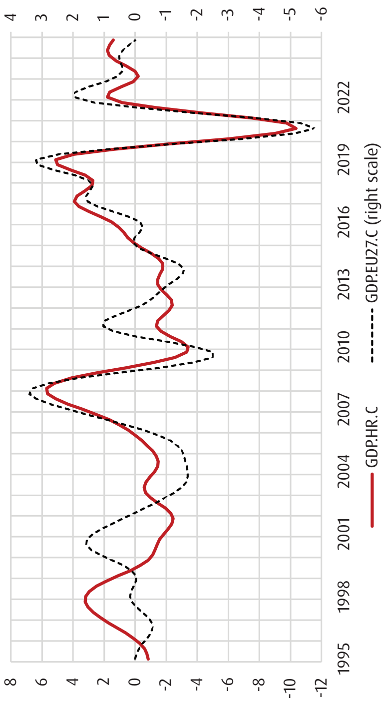

GDP.EE.SCA
GDP.EU27.SCA (right scale)

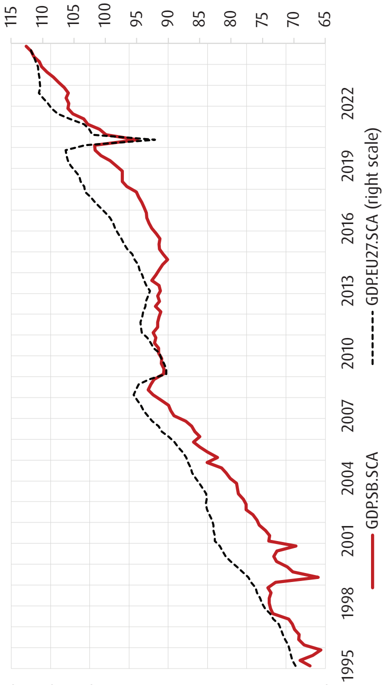

GDP.EE.C
GDP.EU27.C (right scale)

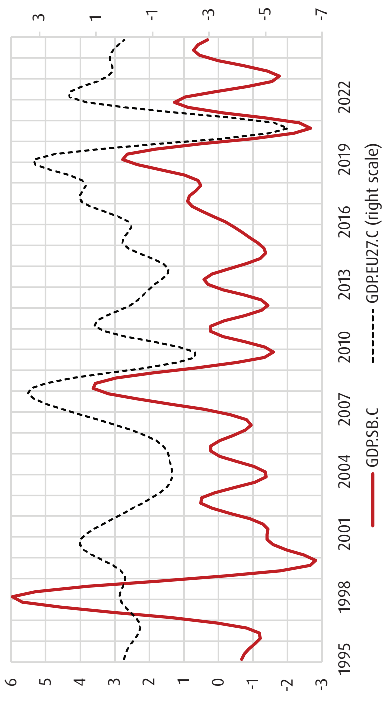

GDP.SI.SCA
GDP.EU27.SCA (right scale)


GDP.SI.C
GDP.EU27.C (right scale)

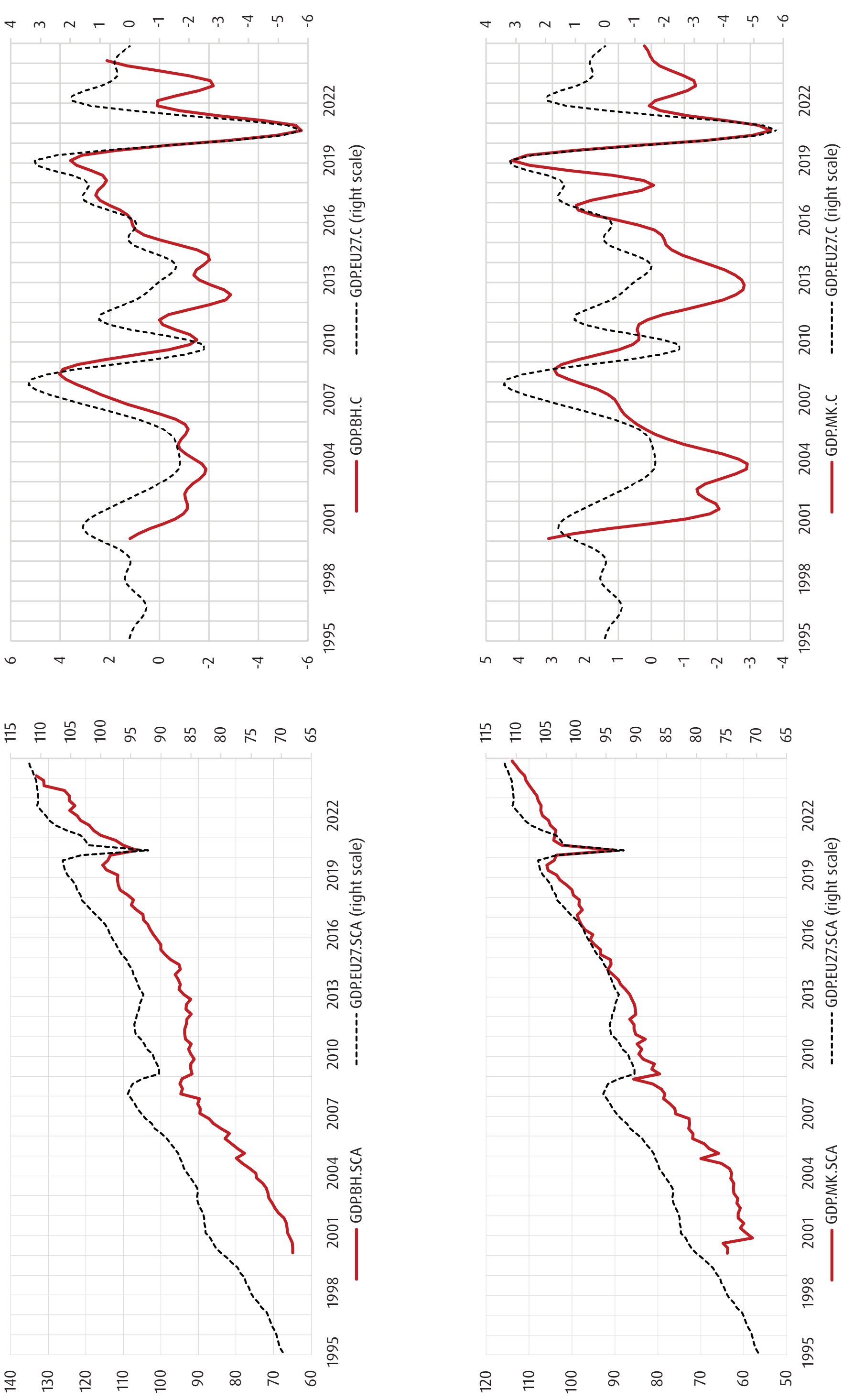

GDP.HR.SCA
GDP.EU27.SCA (right scale)

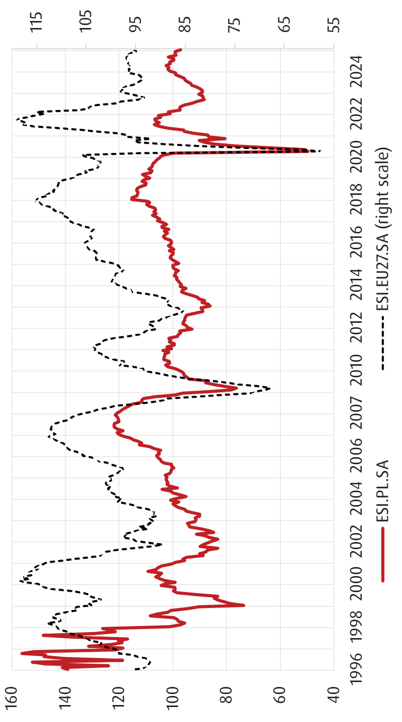

GDP.HR.C
GDP.EU27.C (right scale)

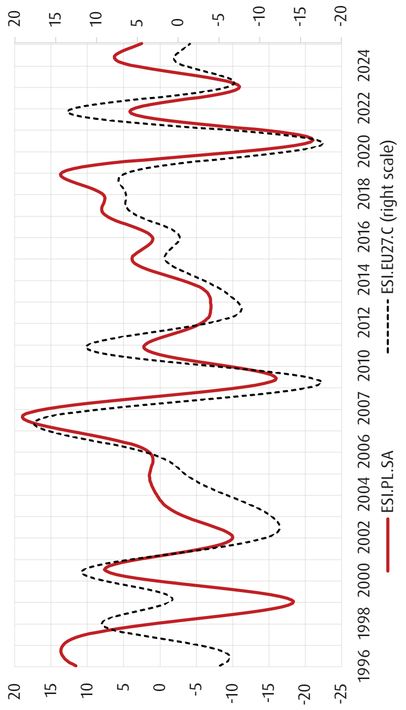

GDP.SB.SCA
GDP.EU27.SCA (right scale)

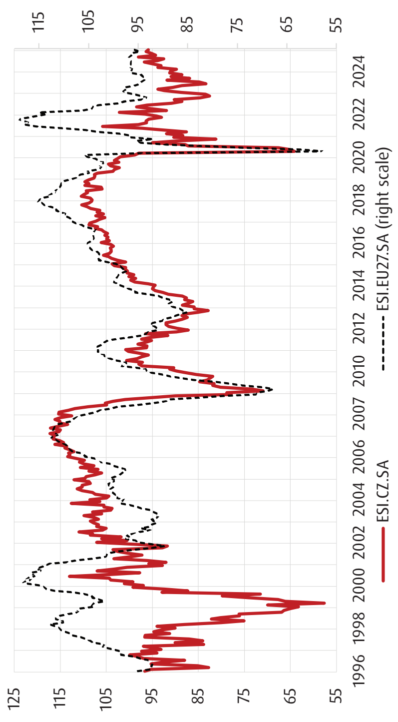

GDP.SB.C
GDP.EU27.C (right scale)

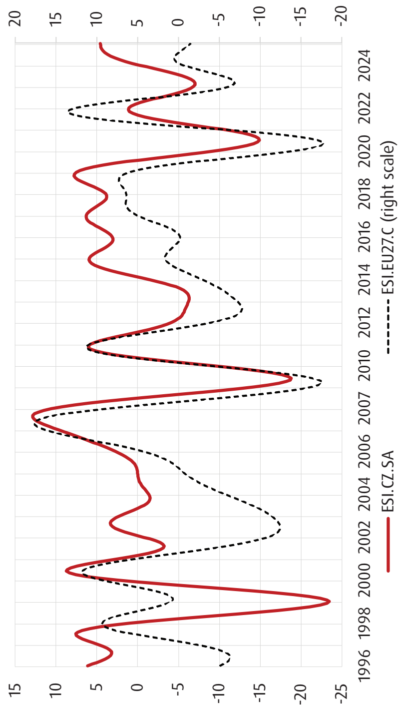
Economic Barometer (ESI, Economic Sentiment)

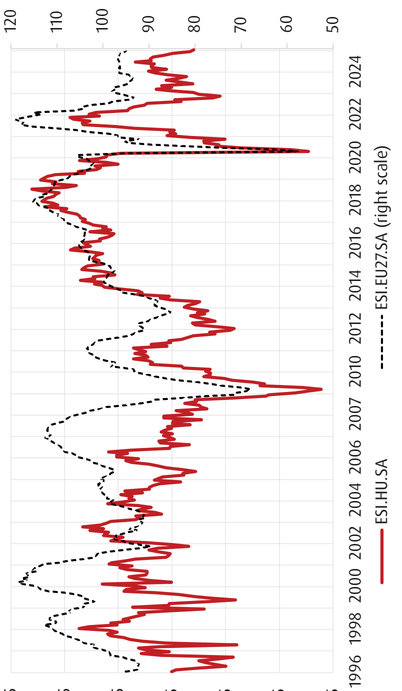


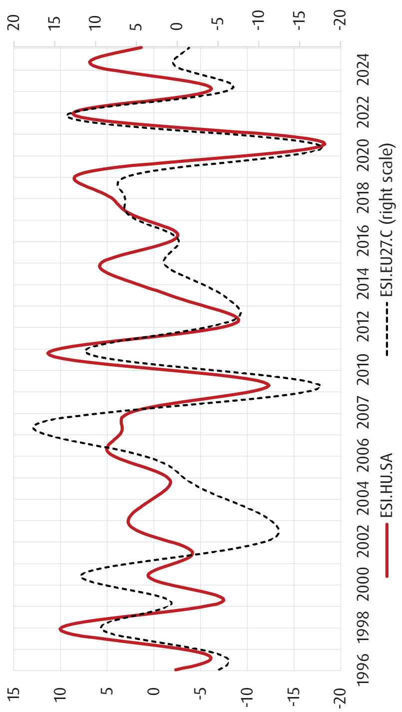

ESI.PL.SA
ESI.EU27.SA (right scale)

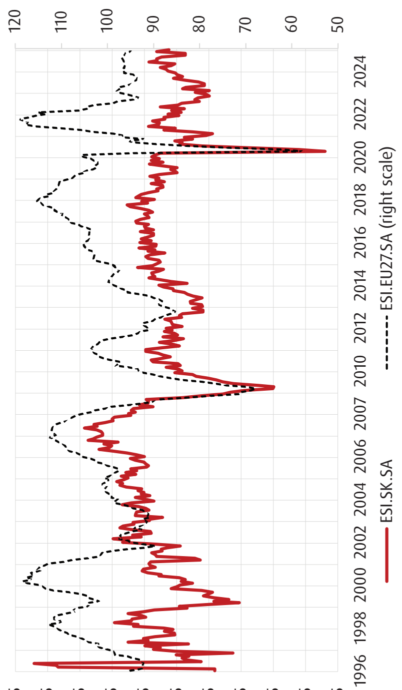

ESI.PL.SA
ESI.EU27.C (right scale)

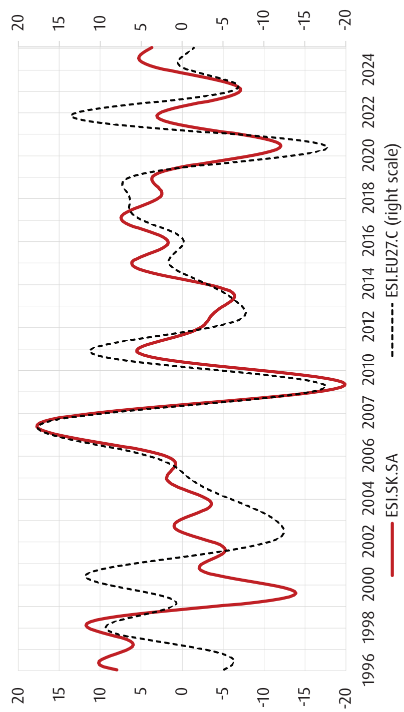

ESI.CZ.SA
ESI.EU27.SA (right scale)

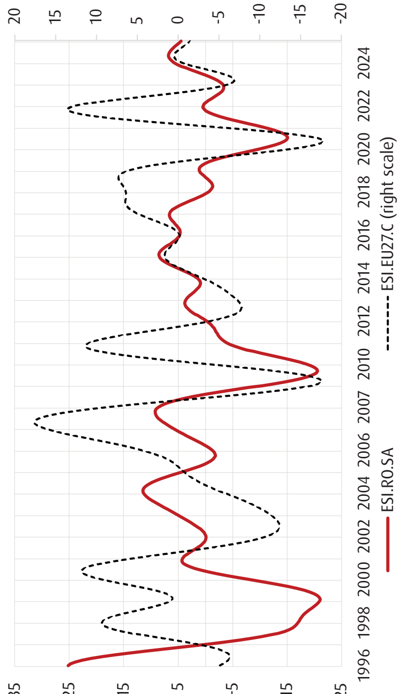

ESI.CZ.SA
ESI.EU27.C (right scale)

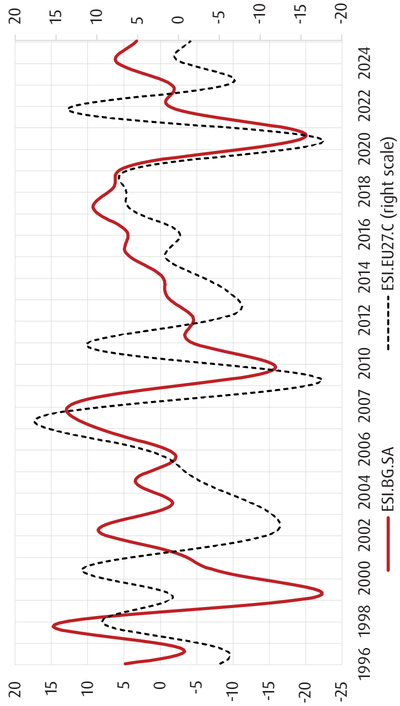

ESI.HU.SA
ESI.EU27.SA (right scale)

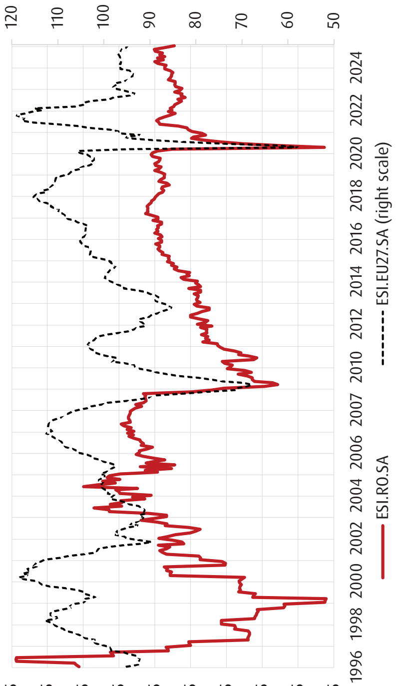

ESI.HU.SA
ESI.EU27.C (right scale)

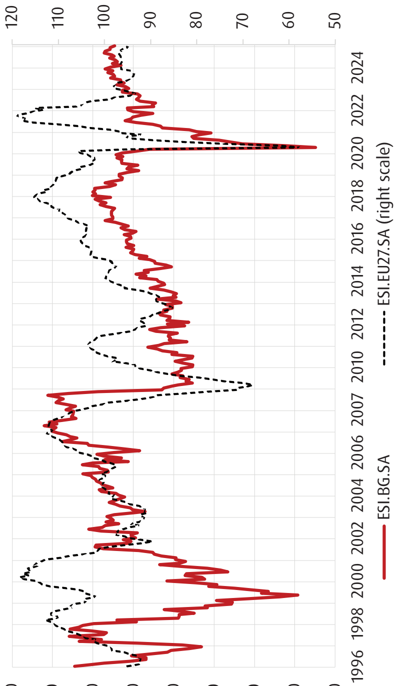

ESI.SK.SA
ESI.EU27.SA (right scale)

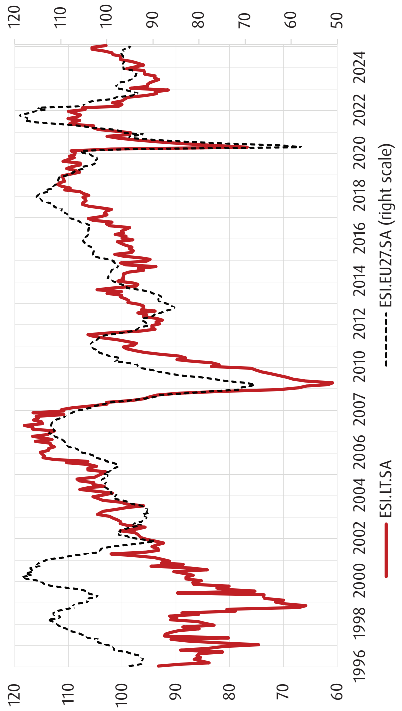

ESI.SK.SA
ESI.EU27.C (right scale)

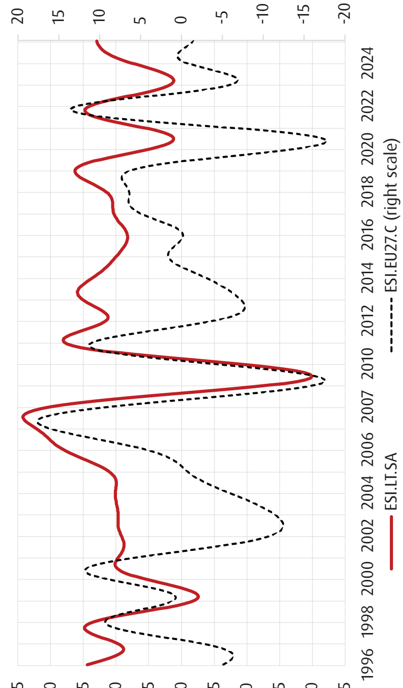

ESI.RO.SA
ESI.EU27.C (right scale)

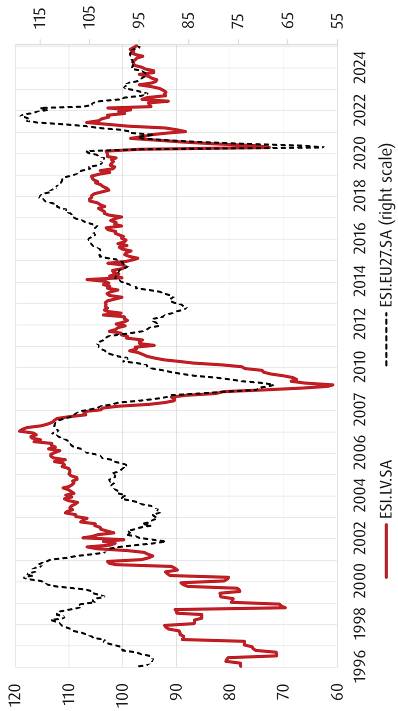

ESI.BG.SA
ESI.EU27.C (right scale)

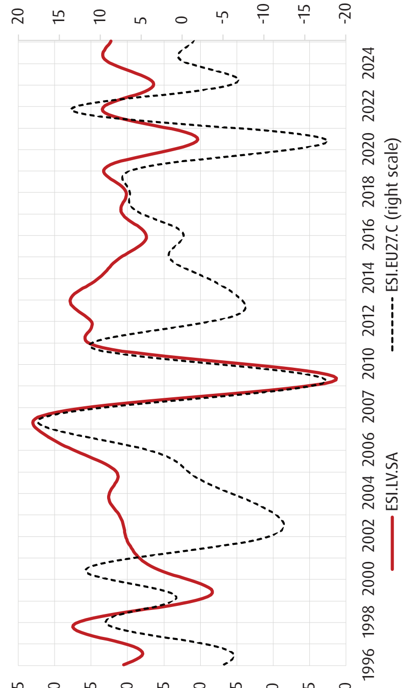

ESI.RO.SA
ESI.EU27.SA (right scale)

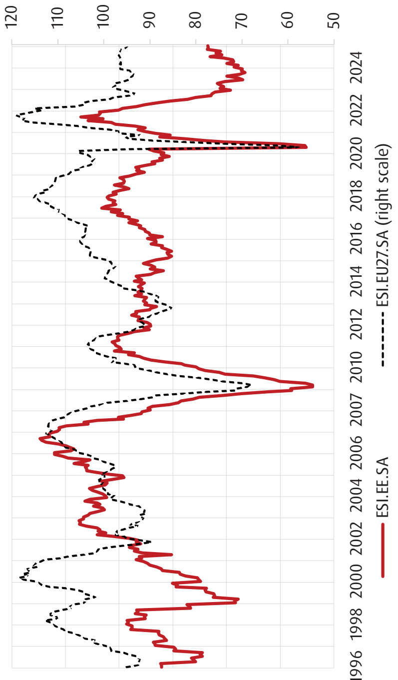

ESI.BG.SA
ESI.EU27.SA (right scale)

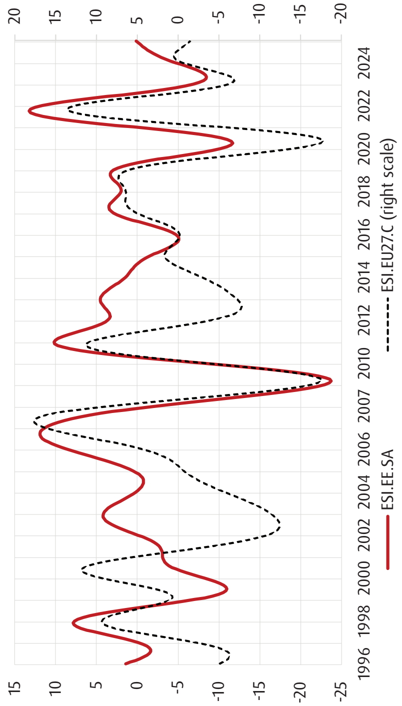

ESI.LT.SA
ESI.EU27.SA (right scale)

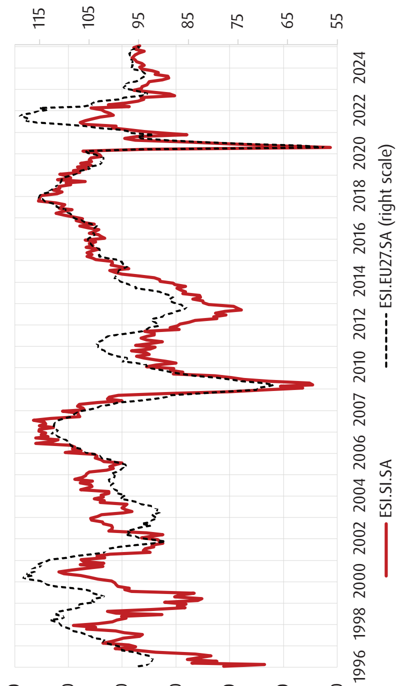

ESI.LT.SA
ESI.EU27.C (right scale)

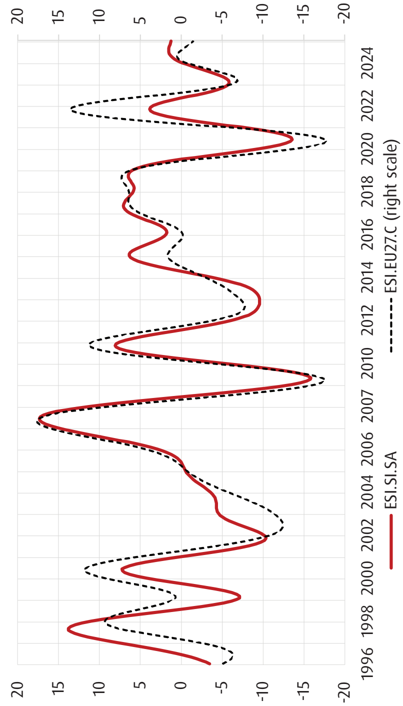

ESI.LV.SA
ESI.EU27.SA (right scale)

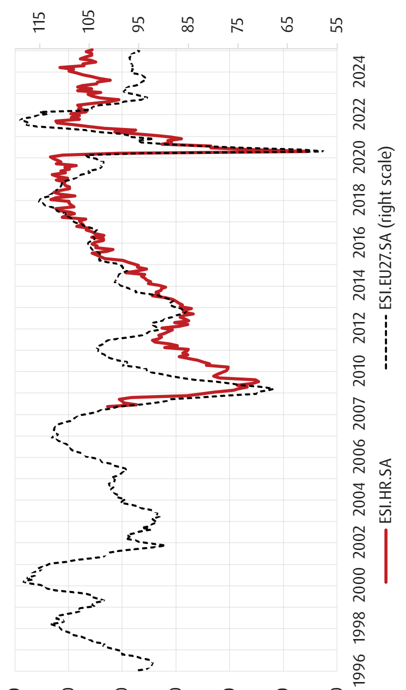

ESI.LV.SA
ESI.EU27.C (right scale)

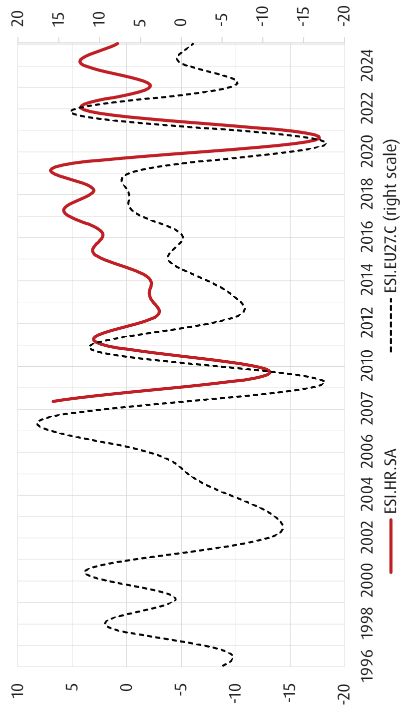

ESI.EE.SA
ESI.EU27.SA (right scale)
1996 1998 2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
125 115 105 95 85 75 65
120 110 100 90 80 70 60 50

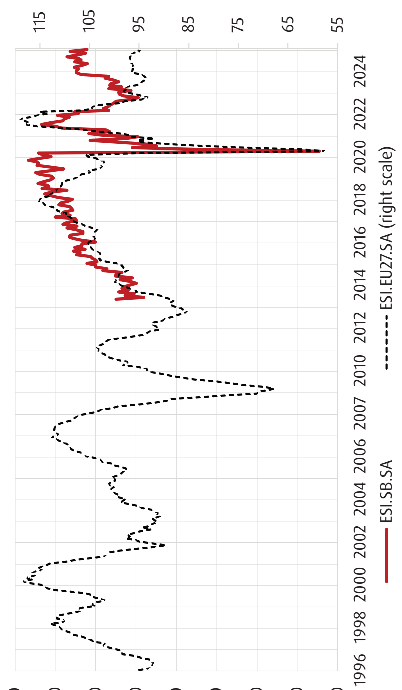

ESI.EE.SA
ESI.EU27.C (right scale)
1996 1998 2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
15 10 5 0 -5 -10 -15 -20 -25
20 15 10 5 0 -5 -10 -15 -20

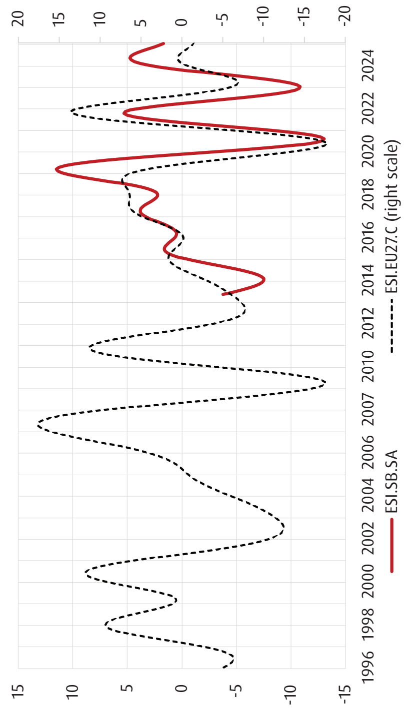

ESI.SI.SA
ESI.EU27.SA (right scale)
1996 1998 2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
120 110 100 90 80 70 60
115 105 95 85 75 65 55


ESI.SI.SA
ESI.EU27.C (right scale)
1996 1998 2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
20 15 10 5 0 -5 -10 -15 -20
20 15 10 5 0 -5 -10 -15 -20

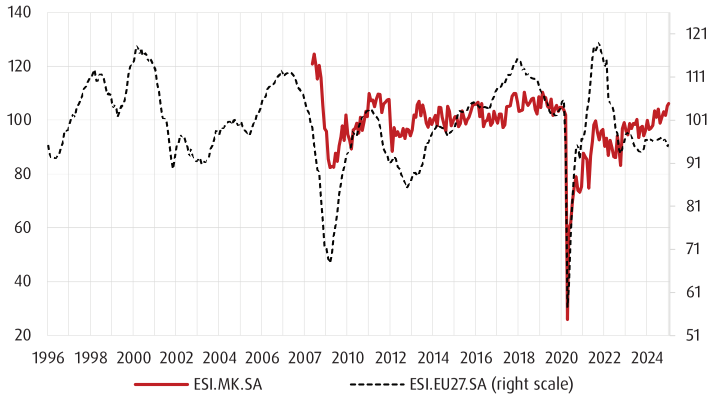

ESI.HR.SA
ESI.EU27.SA (right scale)

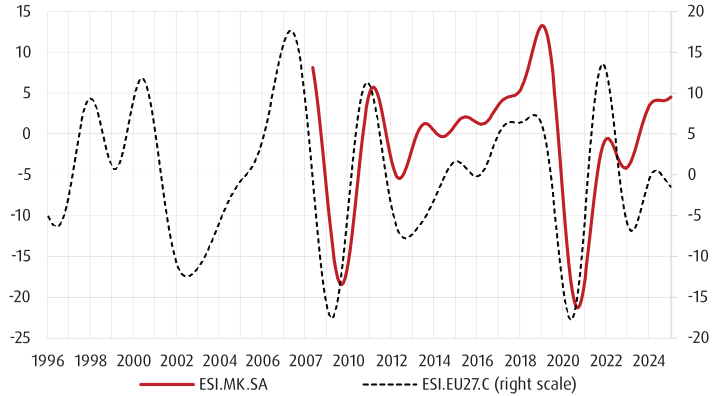

ESI.HR.SA
ESI.EU27.C (right scale)

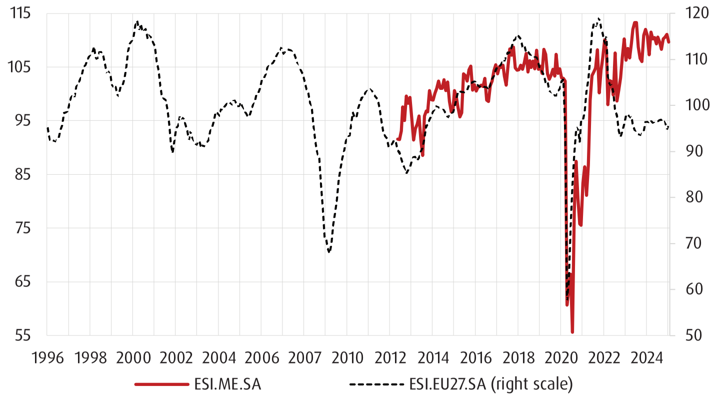

ESI.SB.SA
ESI.EU27.SA (right scale)

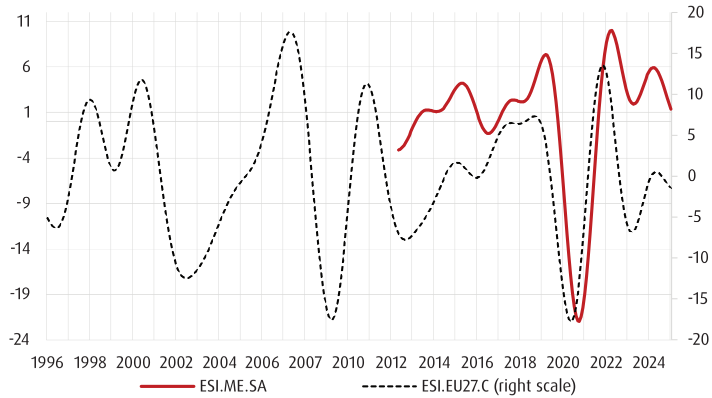

ESI.SB.SA
ESI.EU27.C (right scale)

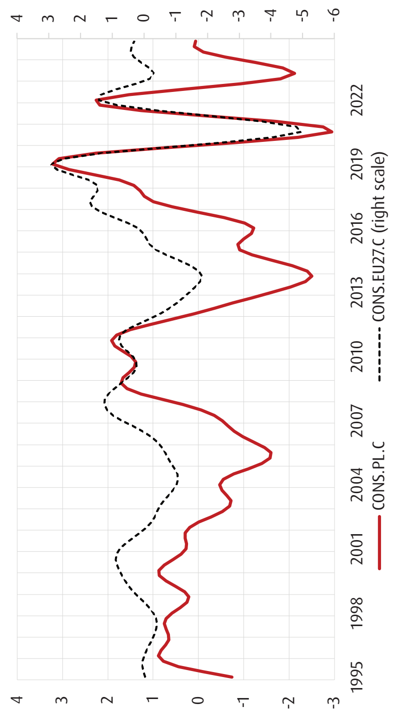
Household consumption

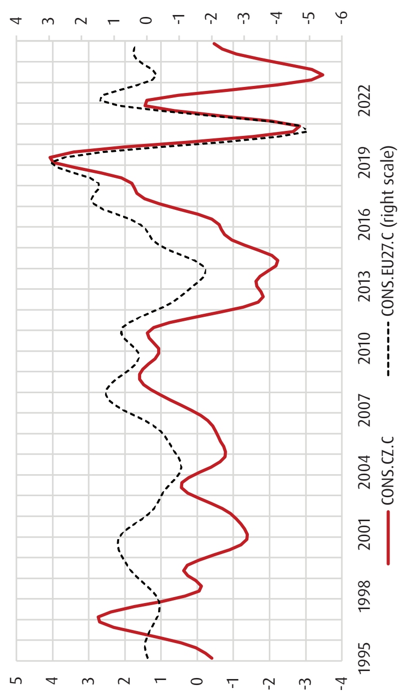


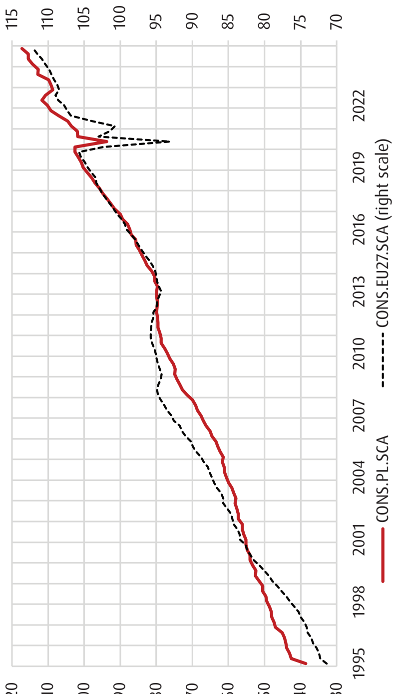


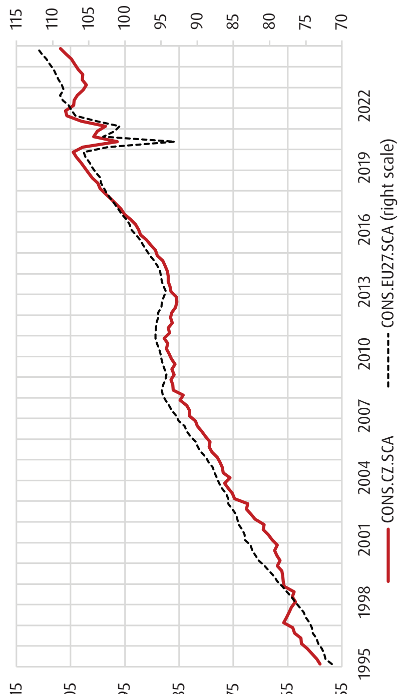


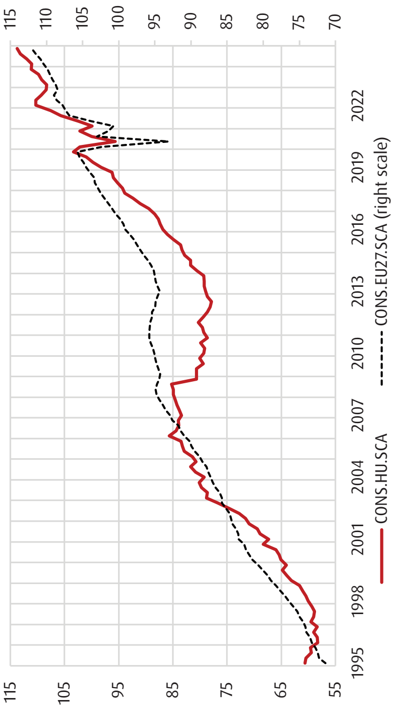


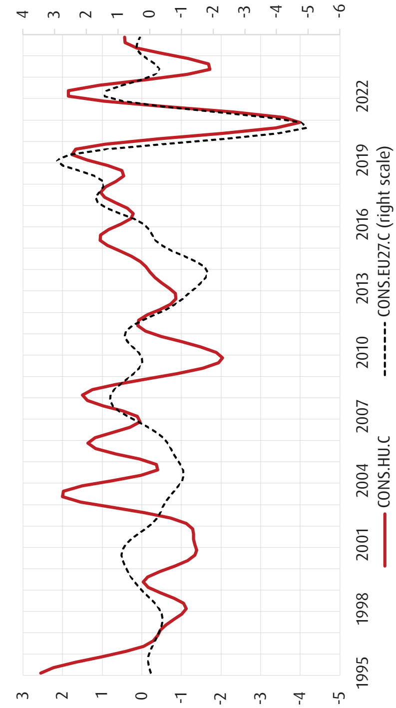

CONS.PL.C
CONS.EU27.C (right scale)

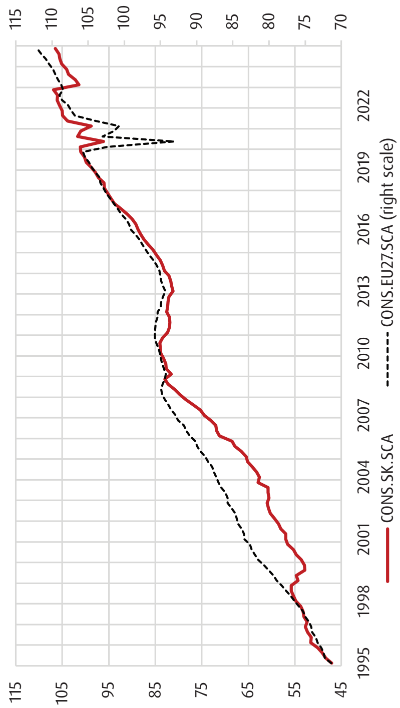

CONS.CZ.C
CONS.EU27.C (right scale)

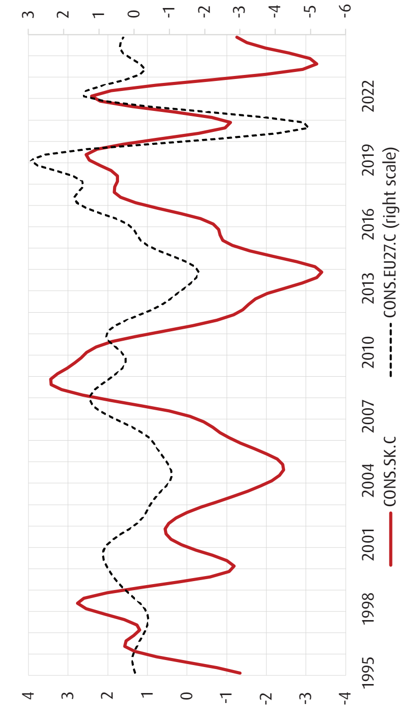

CONS.PL.SCA
CONS.EU27.SCA (right scale)

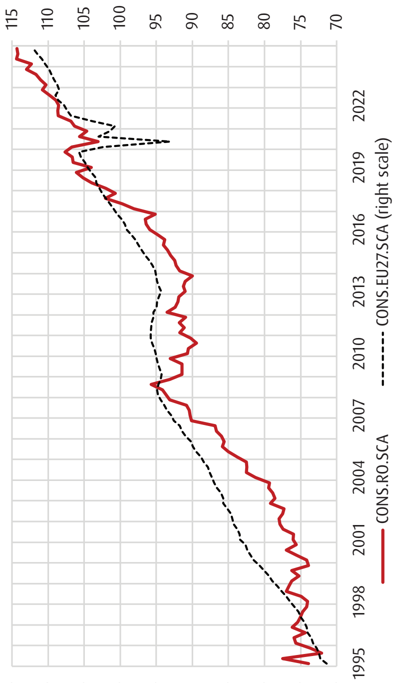

CONS.CZ.SCA
CONS.EU27.SCA (right scale)

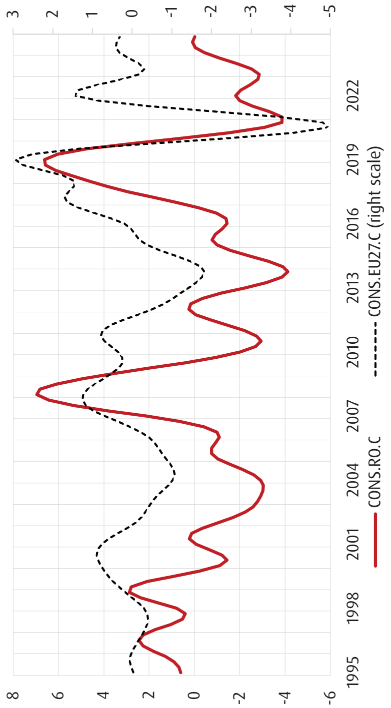

CONS.HU.SCA
CONS.EU27.SCA (right scale)
1995 1998 2001 2004 2007 2010 2013 2016 2019 2022

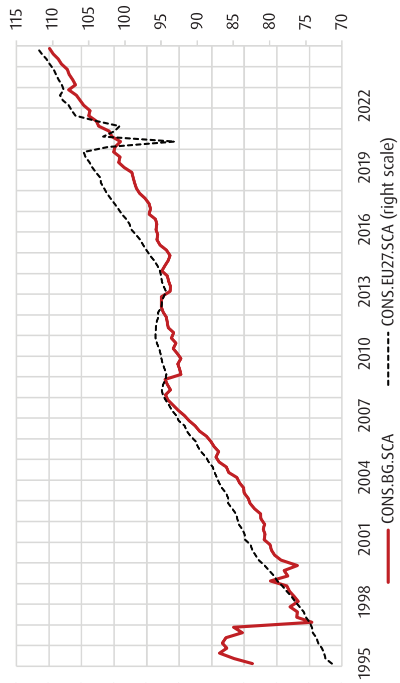

CONS.HU.C
CONS.EU27.C (right scale)
1995 1998 2001 2004 2007 2010 2013 2016 2019 2022

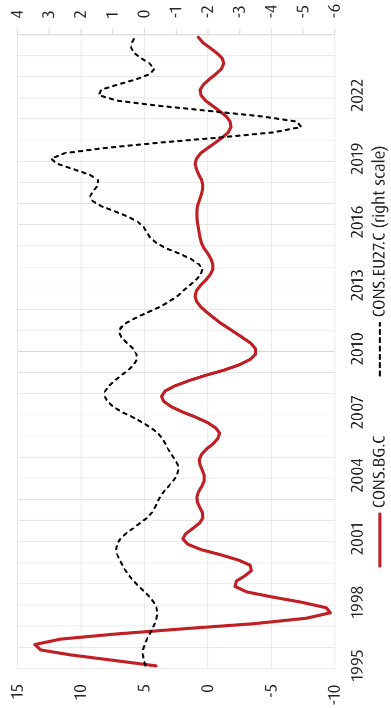

CONS.SK.SCA
CONS.EU27.SCA (right scale)
1995 1998 2001 2004 2007 2010 2013 2016 2019 2022

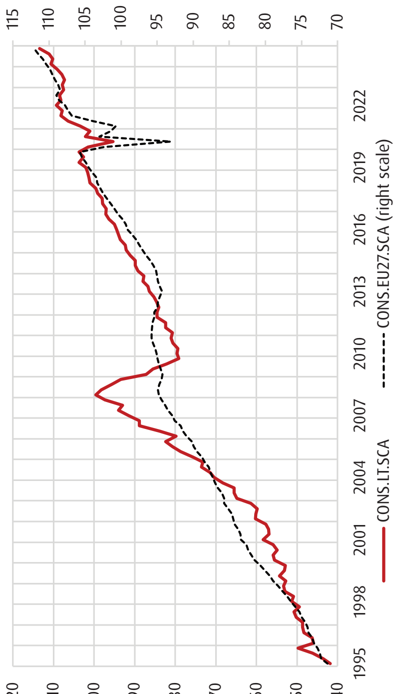

CONS.SK.C
CONS.EU27.C (right scale)
1995 1998 2001 2004 2007 2010 2013 2016 2019 2022

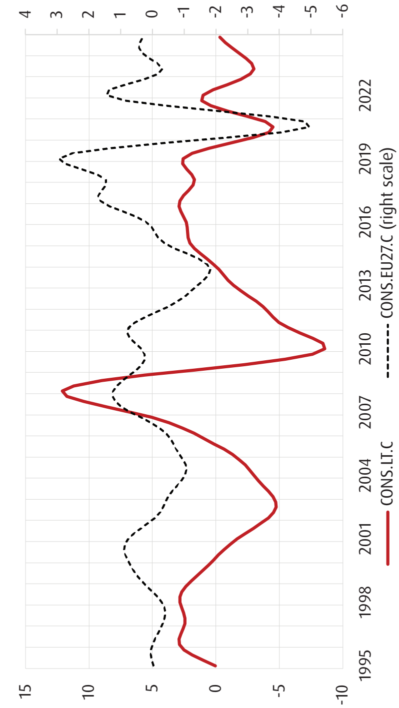

CONS.RO.SCA
CONS.EU27.SCA (right scale)

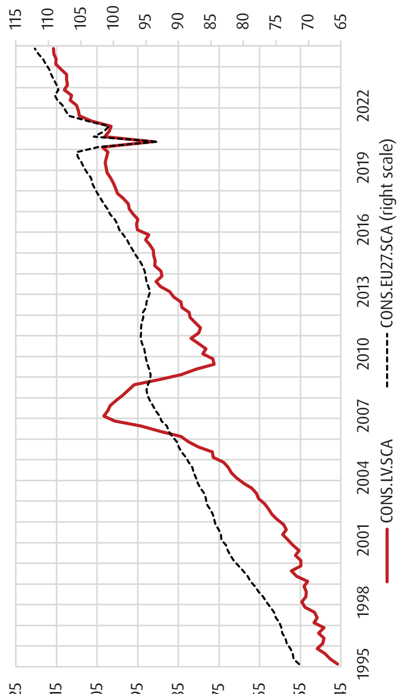

CONS.RO.C
CONS.EU27.C (right scale)

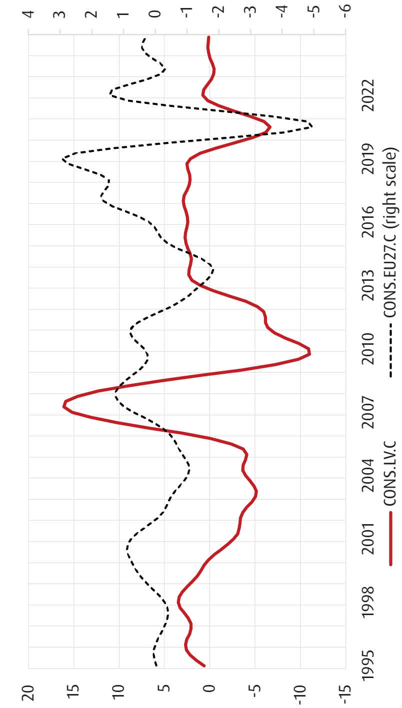

CONS.BG.SCA
CONS.EU27.SCA (right scale)

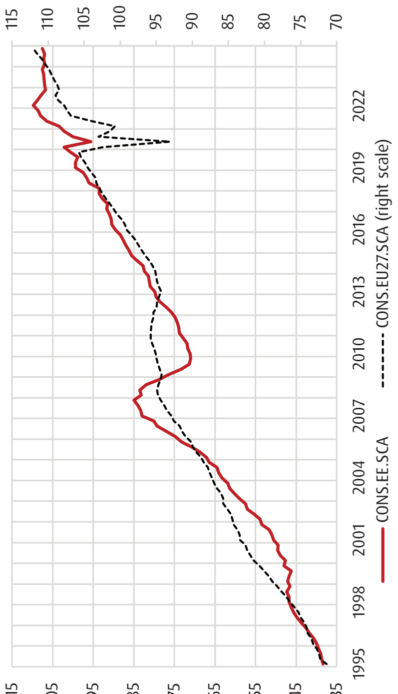

CONS.BG.C
CONS.EU27.C (right scale)

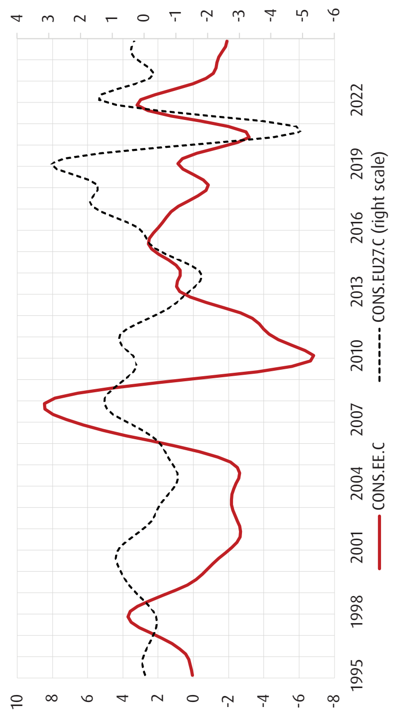

120
110
100
90
80
70
60
50
40
115
110
105
100
95
90
85
80
75
70
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
CONS.LT.SCA
CONS.EU27.SCA (right scale)

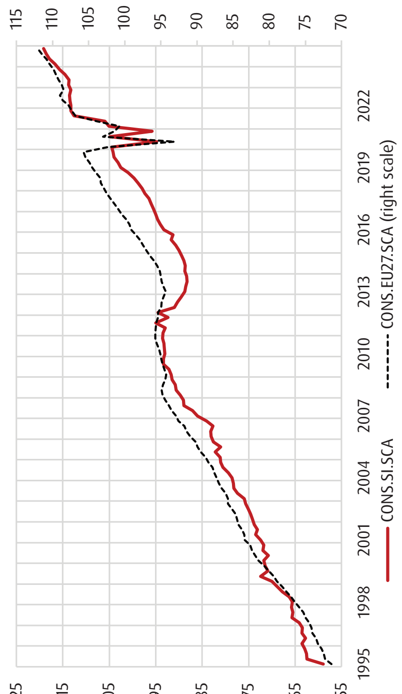

15
10
5
0
-5
-10
4
3
2
1
0
-1
-2
-3
-4
-5
-6
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
CONS.LT.C
CONS.EU27.C (right scale)

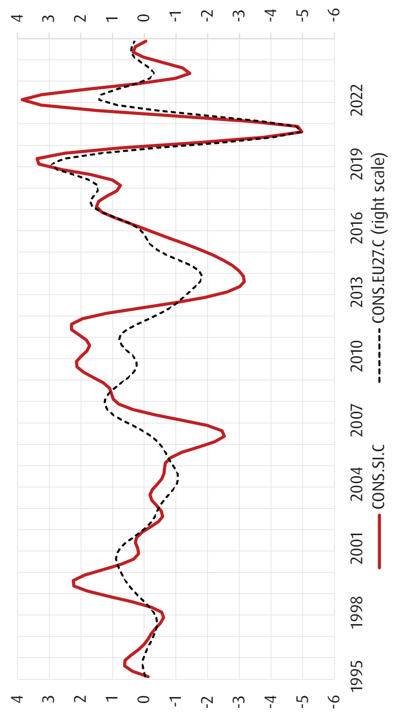

125
115
105
95
85
75
65
55
45
115
110
105
100
95
90
85
80
75
70
65
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
CONS.LV.SCA
CONS.EU27.SCA (right scale)

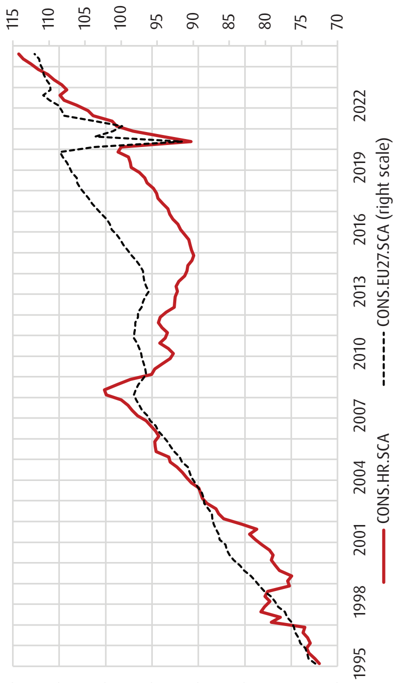

20
15
10
5
0
-5
-10
-15
4
3
2
1
0
-1
-2
-3
-4
-5
-6
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
CONS.LV.C
CONS.EU27.C (right scale)

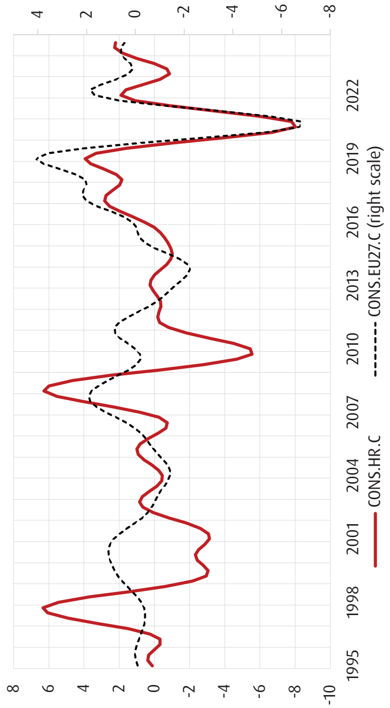

CONS.EE.SCA
CONS.EU27.SCA (right scale)

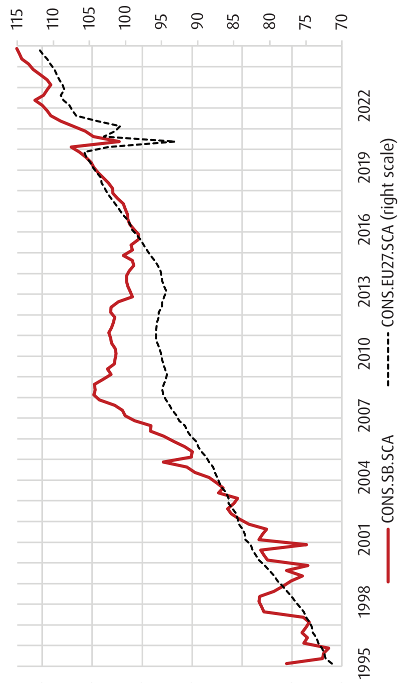

CONS.EE.C
CONS.EU27.C (right scale)

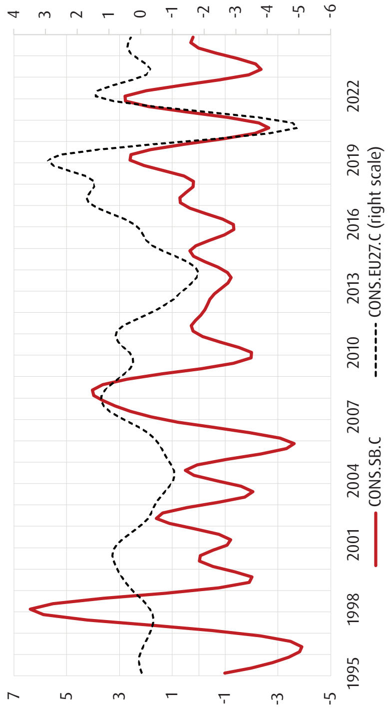

CONS.SI.SCA
CONS.EU27.SCA (right scale)

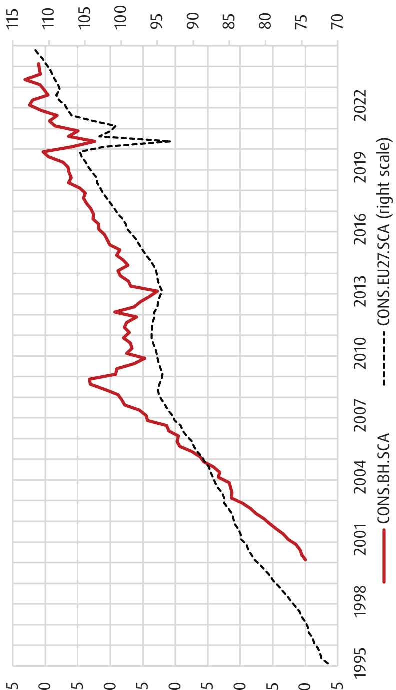

CONS.SI.C
CONS.EU27.C (right scale)

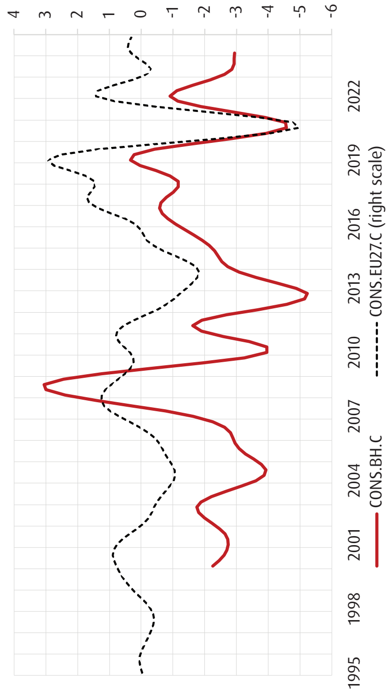

CONS.HR.SCA
CONS.EU27.SCA (right scale)


CONS.HR.C
CONS.EU27.C (right scale)

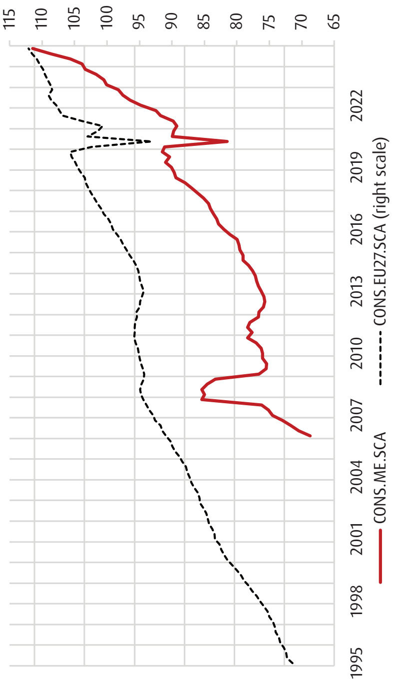

CONS.SB.SCA
CONS.EU27.SCA (right scale)

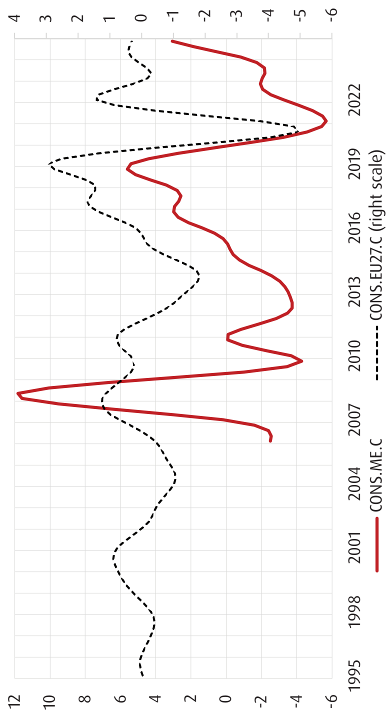

CONS.SB.C
CONS.EU27.C (right scale)

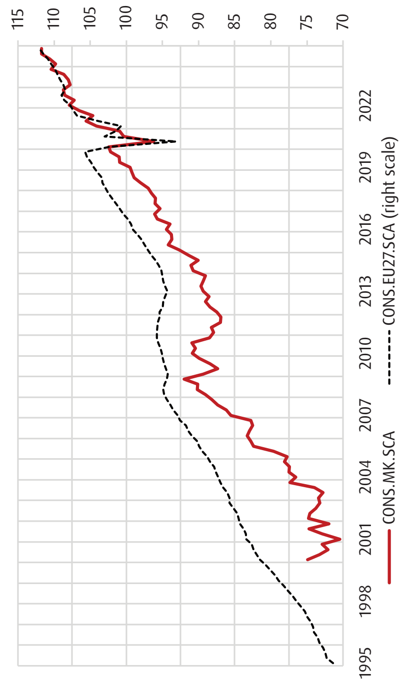

CONS.BH.SCA
CONS.EU27.SCA (right scale)

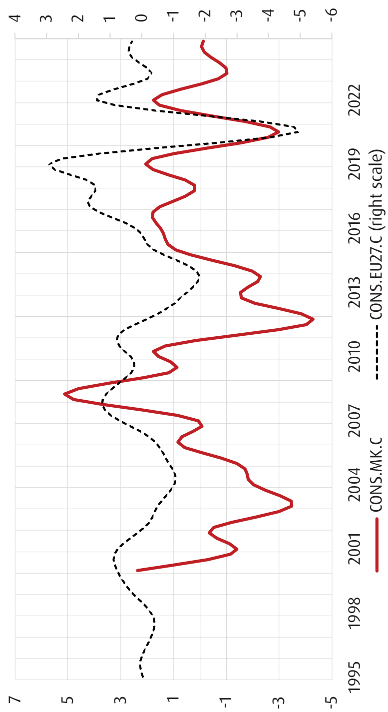

CONS.BH.C
CONS.EU27.C (right scale)

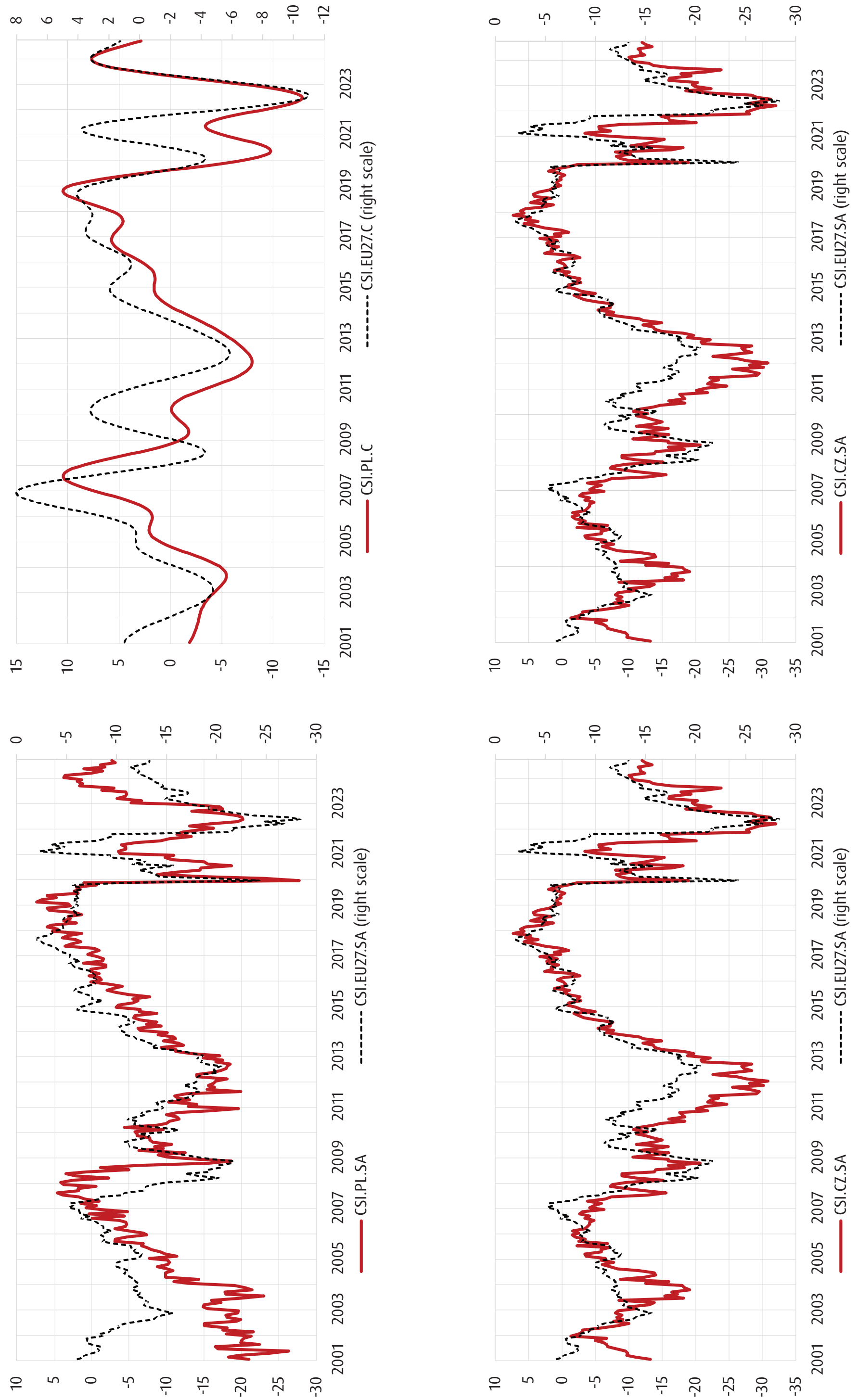
Household Health Index (CSI, Consumer Sentiment)

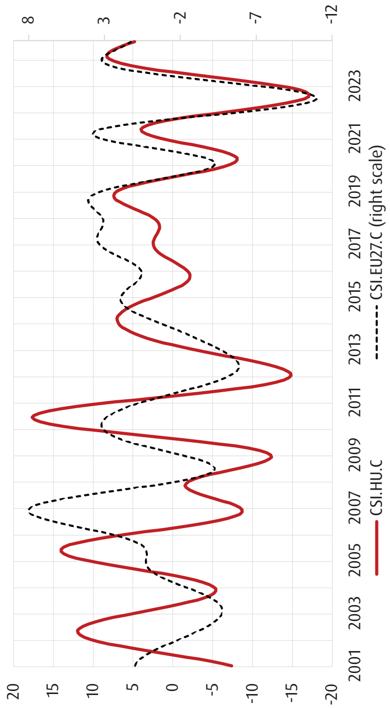


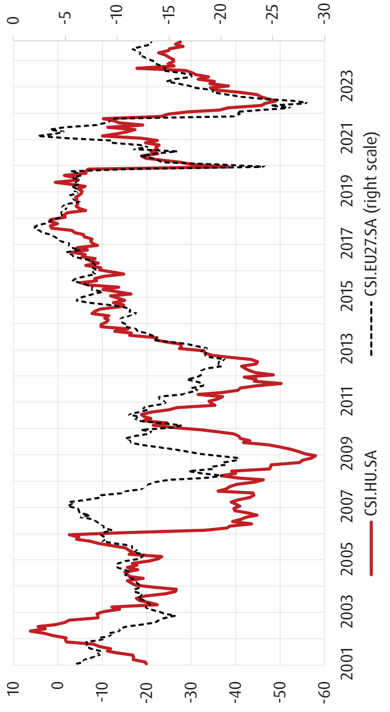


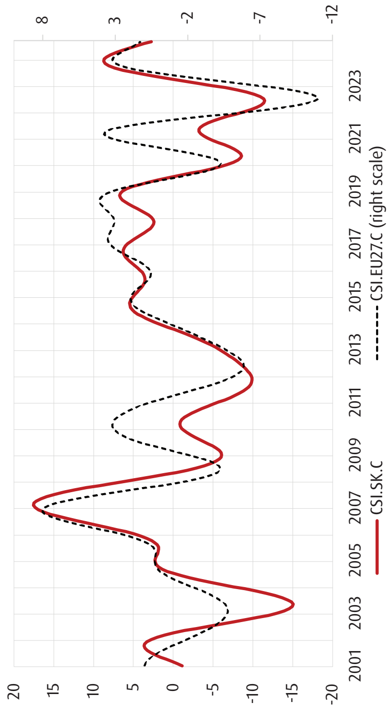


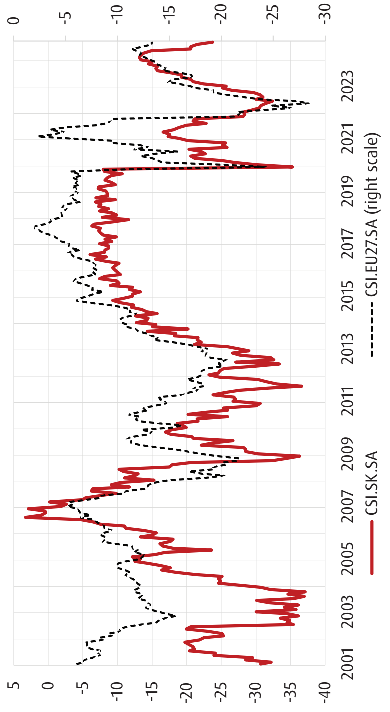


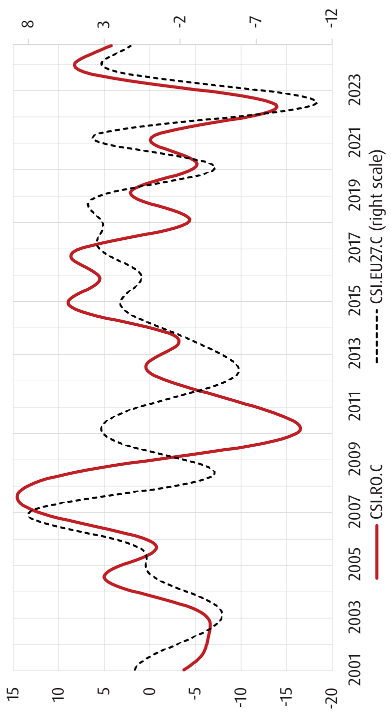

CSI.PL.C
CSI.EU27.C (right scale)
CSI.PL.SA
CSI.EU27.SA (right scale)
CSI.CZ.SA
CSI.EU27.SA (right scale)
CSI.CZ.SA
CSI.EU27.SA (right scale)

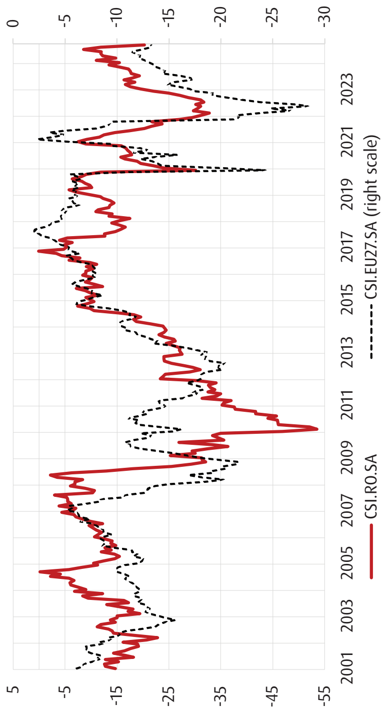

CSI.HU.C
CSI.EU27.C (right scale)

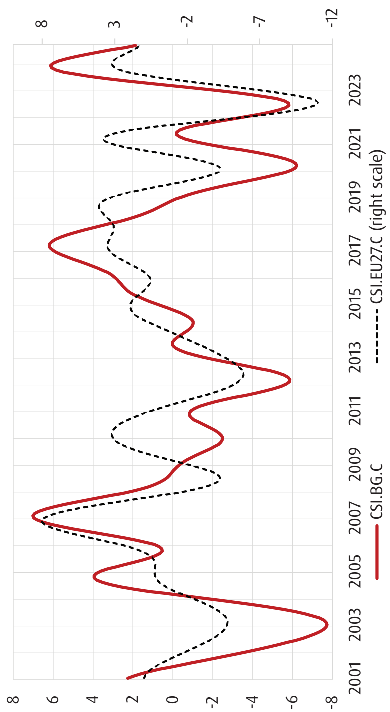

CSI.HU.SA
CSI.EU27.SA (right scale)

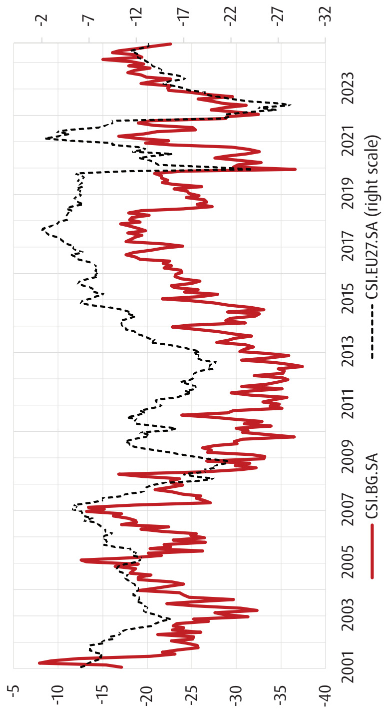

CSI.SK.C
CSI.EU27.C (right scale)

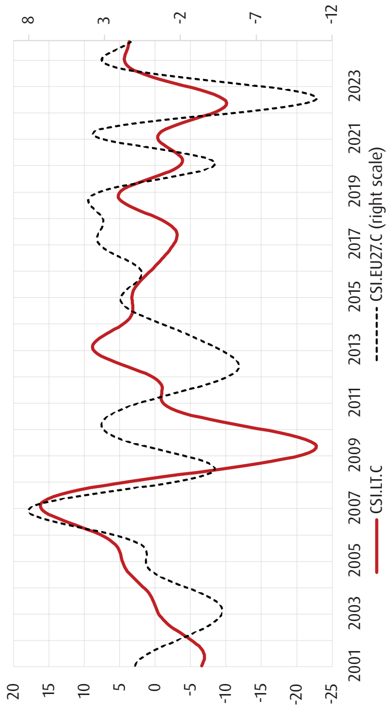

CSI.SK.SA
CSI.EU27.SA (right scale)

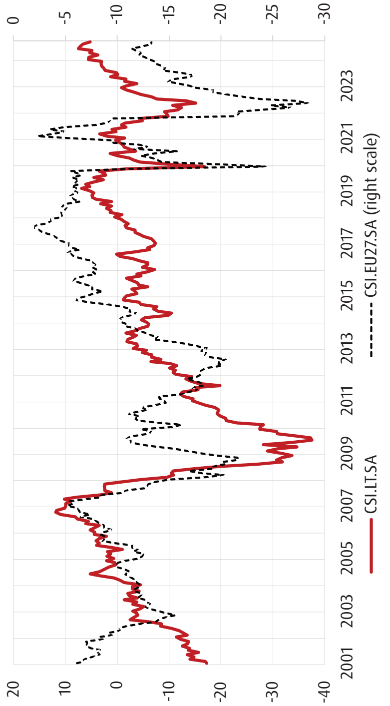

CSI.RO.C
CSI.EU27.C (right scale)

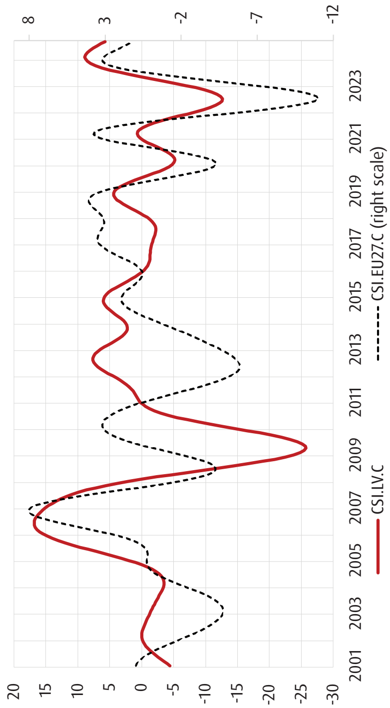

CSI.RO.SA
CSI.EU27.SA (right scale)

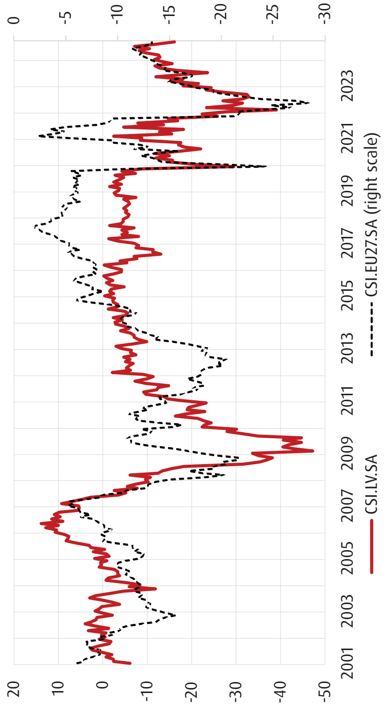

CSI.BG.C
CSI.EU27.C (right scale)

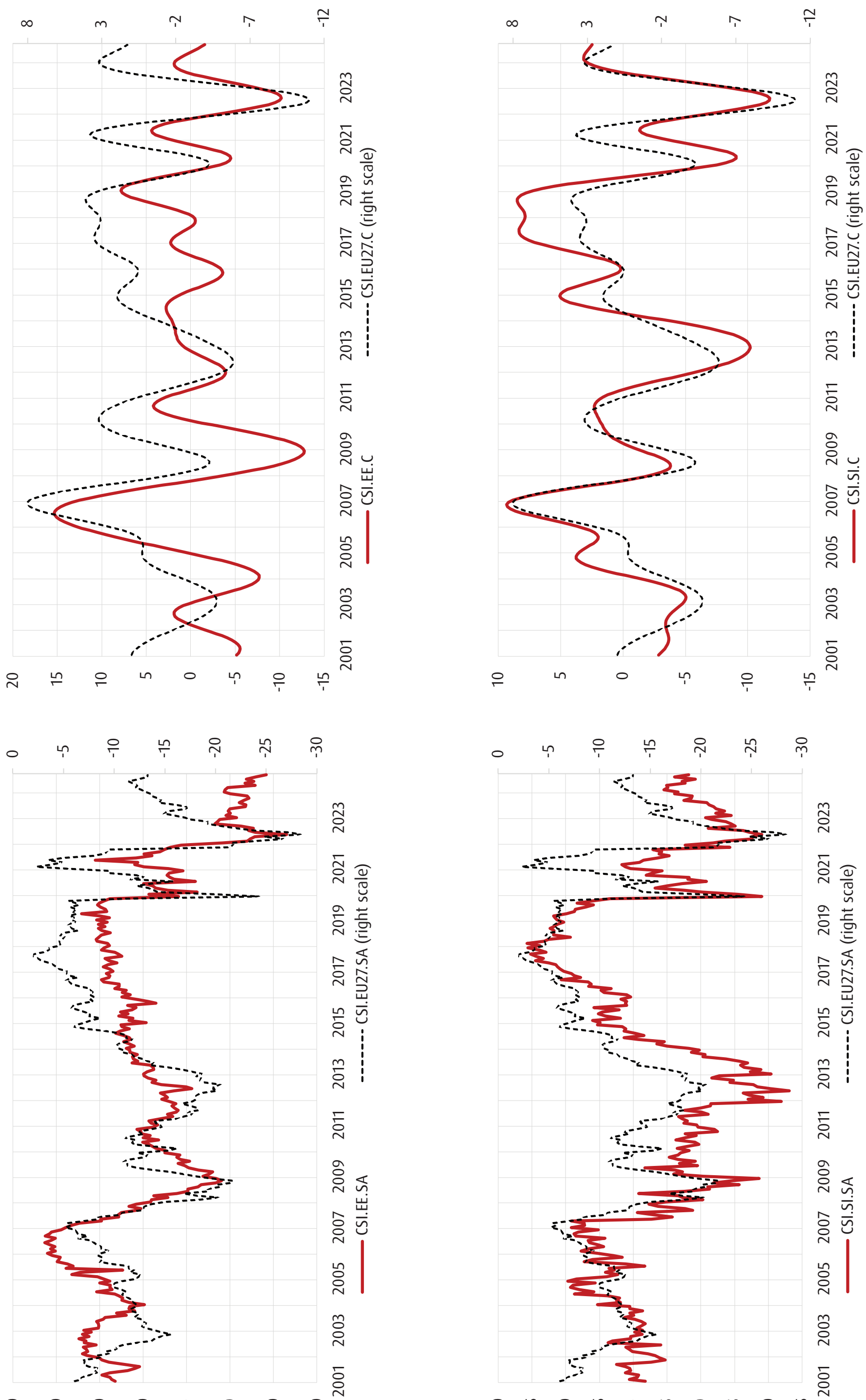

CSI.BG.SA
CSI.EU27.SA (right scale)

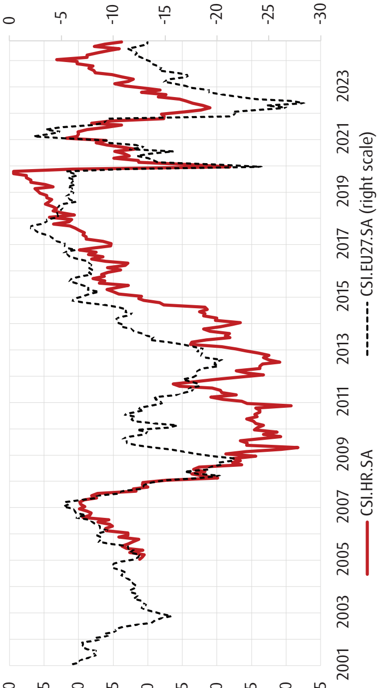

CSI.LT.C
CSI.EU27.C (right scale)

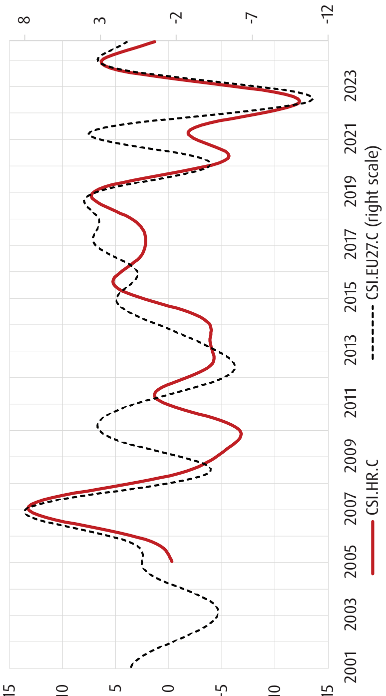

CSI.LT.SA
CSI.EU27.SA (right scale)

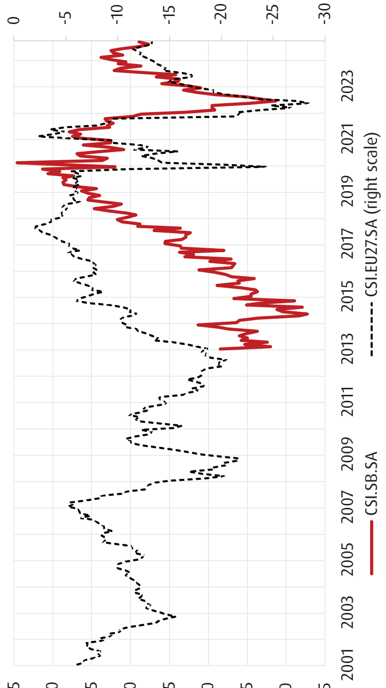

CSI.LV.C
CSI.EU27.C (right scale)

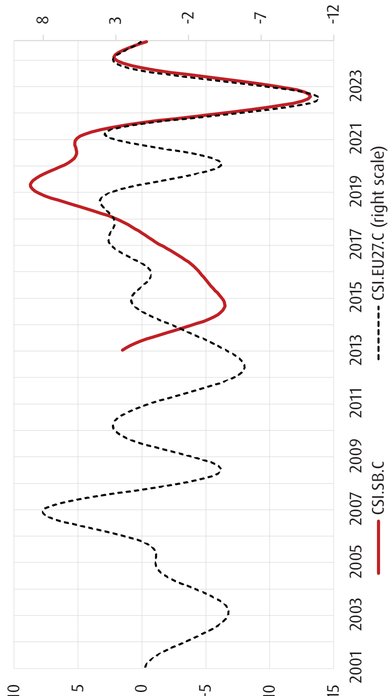

CSI.LV.SA
CSI.EU27.SA (right scale)

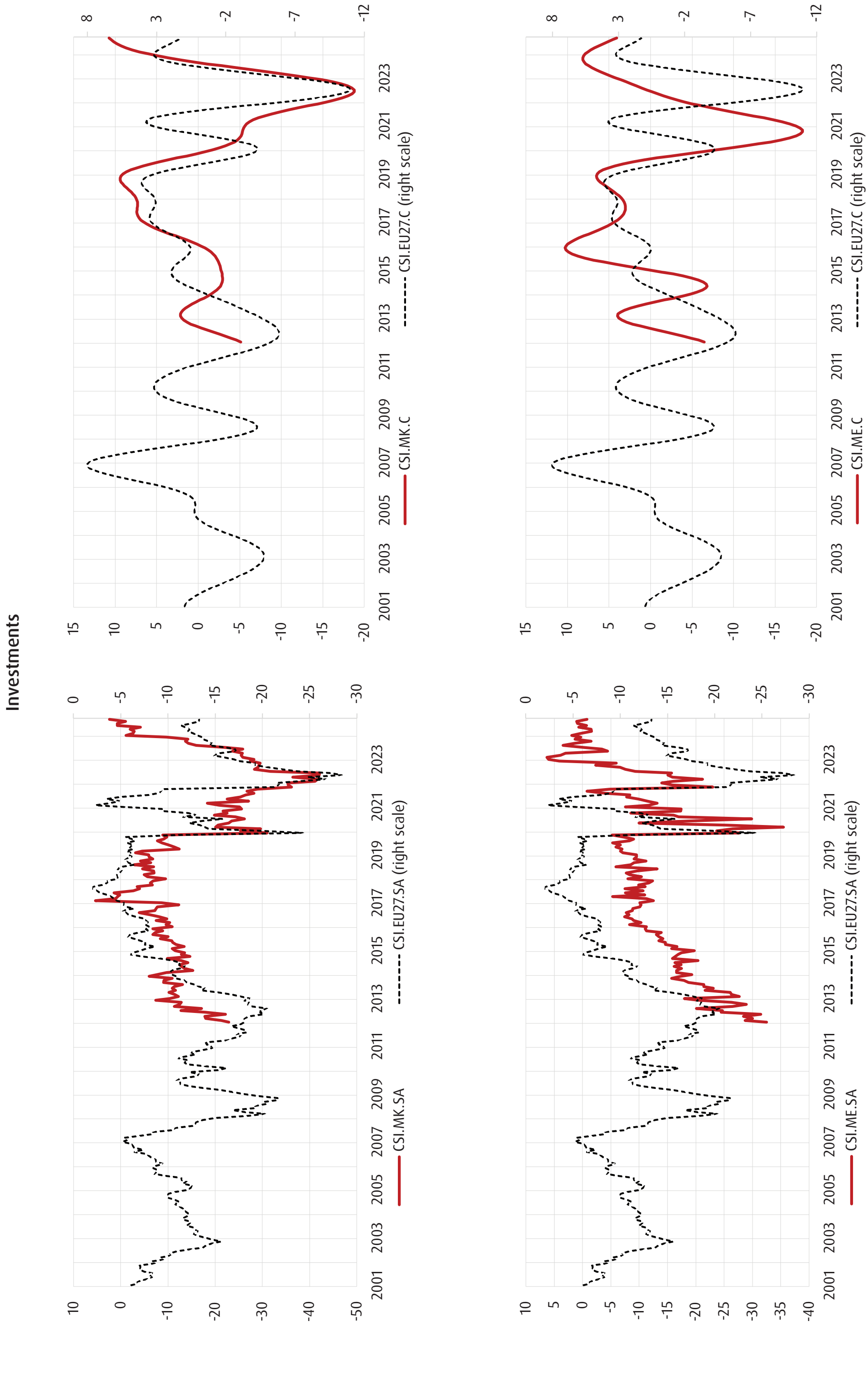

CSI.EE.SA
CSI.EU27.SA (right scale)
CSI.EE.C
CSI.EU27.C (right scale)
CSI.SI.SA
CSI.EU27.SA (right scale)
CSI.SI.C
CSI.EU27.C (right scale)

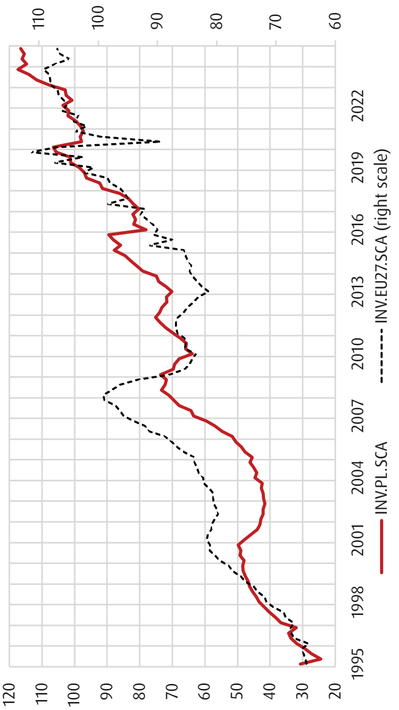

CSI.HR.SA
CSI.EU27.SA (right scale)
2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 2021 2023

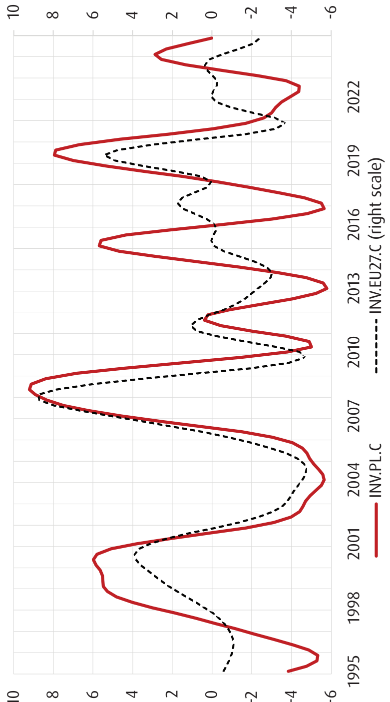

CSI.HR.C
CSI.EU27.C (right scale)
2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 2021 2023

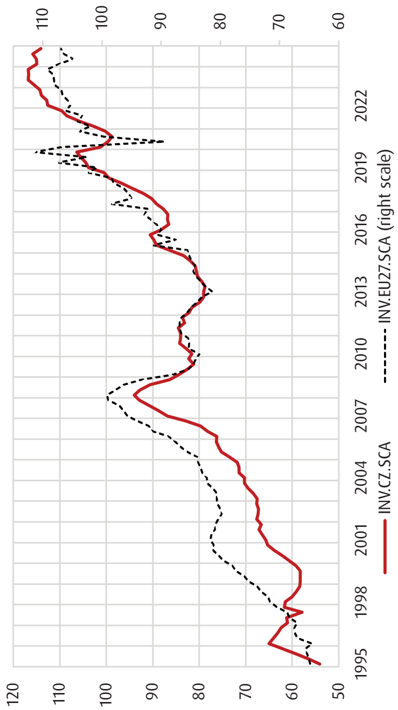

CSI.SB.SA
CSI.EU27.SA (right scale)
2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 2021 2023

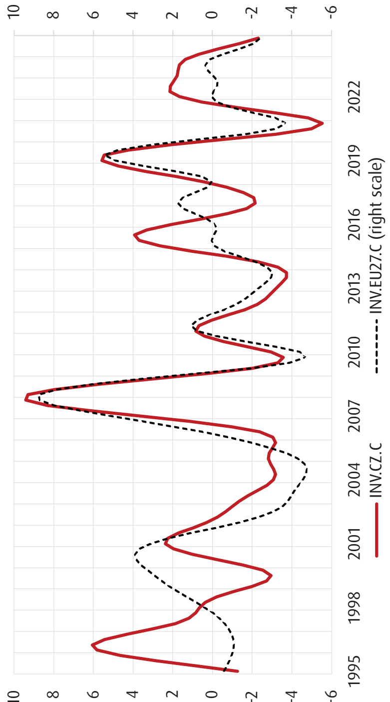

CSI.SB.C
CSI.EU27.C (right scale)
2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 2021 2023

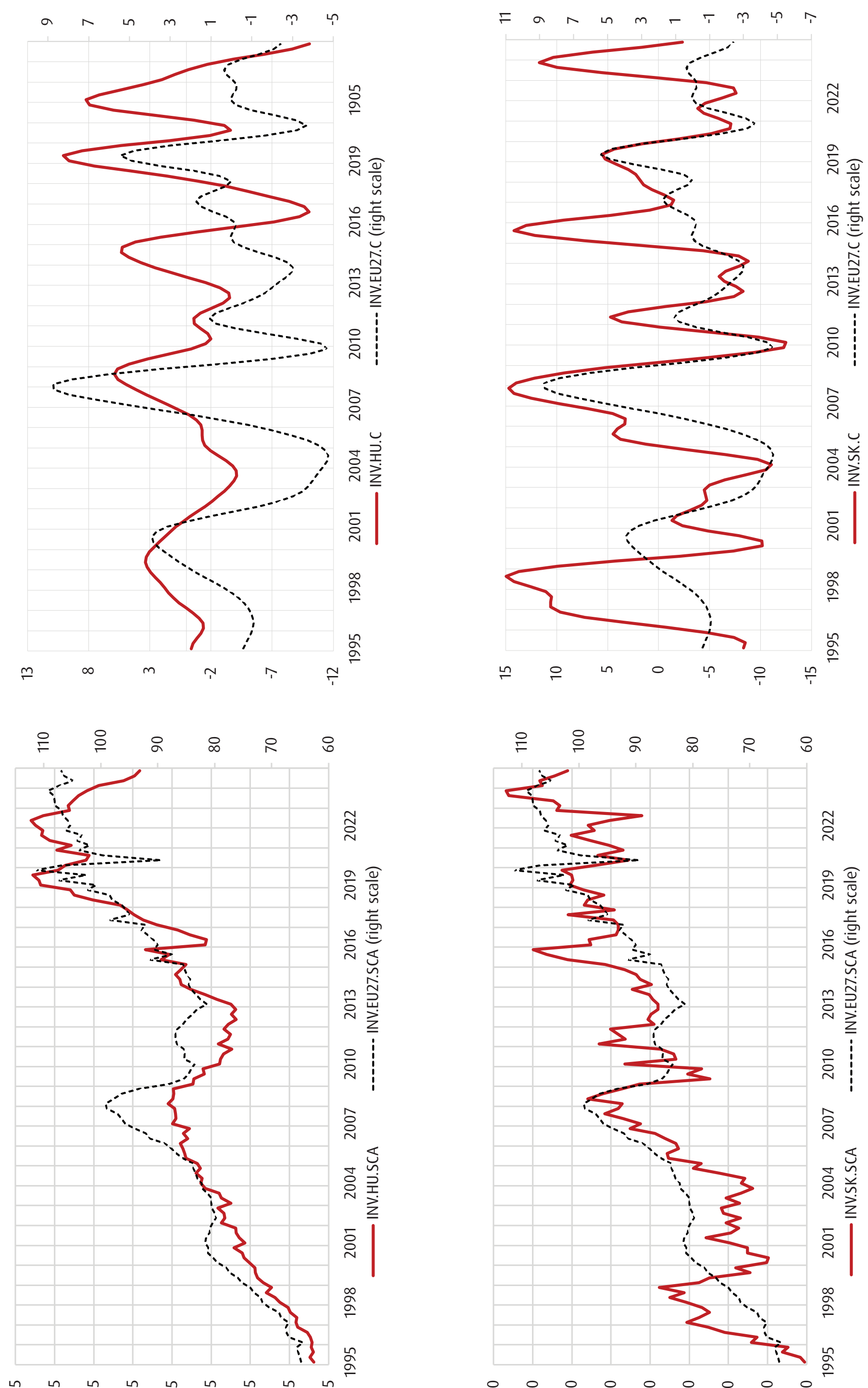

Investments
CSI.MK.SA
CSI.EU27.SA (right scale)
CSI.MK.C
CSI.EU27.C (right scale)
CSI.ME.SA
CSI.EU27.SA (right scale)
CSI.ME.C
CSI.EU27.C (right scale)

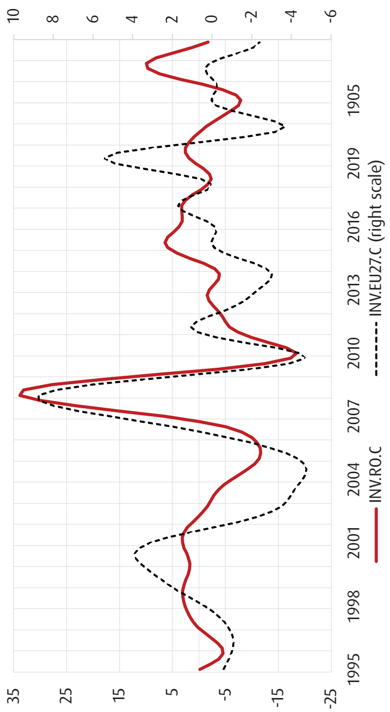

INV.PL.SCA
INV.EU27.SCA (right scale)

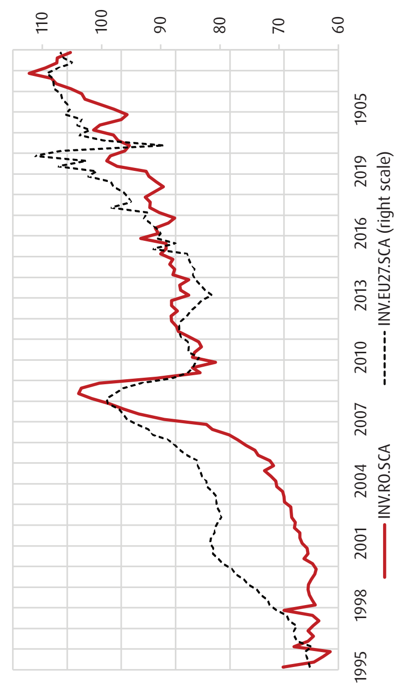

INV.PL.C
INV.EU27.C (right scale)

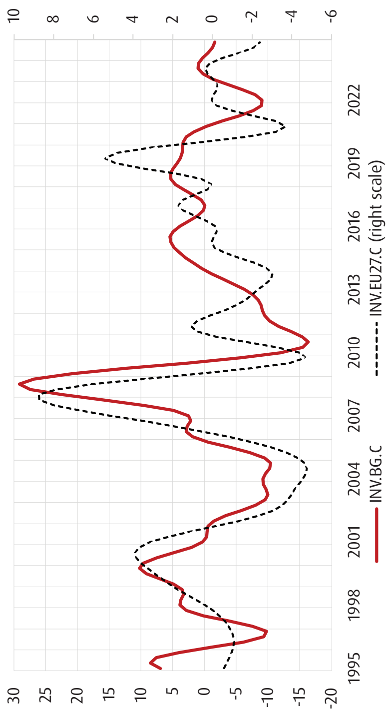

INV.CZ.SCA
INV.EU27.SCA (right scale)

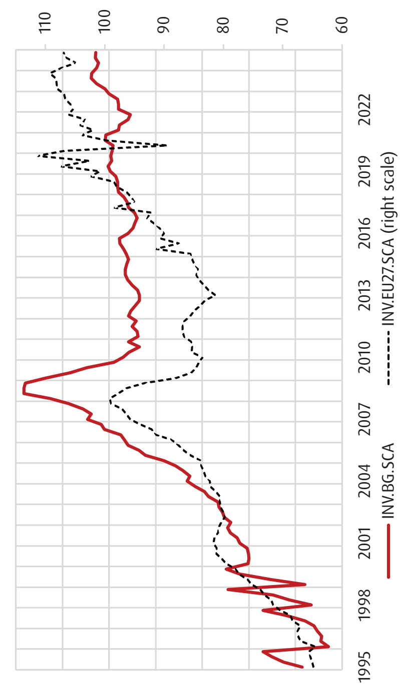

INV.CZ.C
INV.EU27.C (right scale)

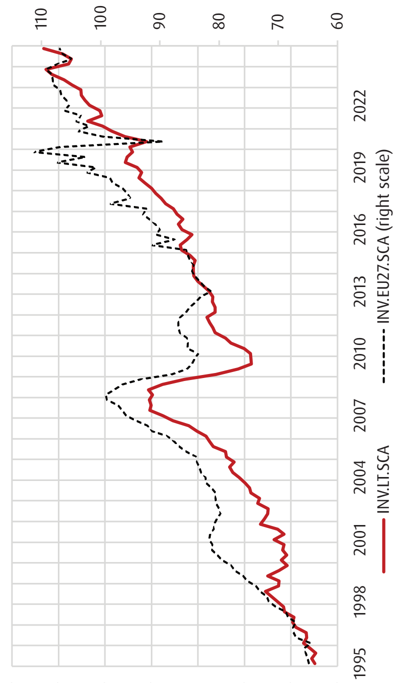

INV.HU.SCA
INV.EU27.SCA (right scale)
INV.HU.C
INV.EU27.C (right scale)
INV.SK.SCA
INV.EU27.SCA (right scale)
INV.SK.C
INV.EU27.C (right scale)

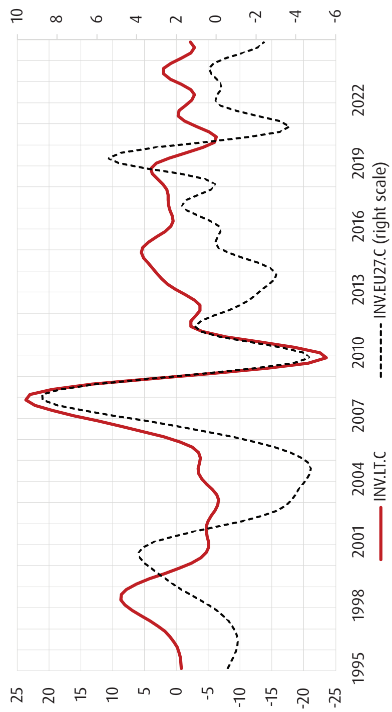

INV.RO.C
INV.EU27.C (right scale)

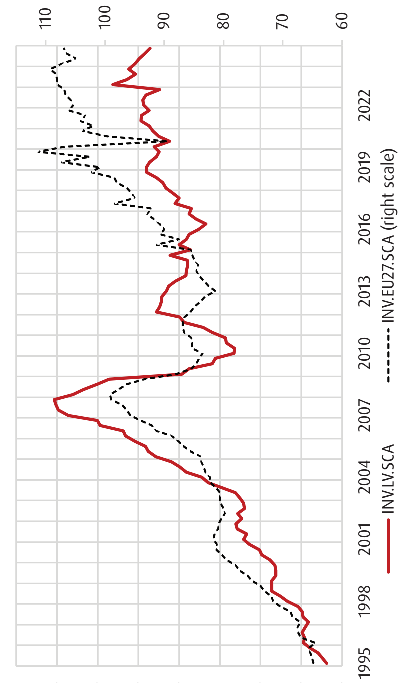

INV.RO.SCA
INV.EU27.SCA (right scale)

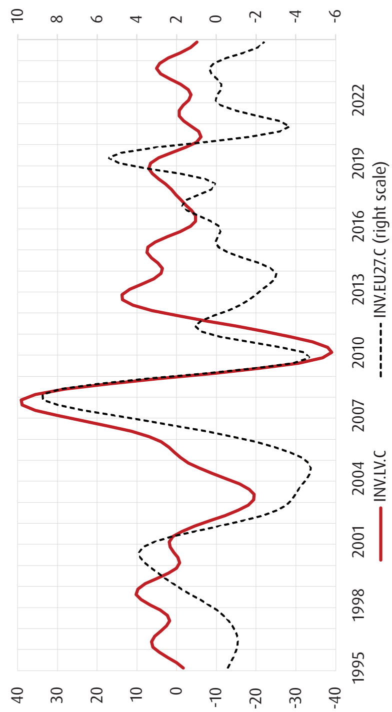

INV.BG.C
INV.EU27.C (right scale)

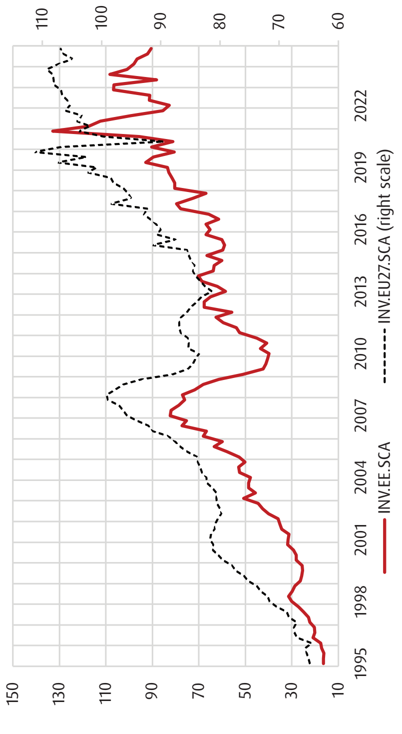

INV.BG.SCA
INV.EU27.SCA (right scale)

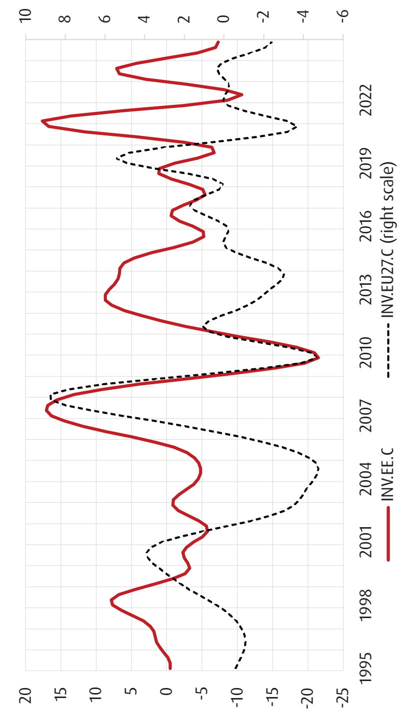

INV.LT.SCA
INV.EU27.SCA (right scale)

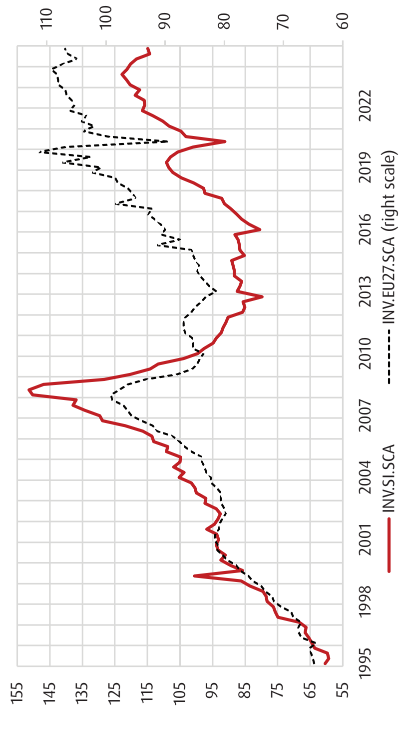

INV.LT.C
INV.EU27.C (right scale)

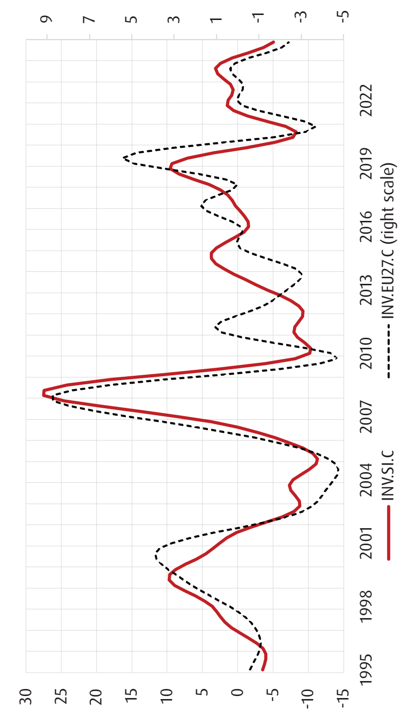

INV.LV.SCA
INV.EU27.SCA (right scale)

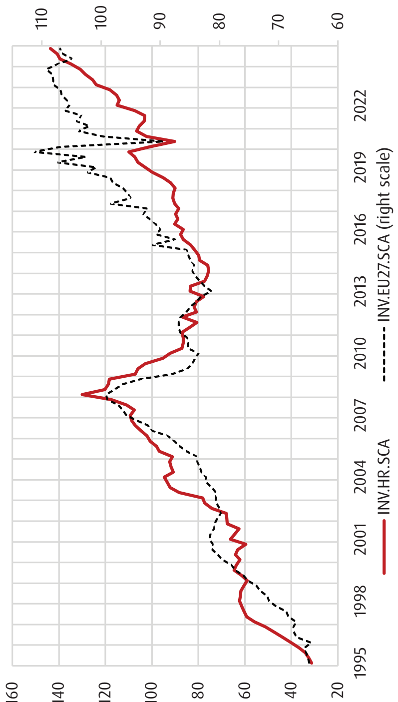

INV.LV.C
INV.EU27.C (right scale)

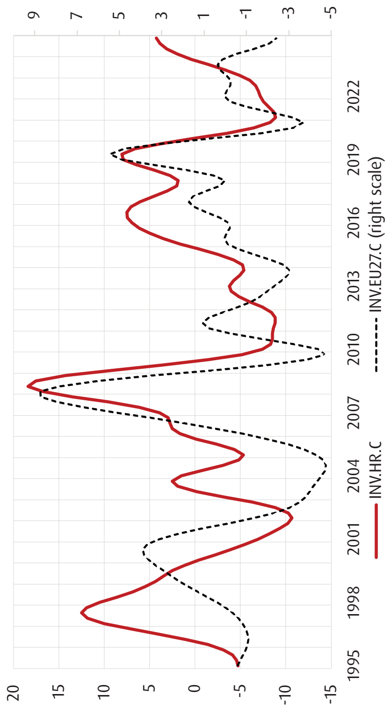

INV.EE.SCA
INV.EU27.SCA (right scale)

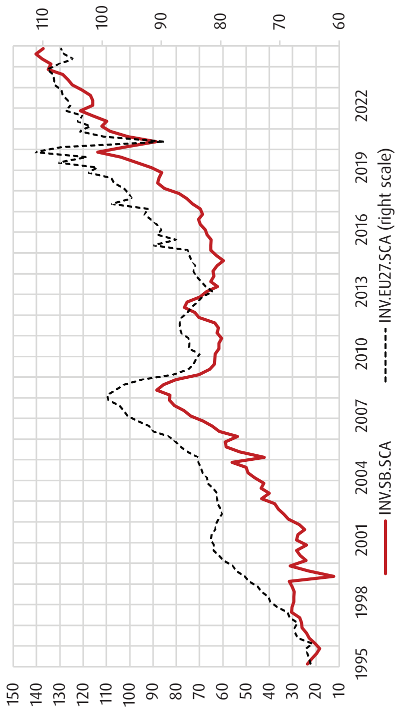

INV.EE.C
INV.EU27.C (right scale)

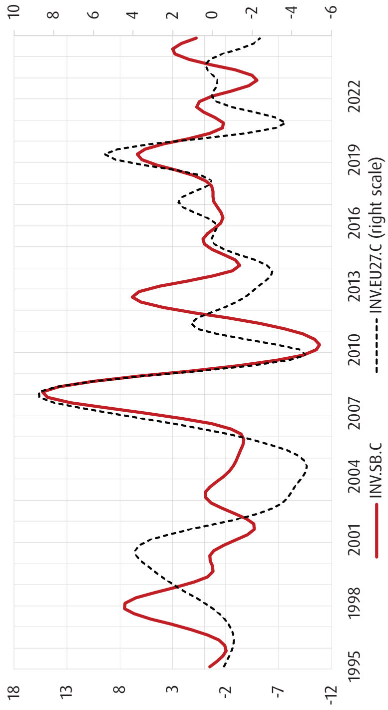

INV.SI.SCA
INV.EU27.SCA (right scale)


INV.SI.C
INV.EU27.C (right scale)

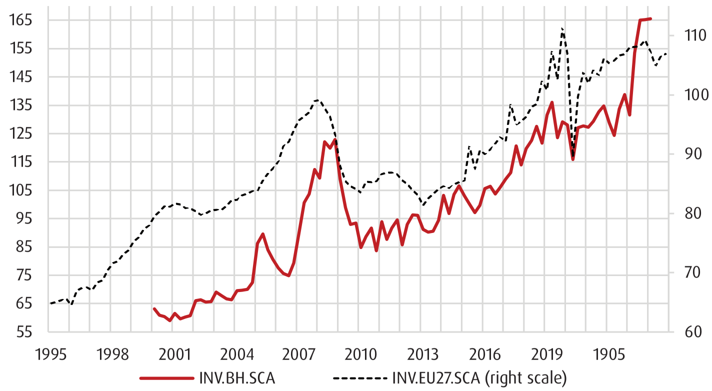

INV.HR.SCA
INV.EU27.SCA (right scale)

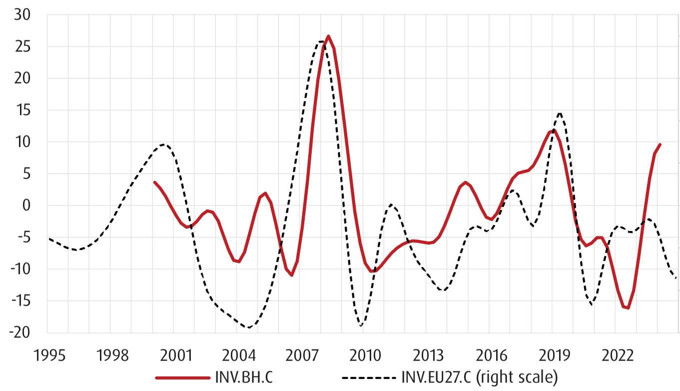

INV.HR.C
INV.EU27.C (right scale)

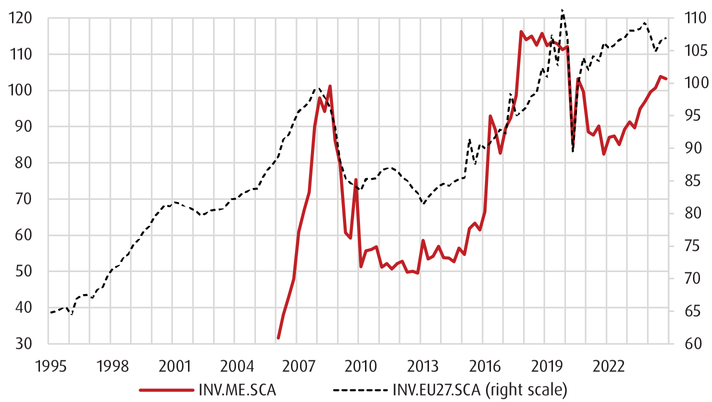

INV.SB.SCA
INV.EU27.SCA (right scale)

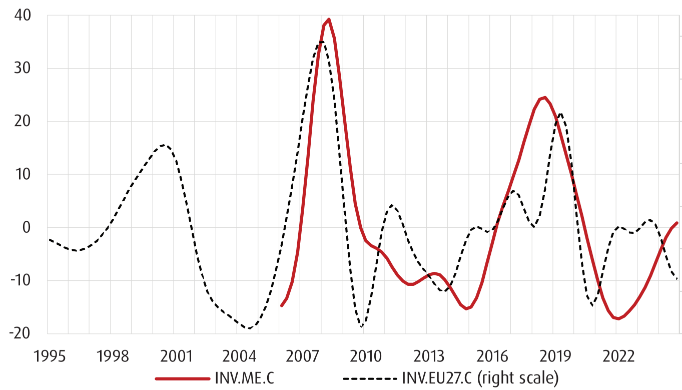

INV.SB.C
INV.EU27.C (right scale)

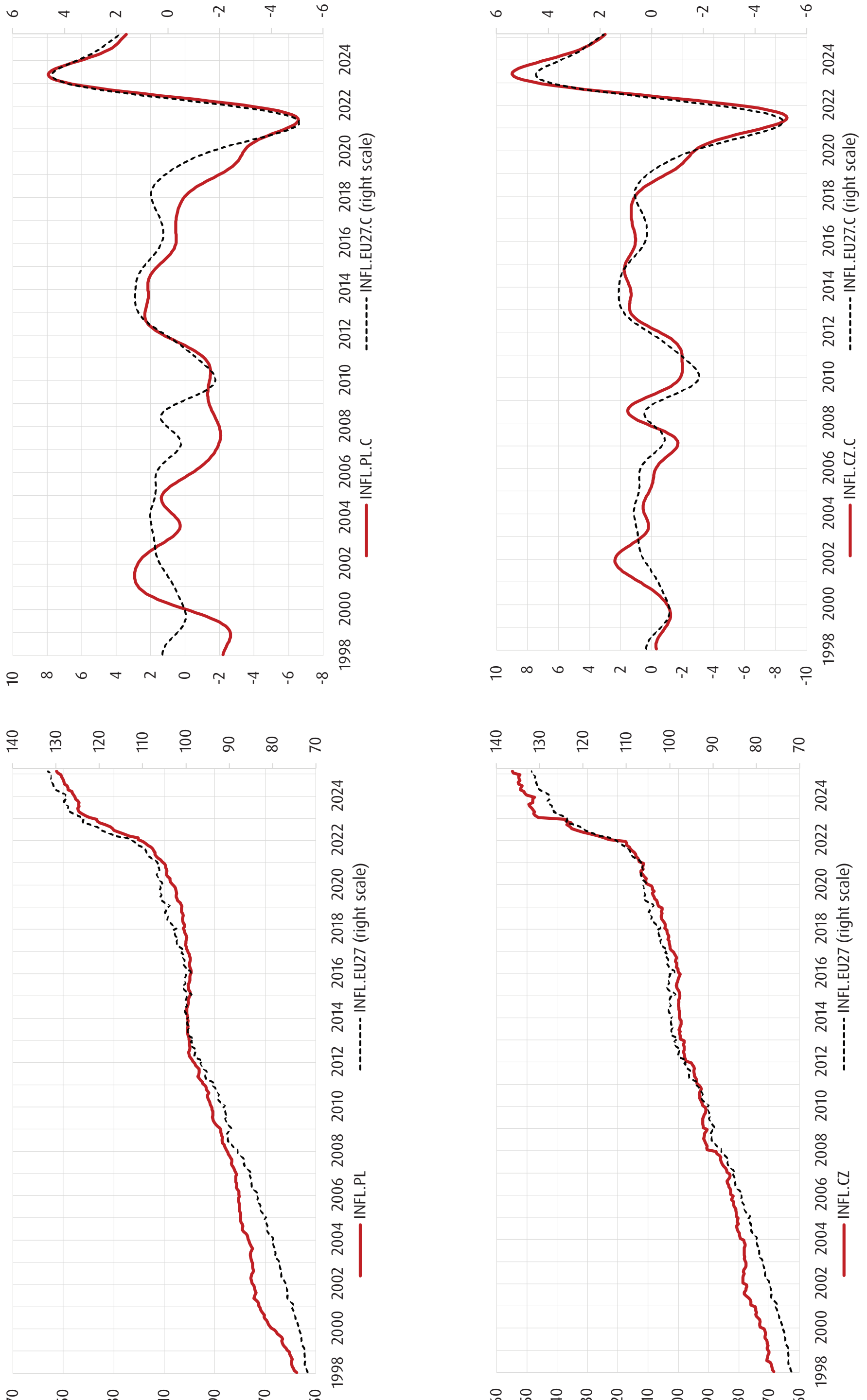
Inflation (HICP)

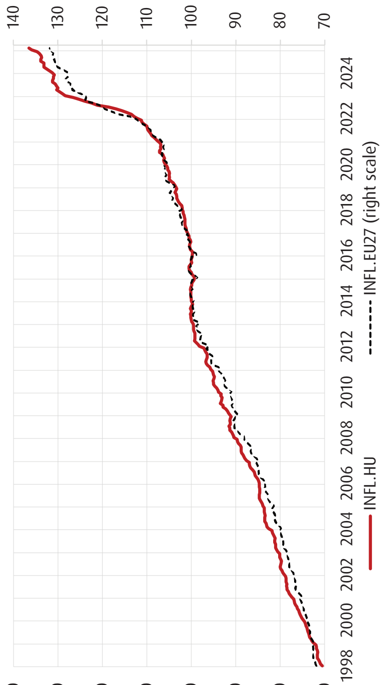




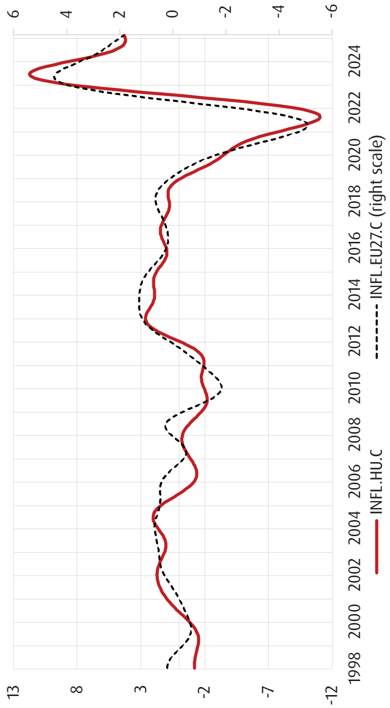




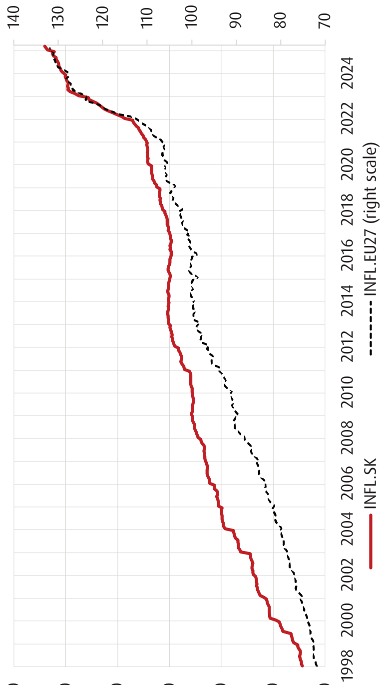

INFL.PL
INFL.EU27 (right scale)
INFL.PL.C
INFL.EU27.C (right scale)
INFL.CZ
INFL.EU27 (right scale)
INFL.CZ.C
INFL.EU27.C (right scale)



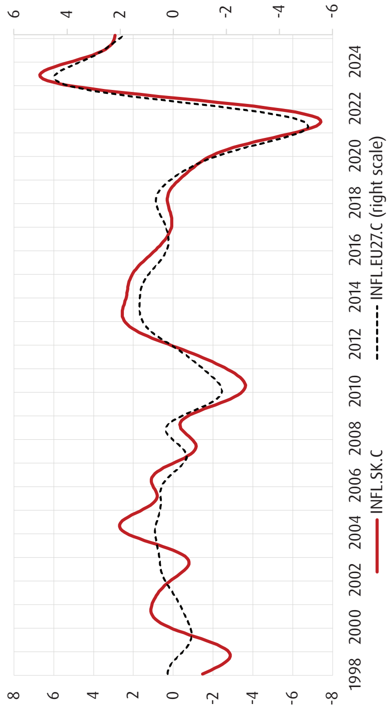
180
160
140
120
100
80
60
40
140
130
120
110
100
90
80
70
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.HU
INFL.EU27 (right scale)



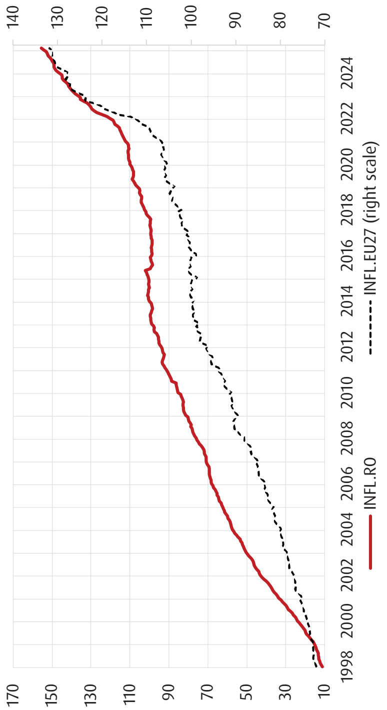
13
8
3
-2
-7
-12
6
4
2
0
-2
-4
-6
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.HU.C
INFL.EU27.C (right scale)

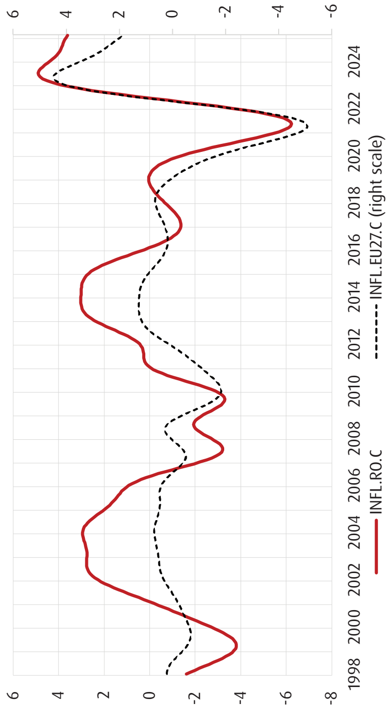


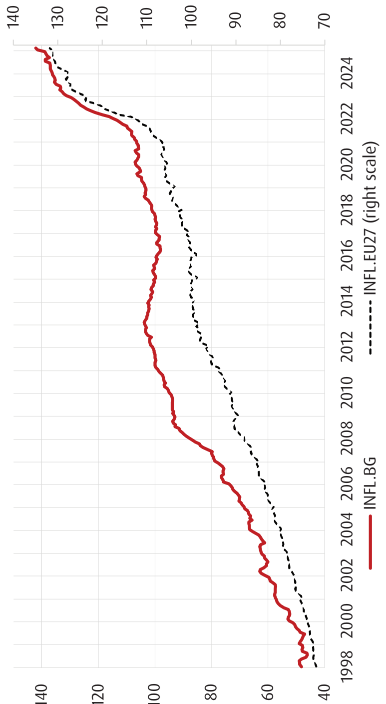
160
140
120
100
80
60
40
140
130
120
110
100
90
80
70
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.SK
INFL.EU27 (right scale)

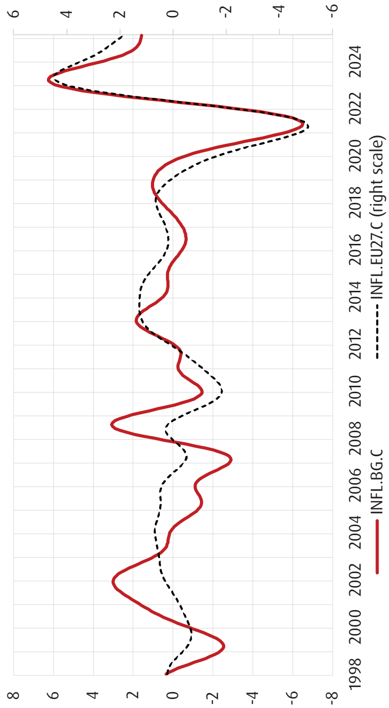


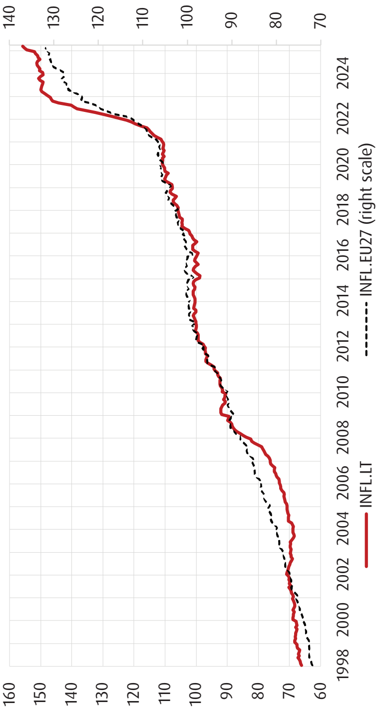
8
6
4
2
0
-2
-4
-6
-8
6
4
2
0
-2
-4
-6
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.SK.C
INFL.EU27.C (right scale)

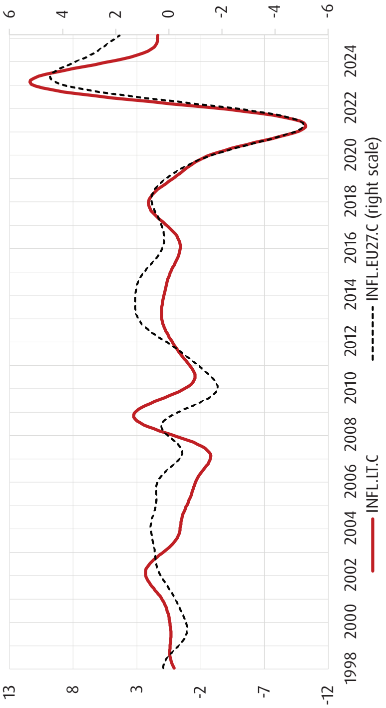

INFL.RO
INFL.EU27 (right scale)

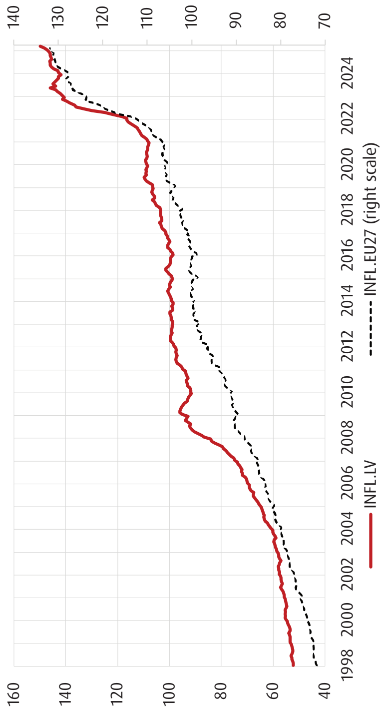

INFL.RO.C
INFL.EU27.C (right scale)

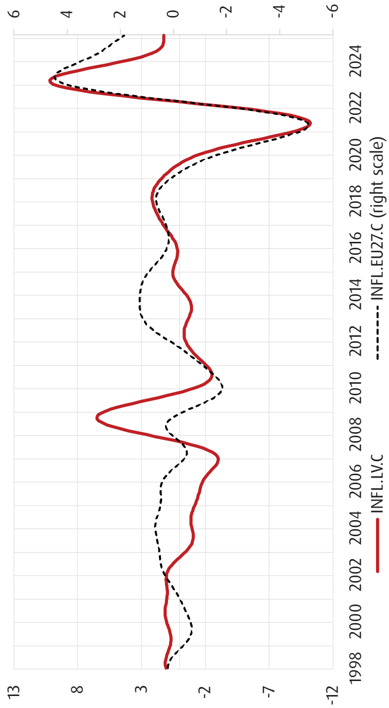

INFL.BG
INFL.EU27 (right scale)

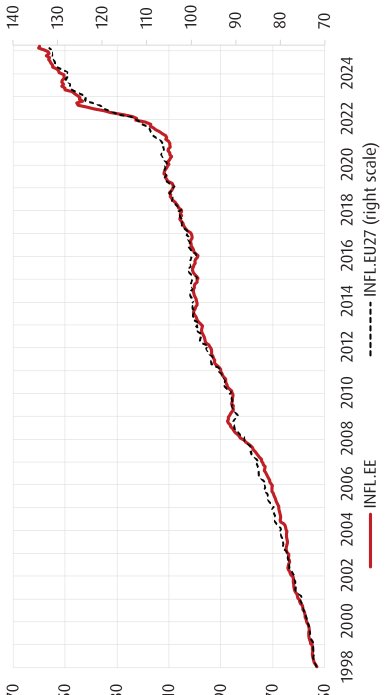

INFL.BG.C
INFL.EU27.C (right scale)

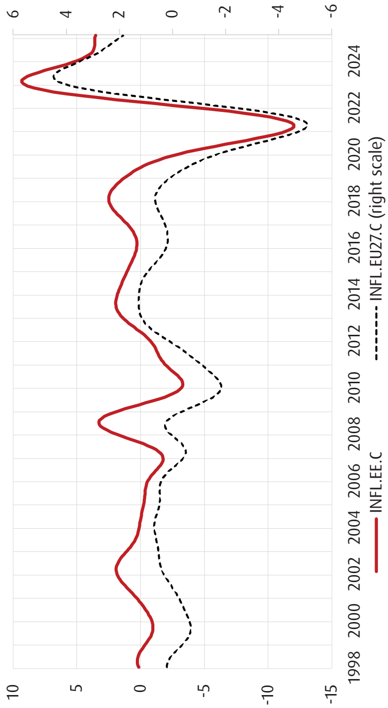

160
150
140
130
120
110
100
90
80
70
60
140
130
120
110
100
90
80
70
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.LT
INFL.EU27 (right scale)

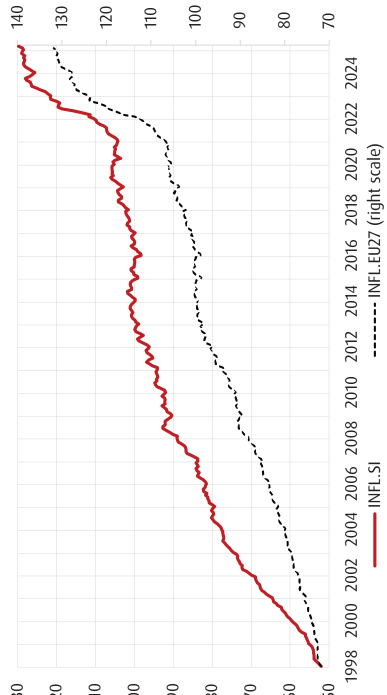

13
8
3
-2
-7
-12
6
4
2
0
-2
-4
-6
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.LT.C
INFL.EU27.C (right scale)

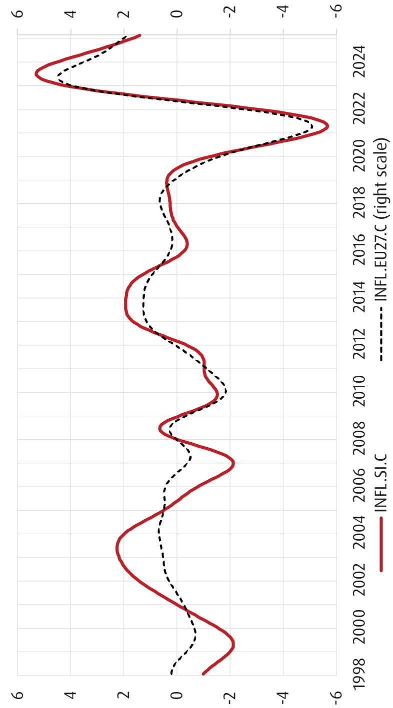

160
140
120
100
80
60
40
140
130
120
110
100
90
80
70
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.LV
INFL.EU27 (right scale)

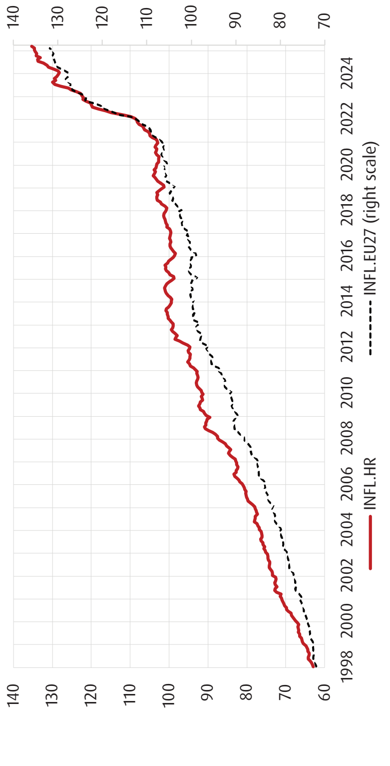

13
8
3
-2
-7
-12
6
4
2
0
-2
-4
-6
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
INFL.LV.C
INFL.EU27.C (right scale)

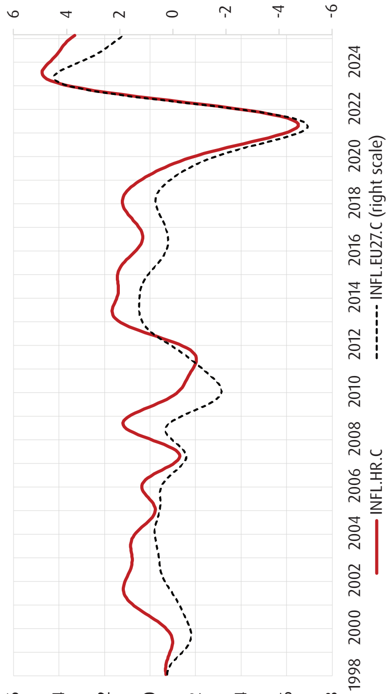

INFL.EE
INFL.EU27 (right scale)

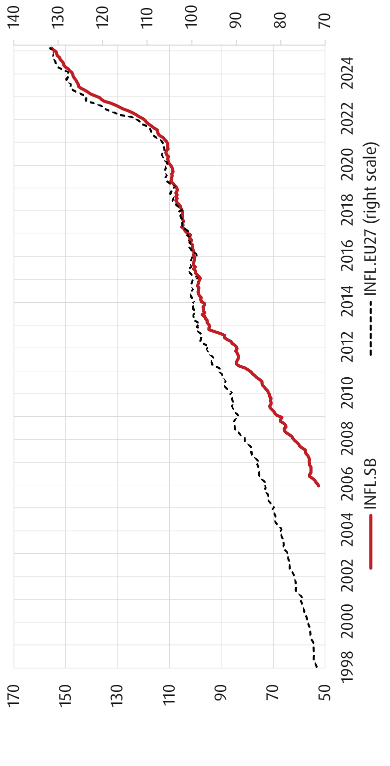

INFL.EE.C
INFL.EU27.C (right scale)

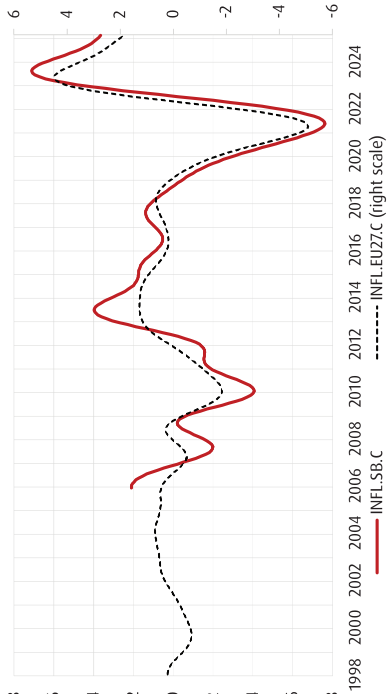

INFL.SI
INFL.EU27 (right scale)


INFL.SI.C
INFL.EU27.C (right scale)

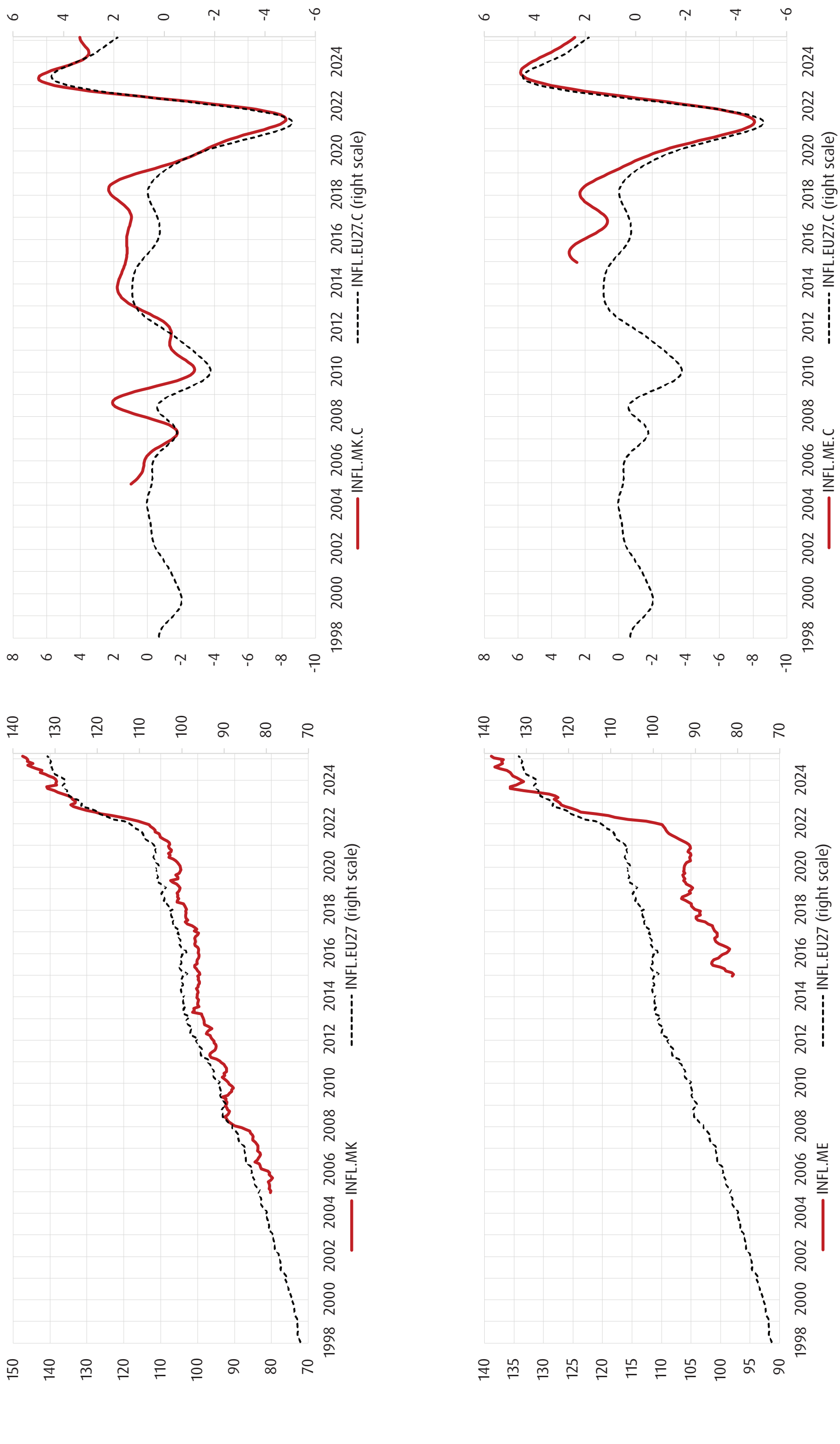

INFL.HR
INFL.EU27 (right scale)

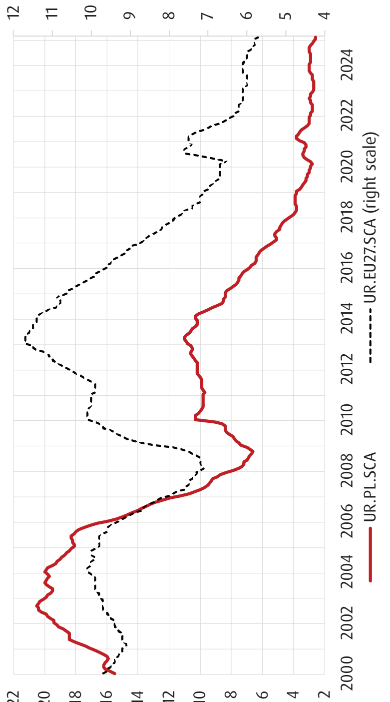

INFL.HR.C
INFL.EU27.C (right scale)

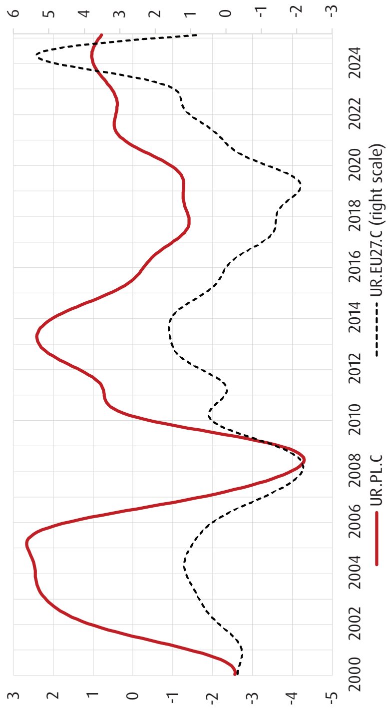

INFL.SB
INFL.EU27 (right scale)

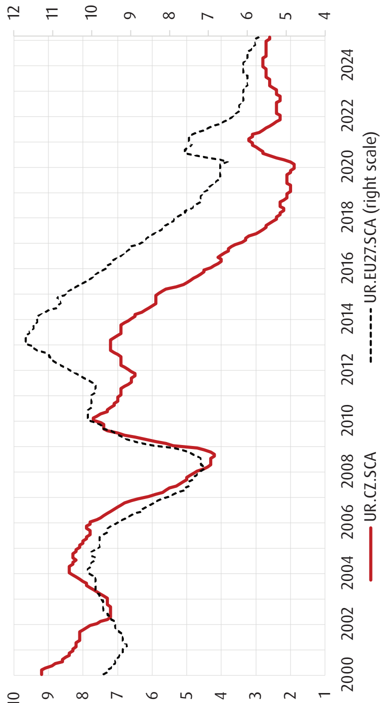

INFL.SB.C
INFL.EU27.C (right scale)

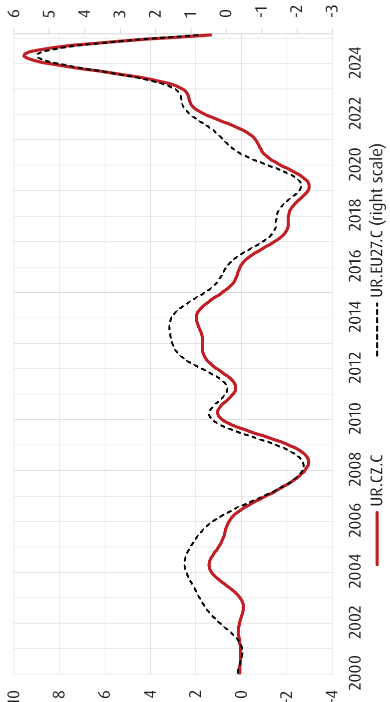
Unemployment

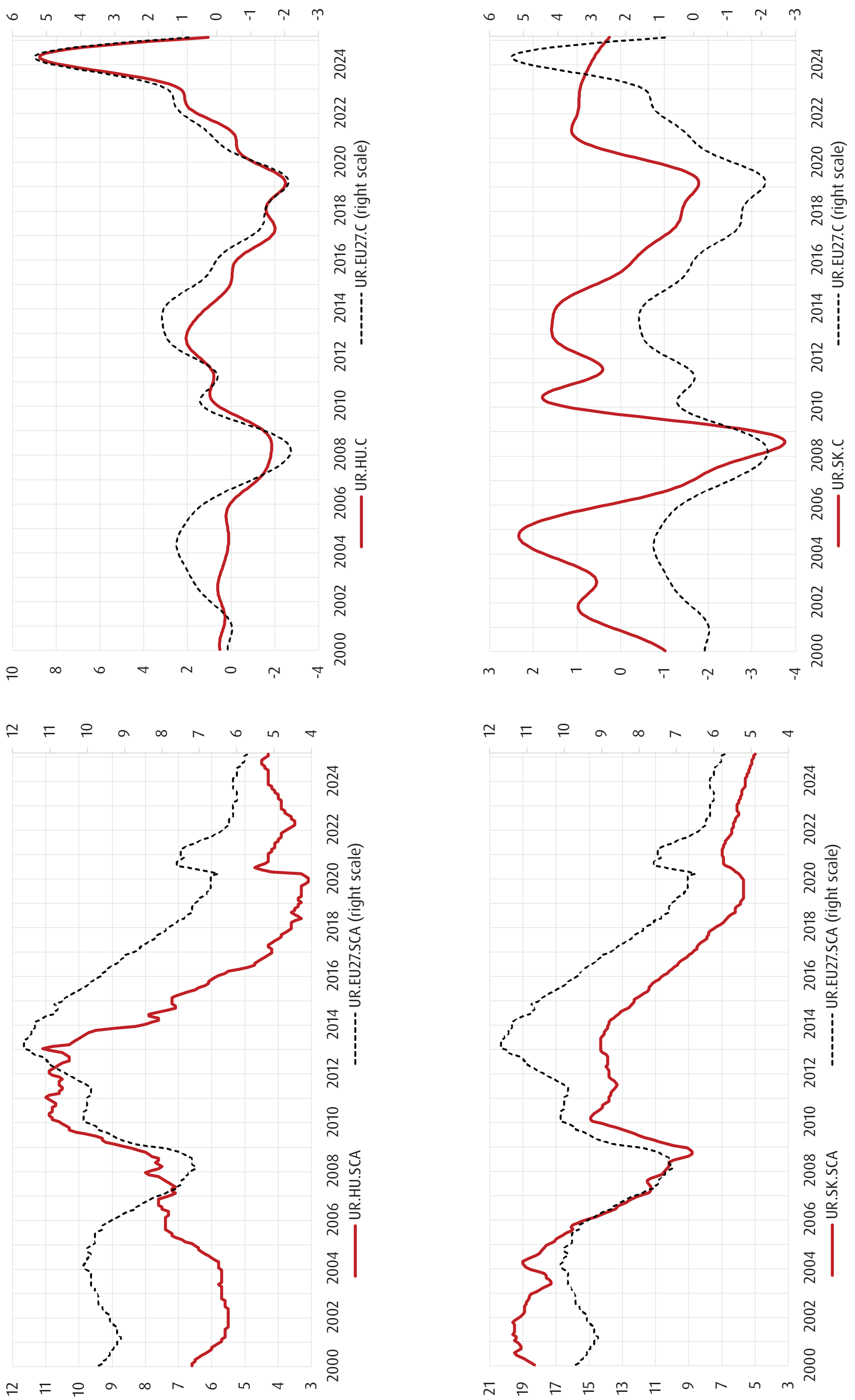


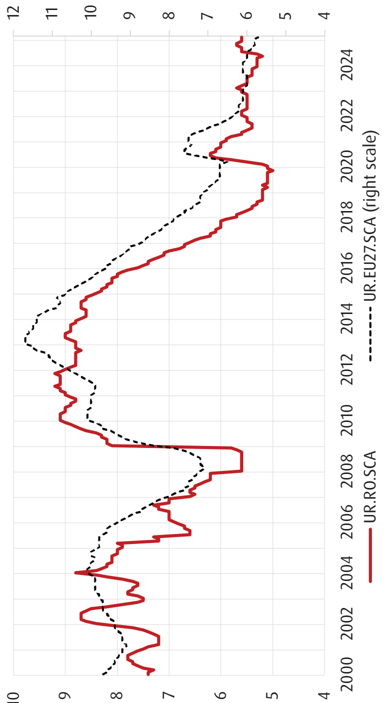

UR.PL.SCA
UR.EU27.SCA (right scale)

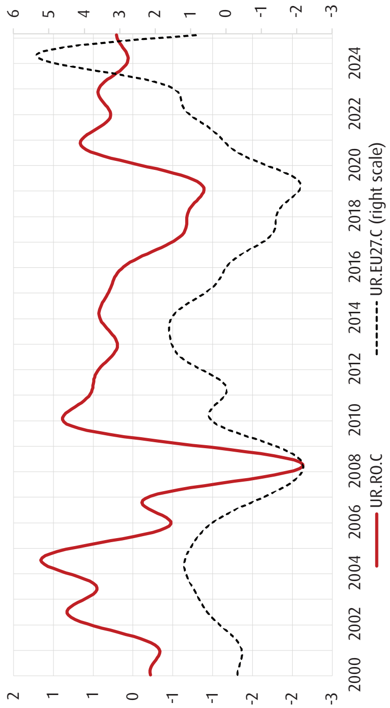

UR.PL.C
UR.EU27.C (right scale)

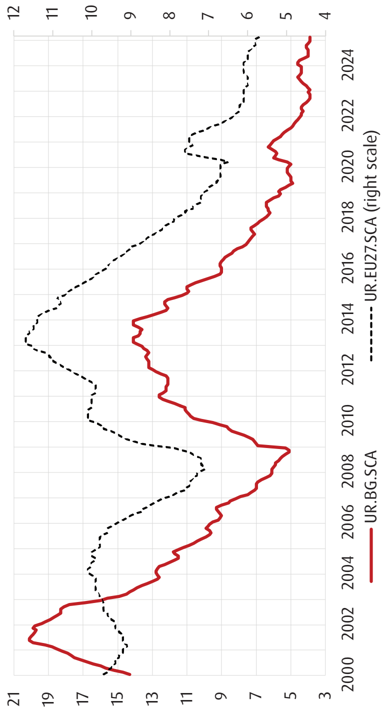

UR.CZ.SCA
UR.EU27.SCA (right scale)

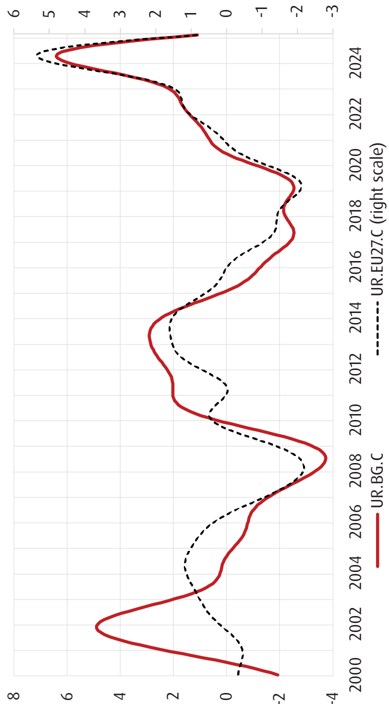

UR.CZ.C
UR.EU27.C (right scale)

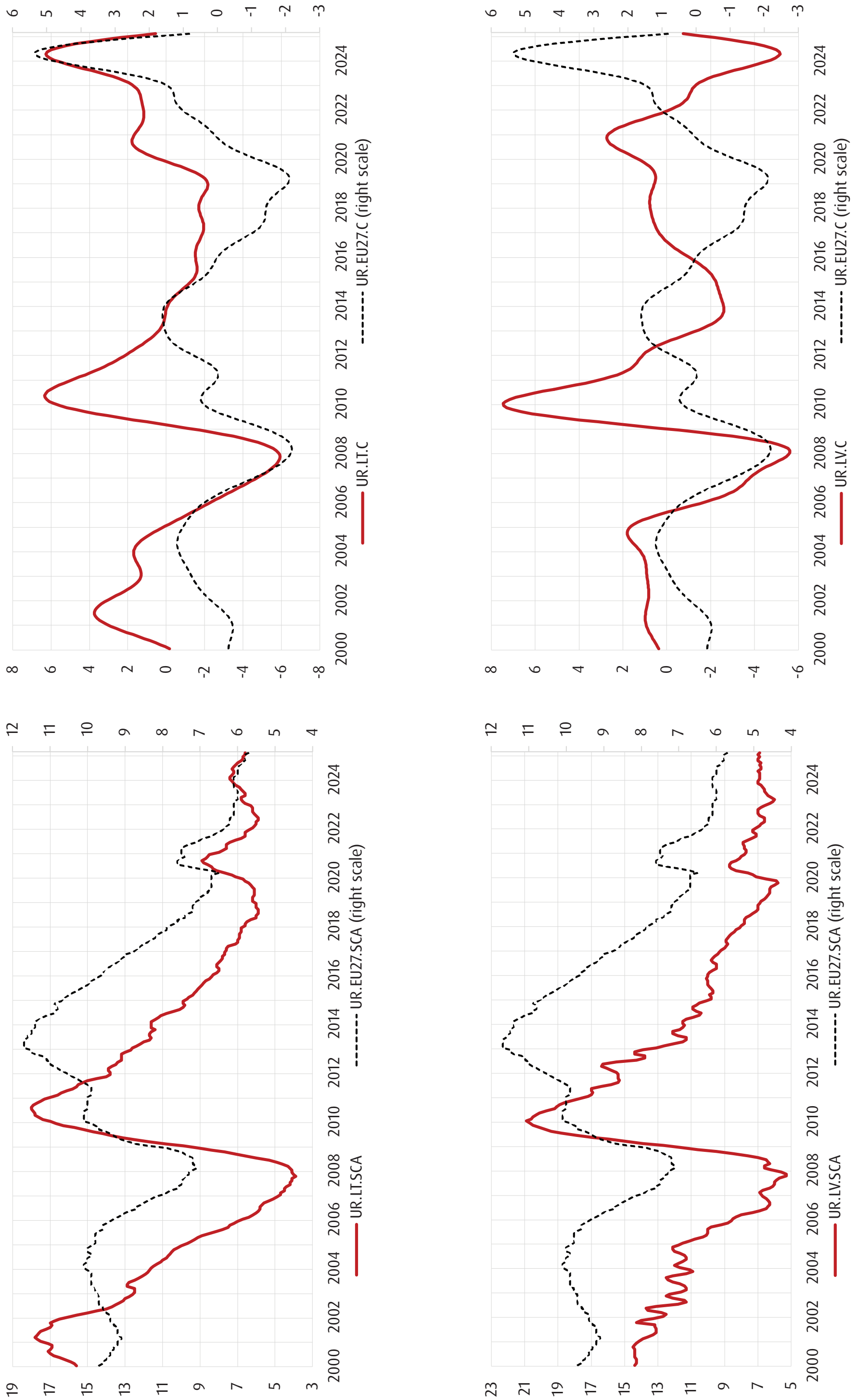

UR.HU.SCA
UR.EU27.SCA (right scale)
UR.HU.C
UR.EU27.C (right scale)
UR.SK.SCA
UR.EU27.SCA (right scale)
UR.SK.C
UR.EU27.C (right scale)

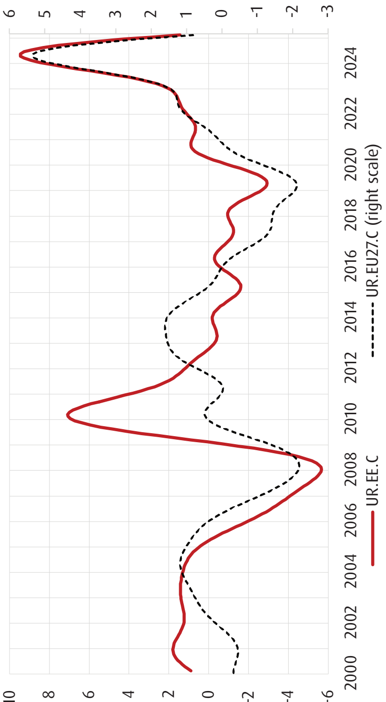

UR.RO.SCA
UR.EU27.SCA (right scale)

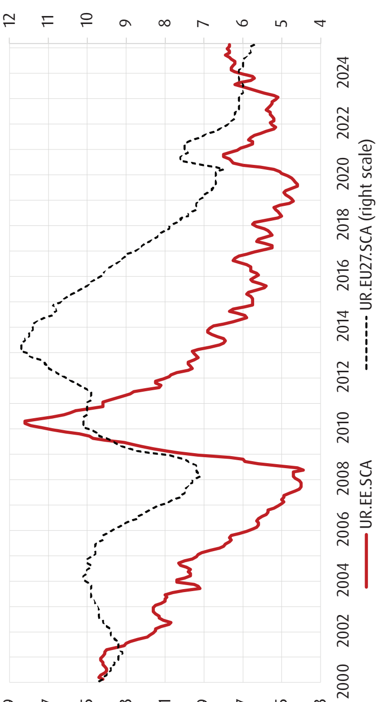

UR.RO.C
UR.EU27.C (right scale)

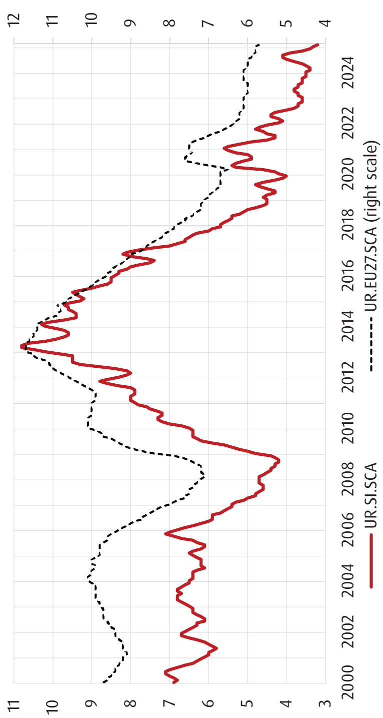

UR.BG.SCA
UR.EU27.SCA (right scale)


UR.BG.C
UR.EU27.C (right scale)

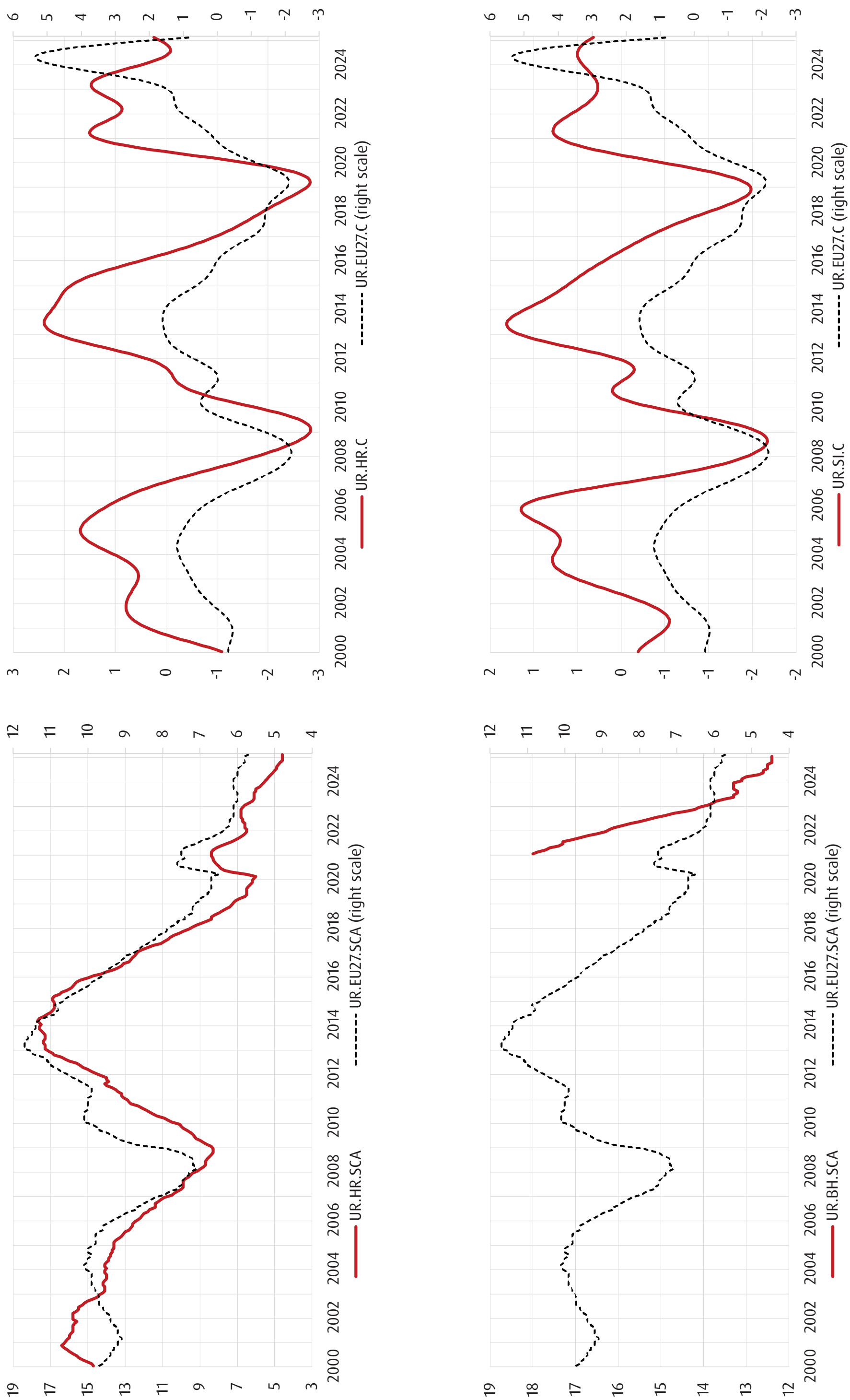

UR.LT.SCA
UR.EU27.SCA (right scale)
UR.LT.C
UR.EU27.C (right scale)
UR.LV.SCA
UR.EU27.SCA (right scale)
UR.LV.C
UR.EU27.C (right scale)

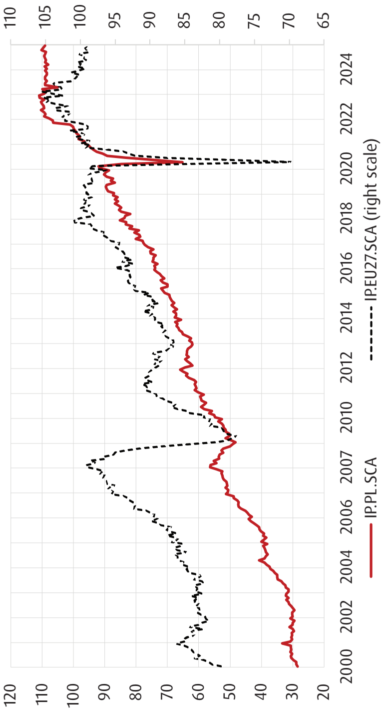

UR.EE.C
UR.EU27.C (right scale)

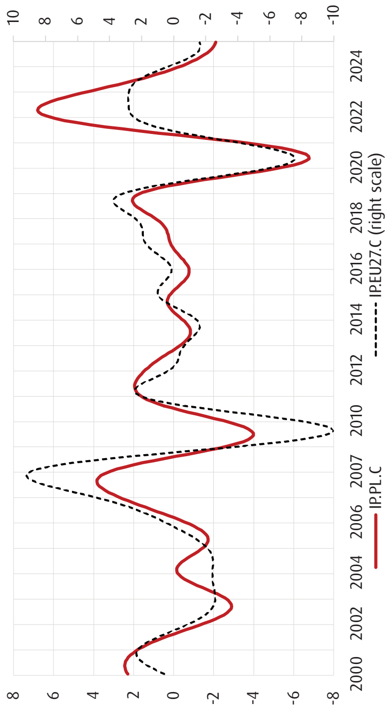

UR.EE.SCA
UR.EU27.SCA (right scale)

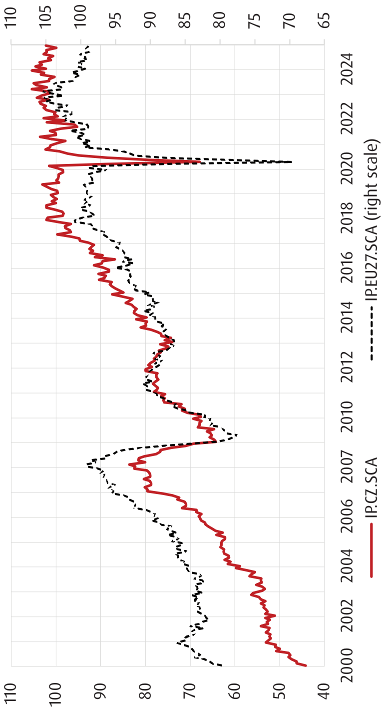

UR.SI.SCA
UR.EU27.SCA (right scale)

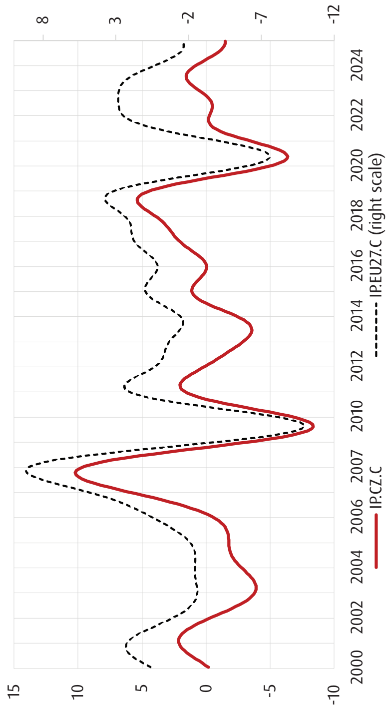
Industrial production

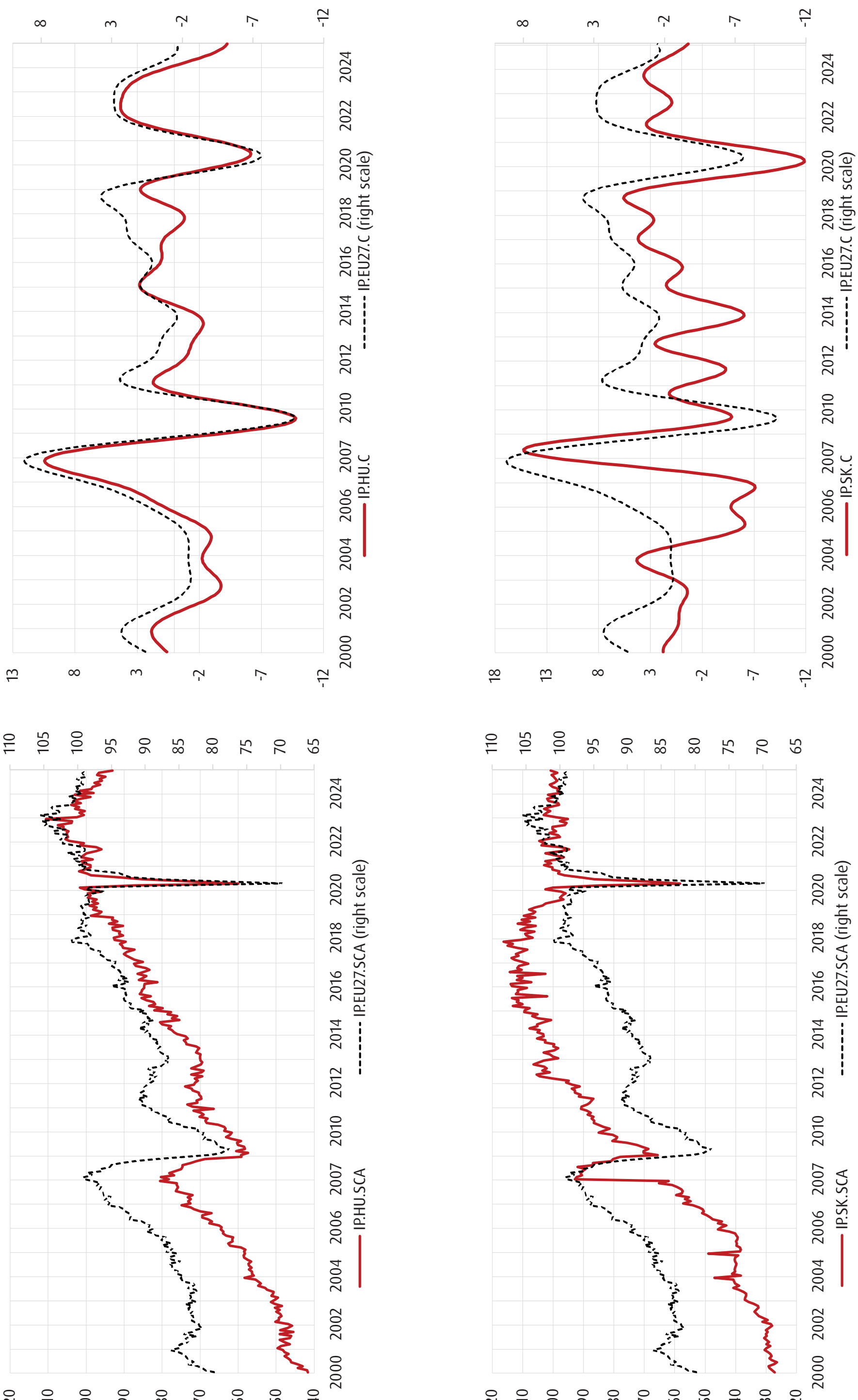


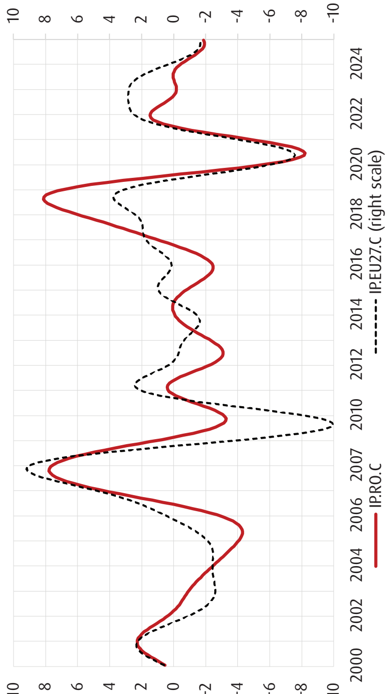

IP.PL.SCA
IP.EU27.SCA (right scale)

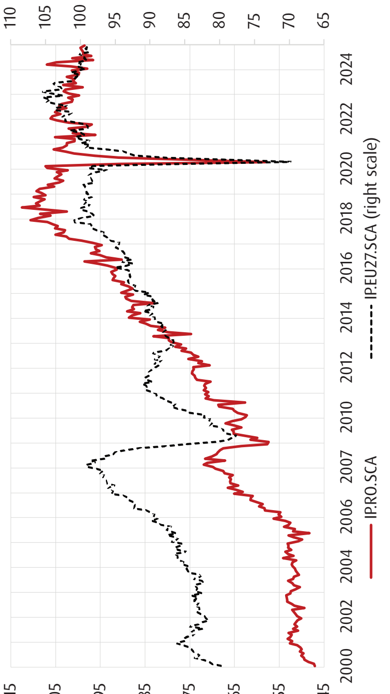

IP.PL.C
IP.EU27.C (right scale)

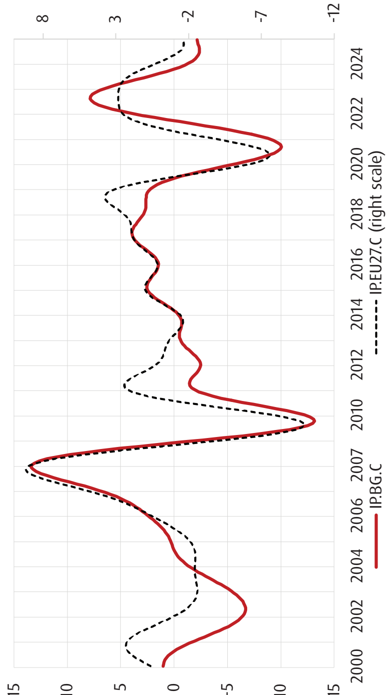

IP.CZ.SCA
IP.EU27.SCA (right scale)

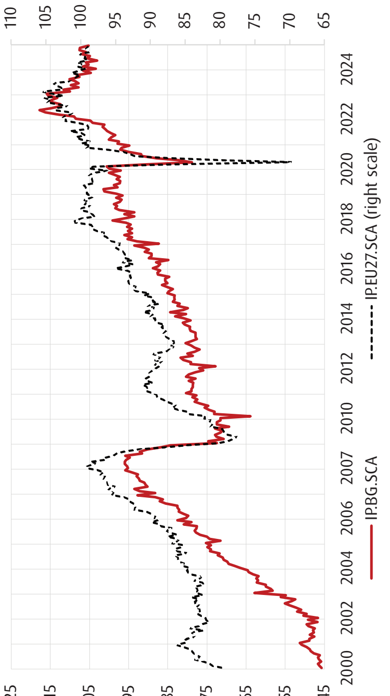

IP.CZ.C
IP.EU27.C (right scale)

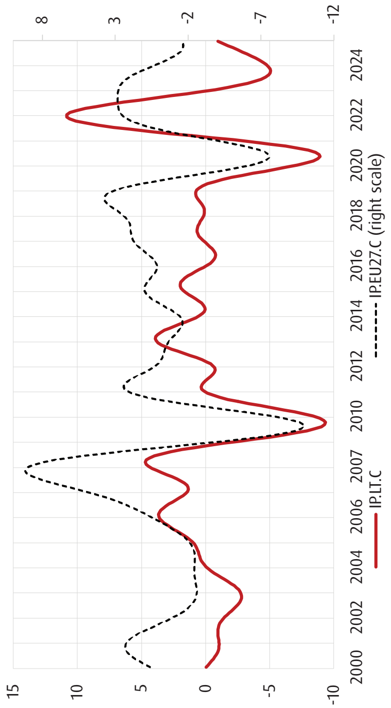

IP.HU.SCA
IP.EU27.SCA (right scale)
IP.HU.C
IP.EU27.C (right scale)
IP.SK.SCA
IP.EU27.SCA (right scale)
IP.SK.C
IP.EU27.C (right scale)

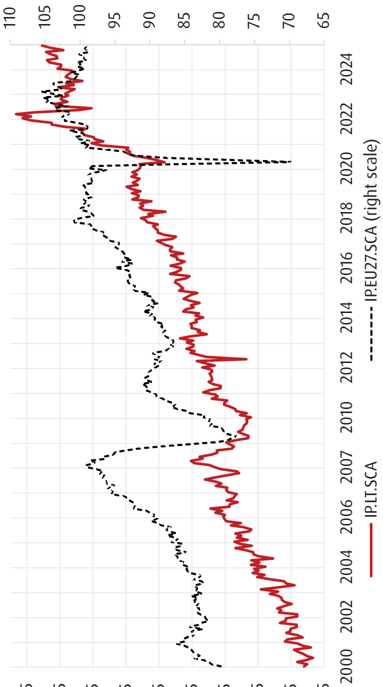

IP.RO.C
IP.EU27.C (right scale)

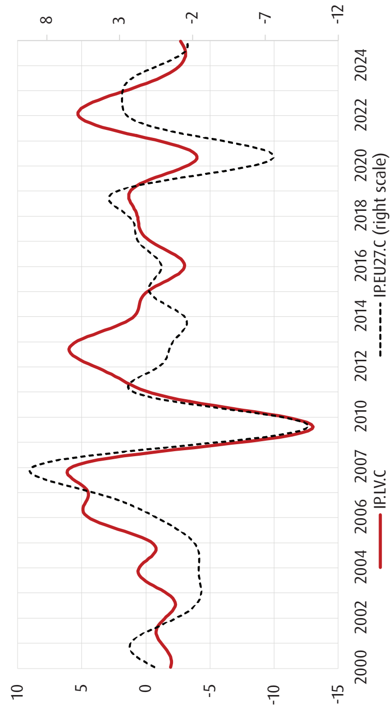

IP.RO.SCA
IP.EU27.SCA (right scale)

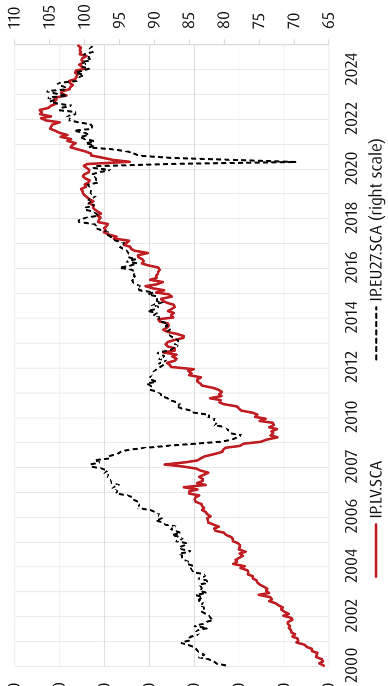

IP.BG.C
IP.EU27.C (right scale)

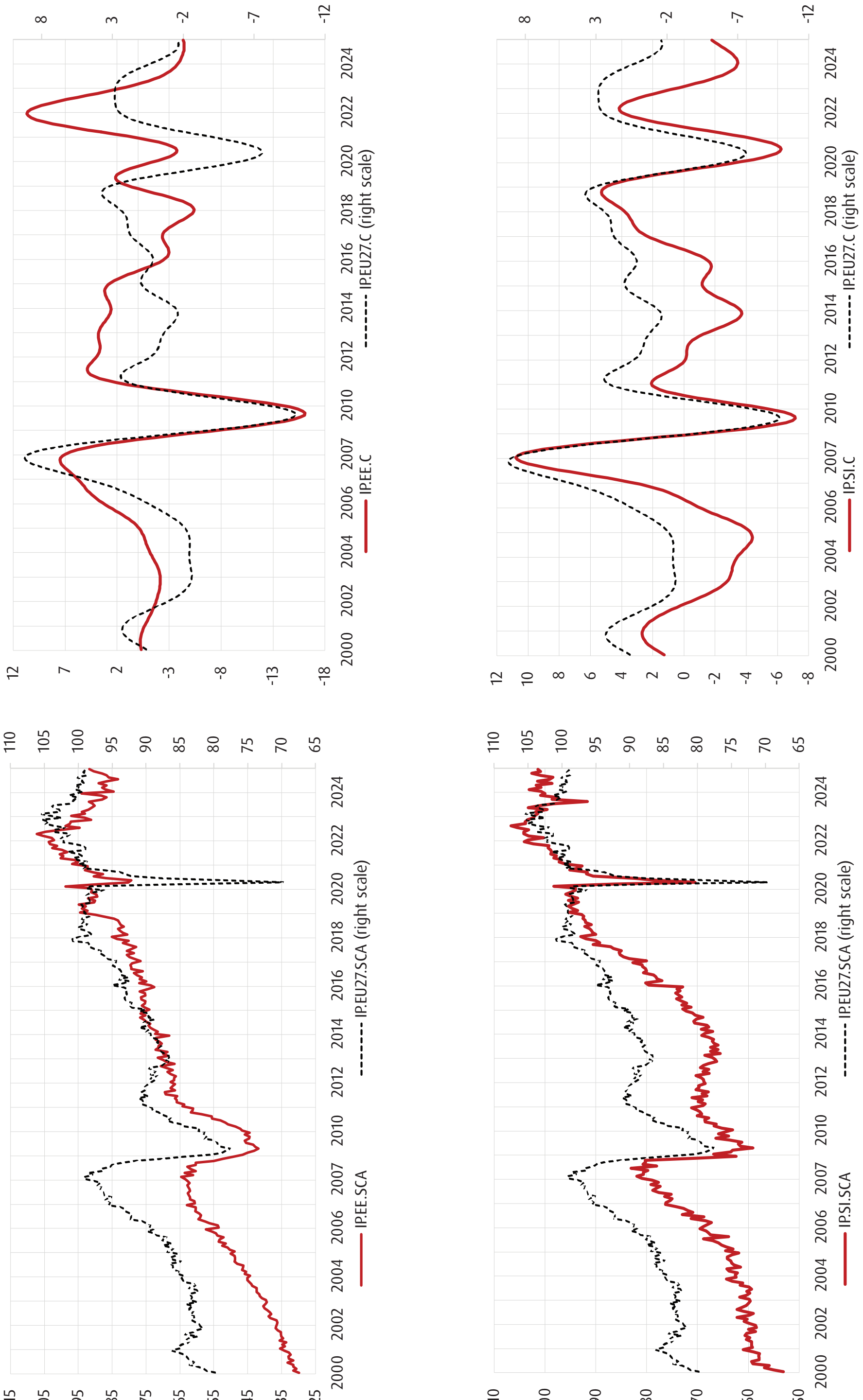

IP.BG.SCA
IP.EU27.SCA (right scale)

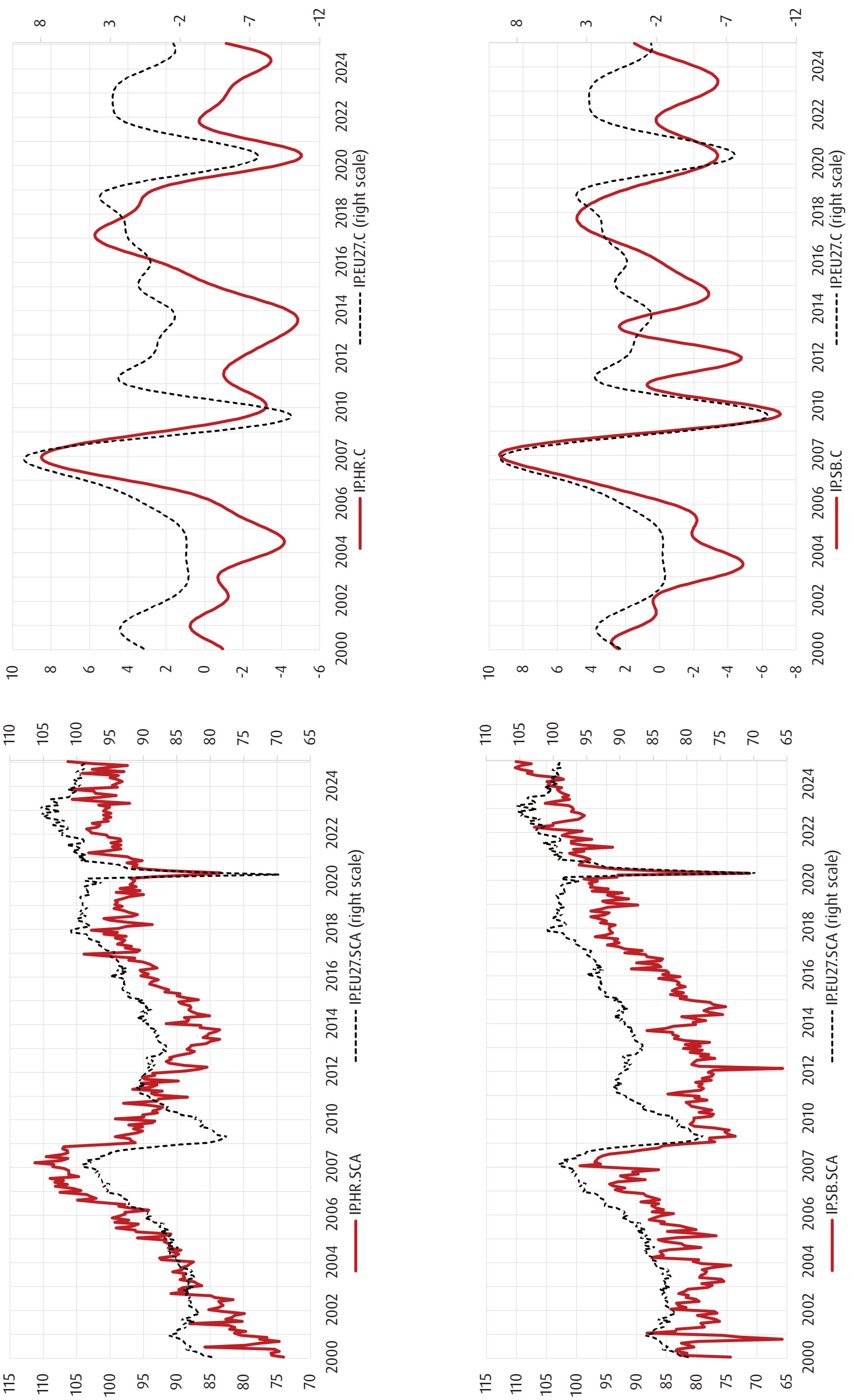

IP.LT.C
IP.EU27.C (right scale)

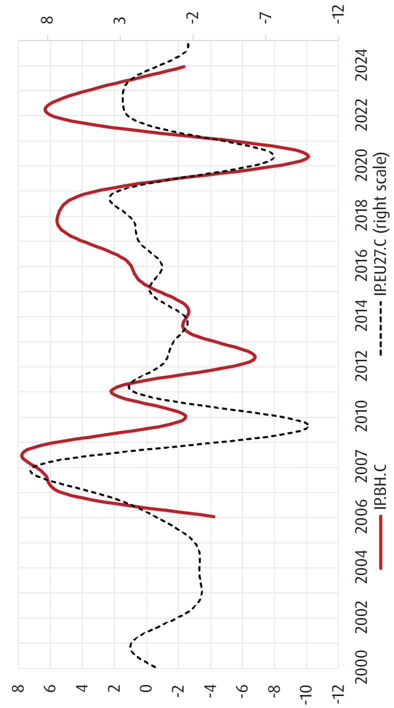

IP.LT.SCA
IP.EU27.SCA (right scale)

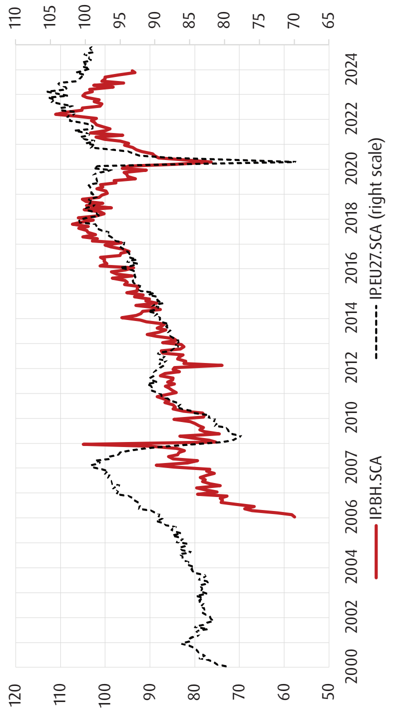

IP.LV.C
IP.EU27.C (right scale)


IP.LV.SCA
IP.EU27.SCA (right scale)

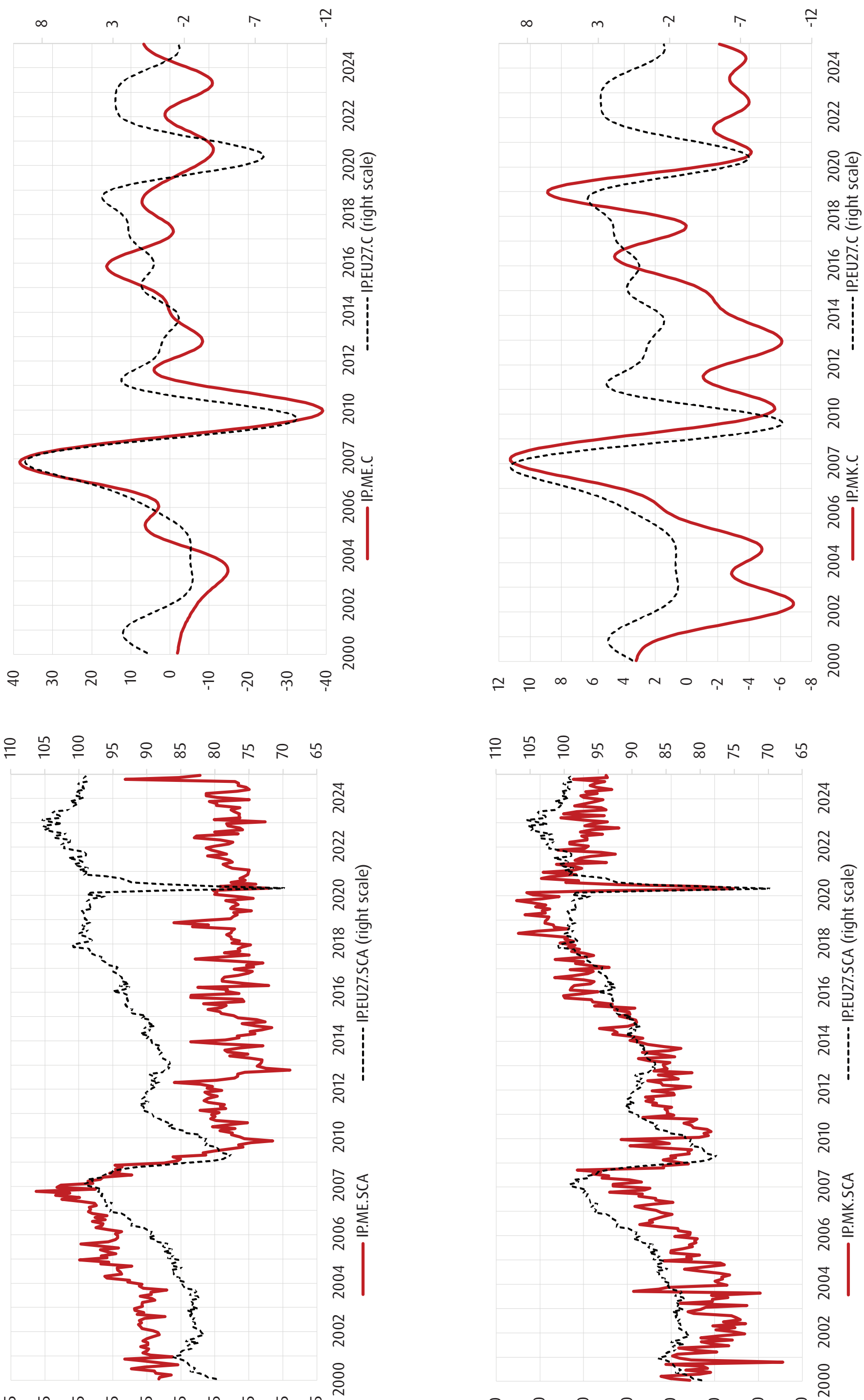

IP.EE.SCA
IP.EU27.SCA (right scale)
IP.EE.C
IP.EU27.C (right scale)
IP.SI.SCA
IP.EU27.SCA (right scale)
IP.SI.C
IP.EU27.C (right scale)

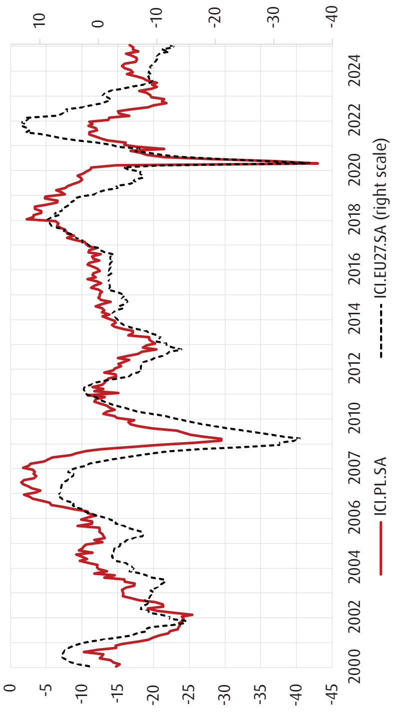

IP.HR.SCA
IP.EU27.SCA (right scale)
IP.HR.C
IP.EU27.C (right scale)
IP.SB.SCA
IP.EU27.SCA (right scale)
IP.SB.C
IP.EU27.C (right scale)

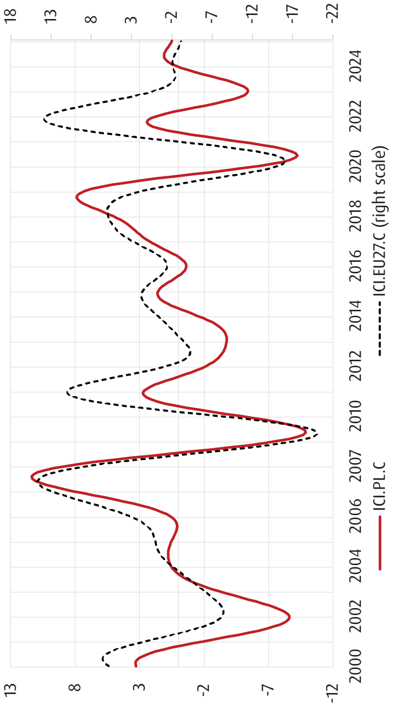

IP.BH.C
IP.EU27.C (right scale)
8
6
4
2
0
-2
-4
-6
-8
-10
-12
8
3
-2
-7
-12
2000
2002
2004
2006
2007
2010
2012
2014
2016
2018
2020
2022
2024

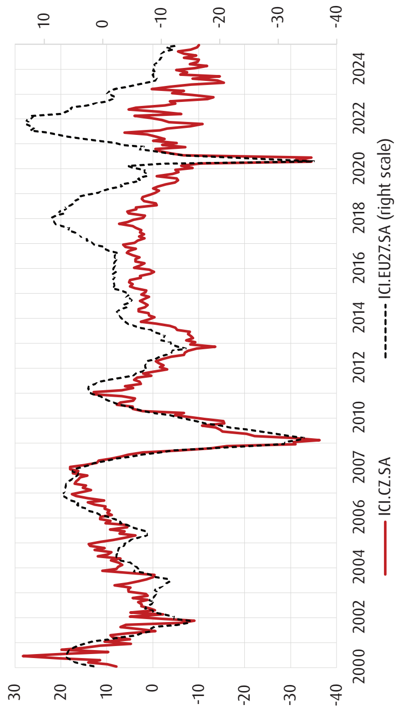

IP.BH.SCA
IP.EU27.SCA (right scale)
120
110
100
90
80
70
60
50
110
105
100
95
90
85
80
75
70
65
2000
2002
2004
2006
2007
2010
2012
2014
2016
2018
2020
2022
2024

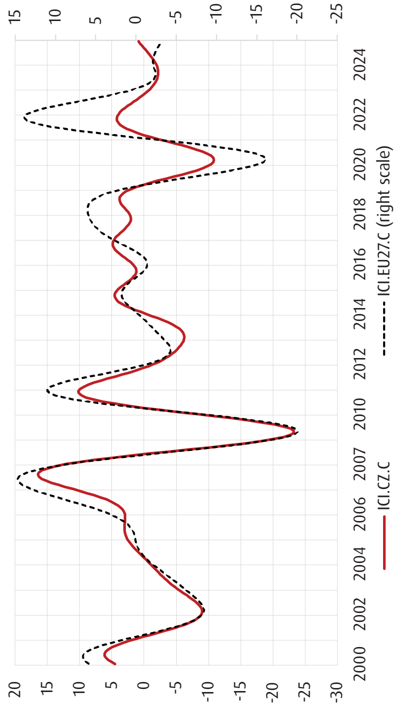
Business sentiment indicator in the manufacturing industry

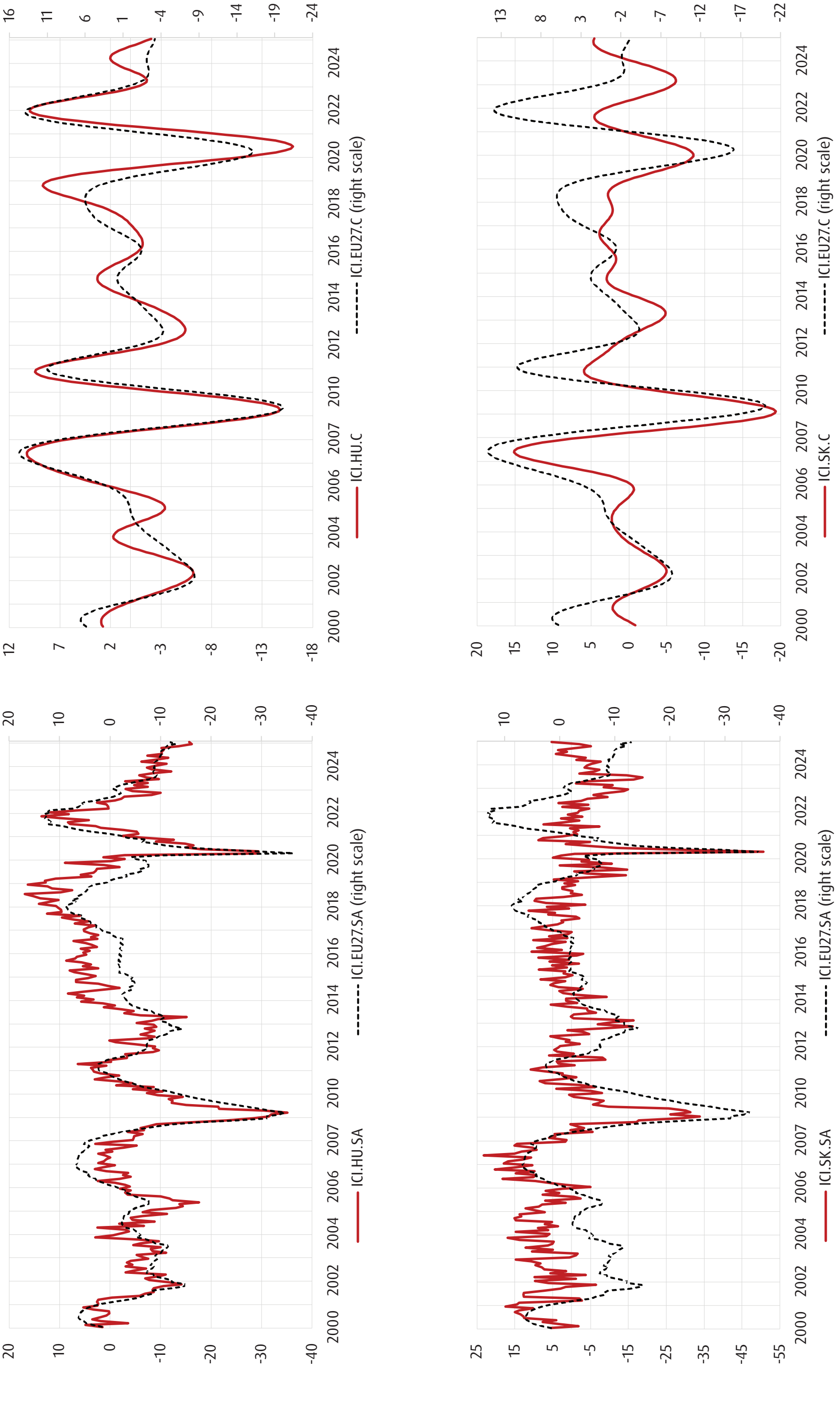


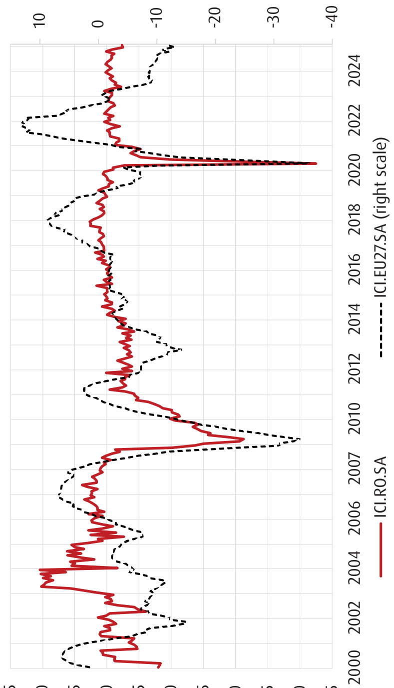

ICI.PL.SA
ICI.EU27.SA (right scale)

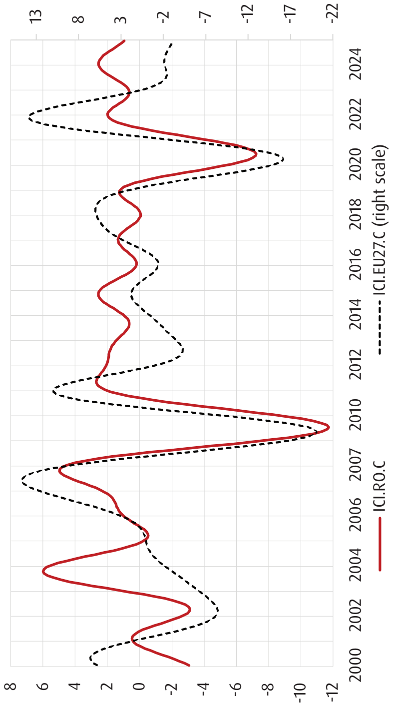

ICI.PL.C
ICI.EU27.C (right scale)

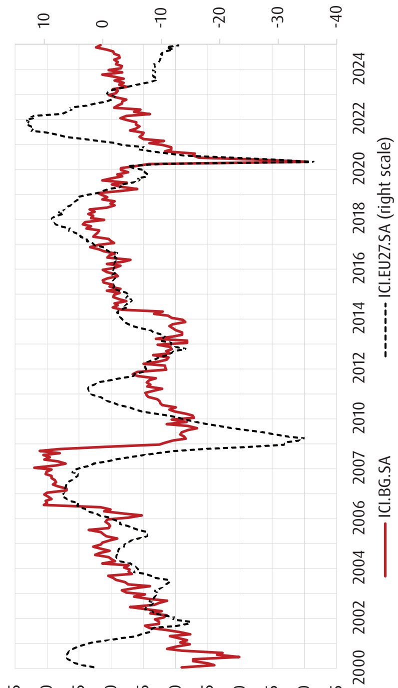

ICI.CZ.SA
ICI.EU27.SA (right scale)

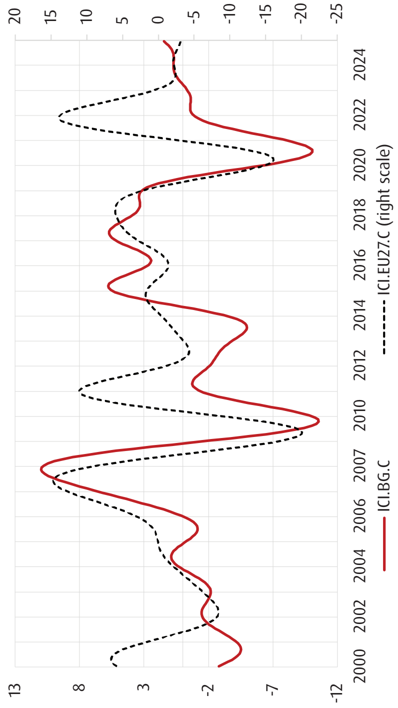

ICI.CZ.C
ICI.EU27.C (right scale)

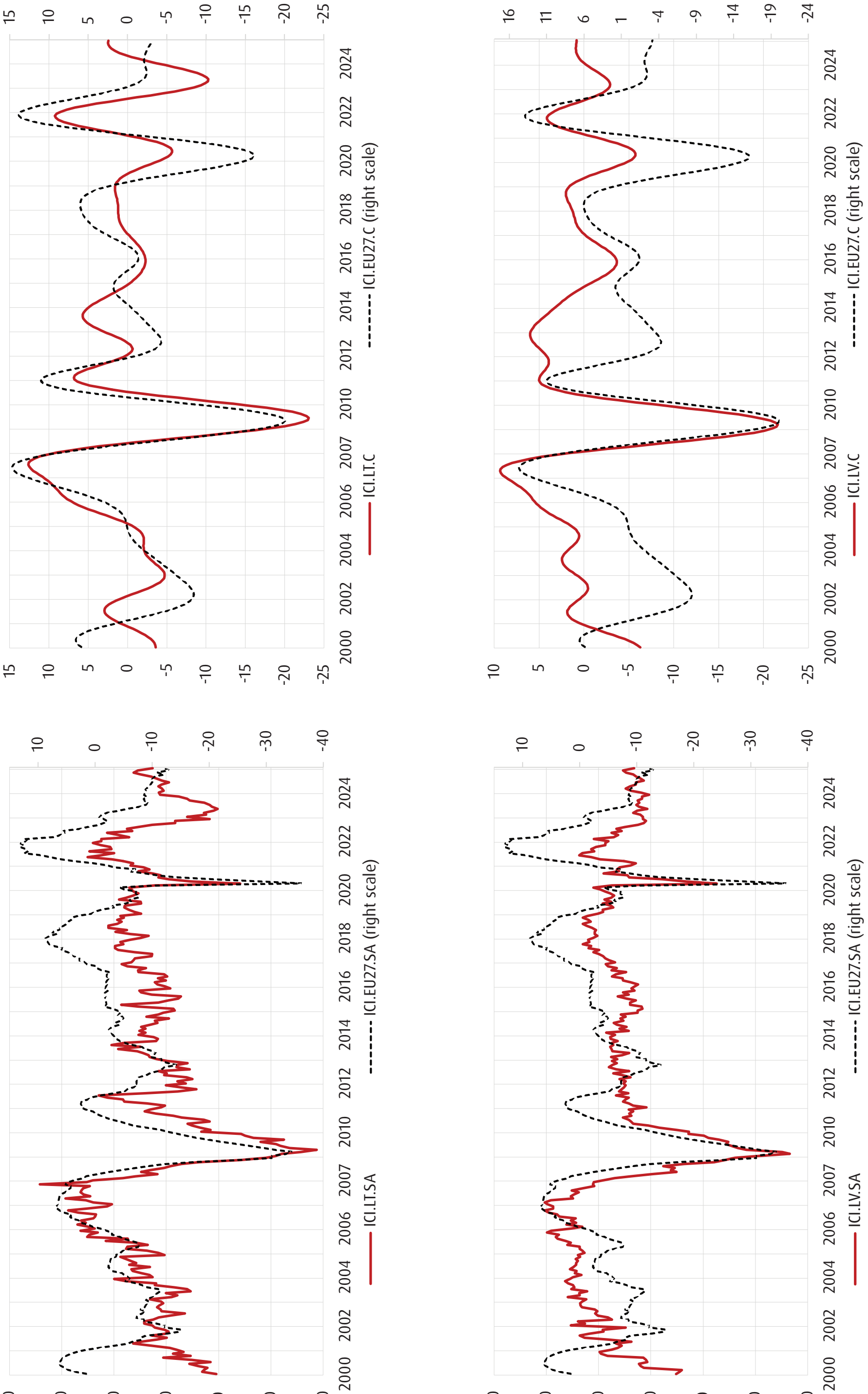

ICI.HU.SA
ICI.EU27.SA (right scale)
ICI.HU.C
ICI.EU27.C (right scale)
ICI.SK.SA
ICI.EU27.SA (right scale)
ICI.SK.C
ICI.EU27.C (right scale)

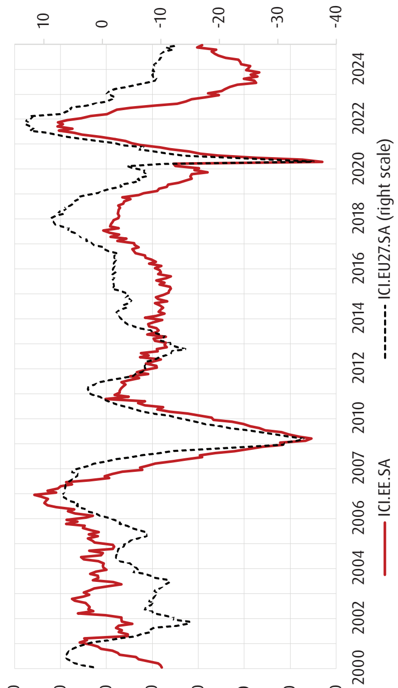

ICI.RO.SA
ICI.EU27.SA (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
15 10 5 0 -5 -10 -15 -20 -25 -30 -35
10 0 -10 -20 -30 -40

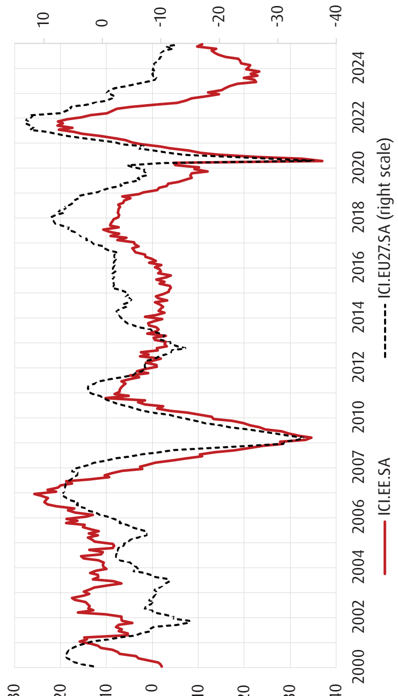

ICI.RO.C
ICI.EU27.C (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
8 6 4 2 0 -2 -4 -6 -8 -10 -12
13 8 3 -2 -7 -12 -17 -22

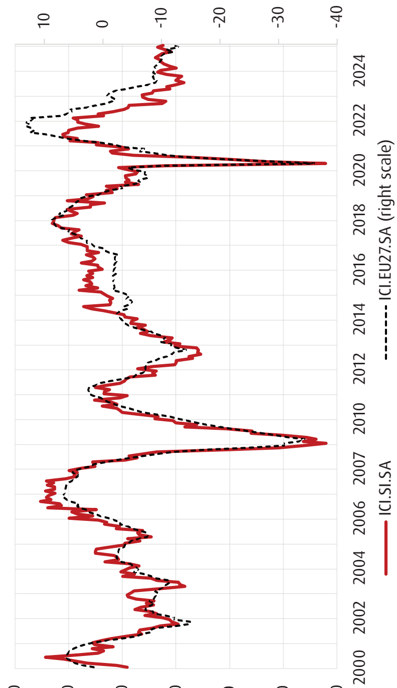

ICI.BG.SA
ICI.EU27.SA (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
15 10 5 0 -5 -10 -15 -20 -25 -30 -35
10 0 -10 -20 -30 -40

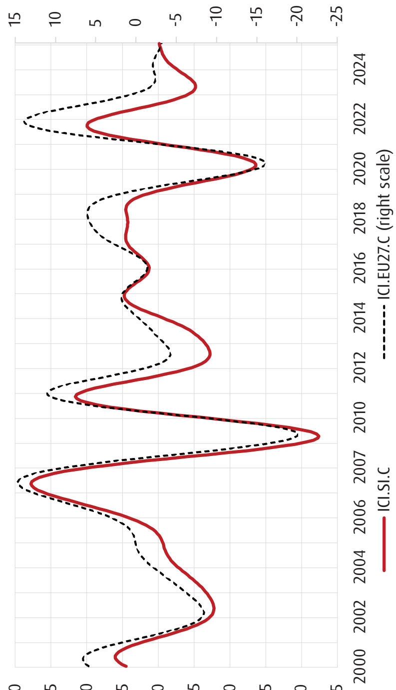

ICI.BG.C
ICI.EU27.C (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
13 8 3 -2 -7 -12
20 15 10 5 0 -5 -10 -15 -20 -25

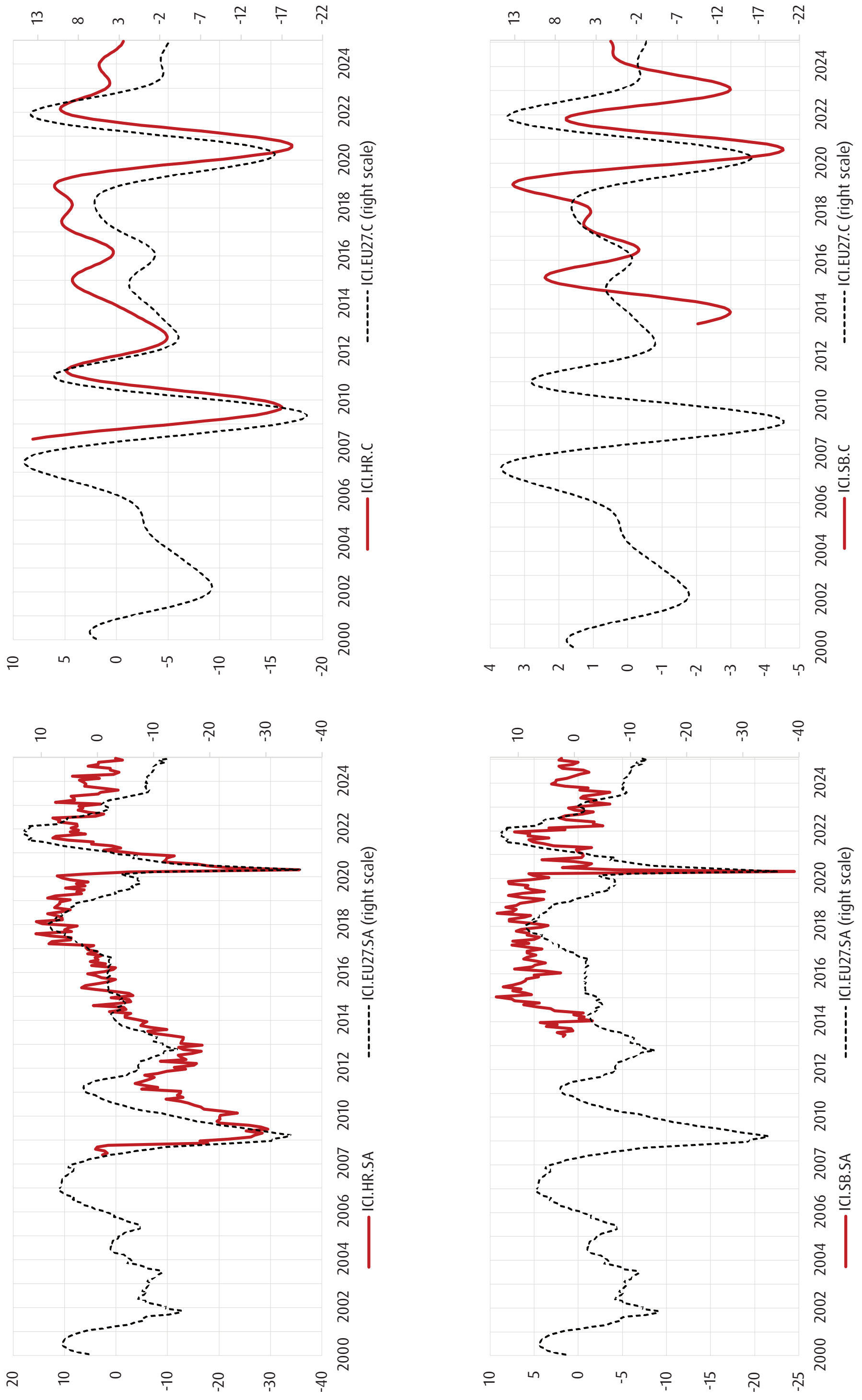

ICI.LT.SA
ICI.EU27.SA (right scale)
ICI.LT.C
ICI.EU27.C (right scale)
ICI.LV.SA
ICI.EU27.SA (right scale)
ICI.LV.C
ICI.EU27.C (right scale)


ICI.EE.SA
ICI.EU27.SA (right scale)

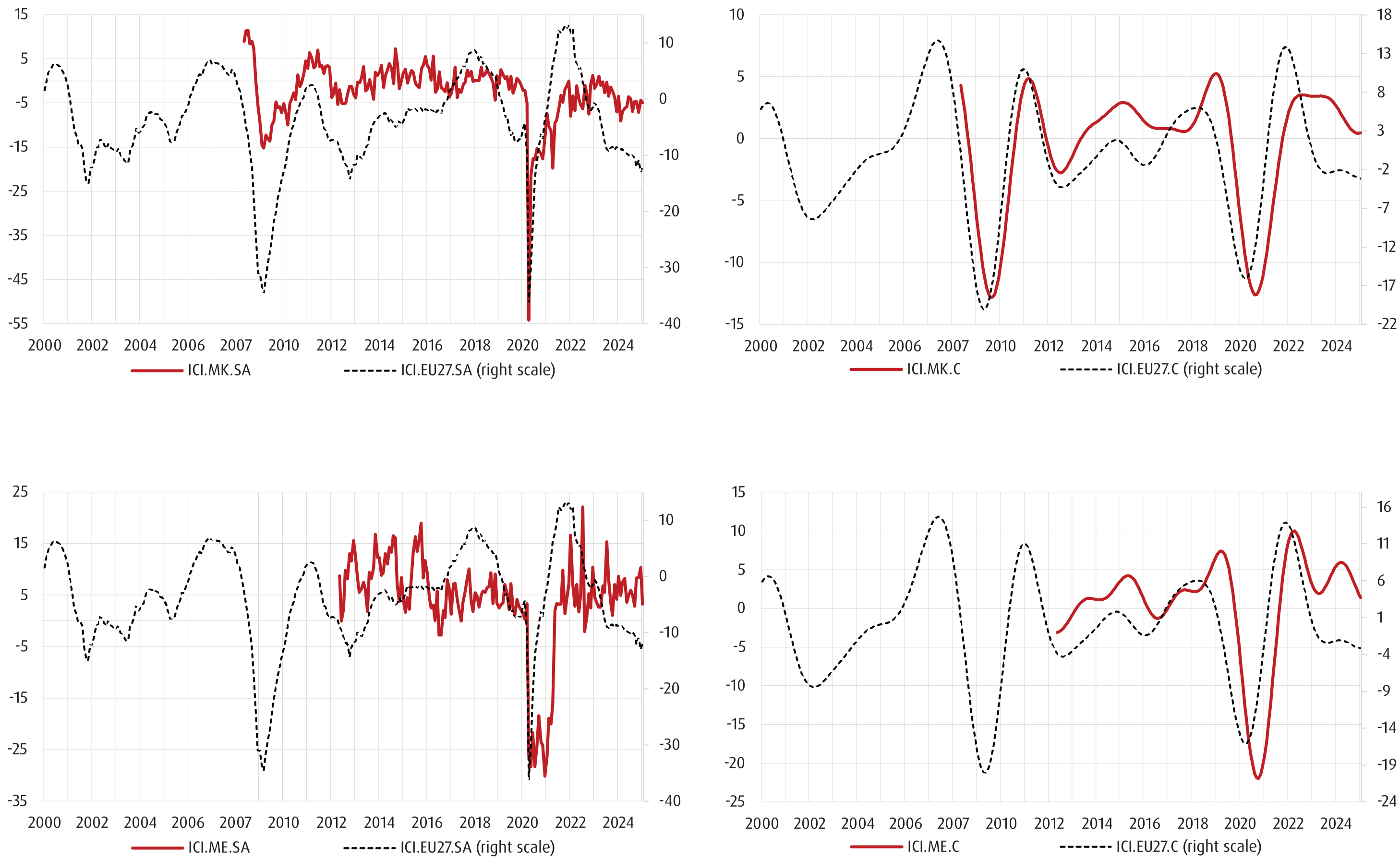

ICI.EE.SA
ICI.EU27.SA (right scale)

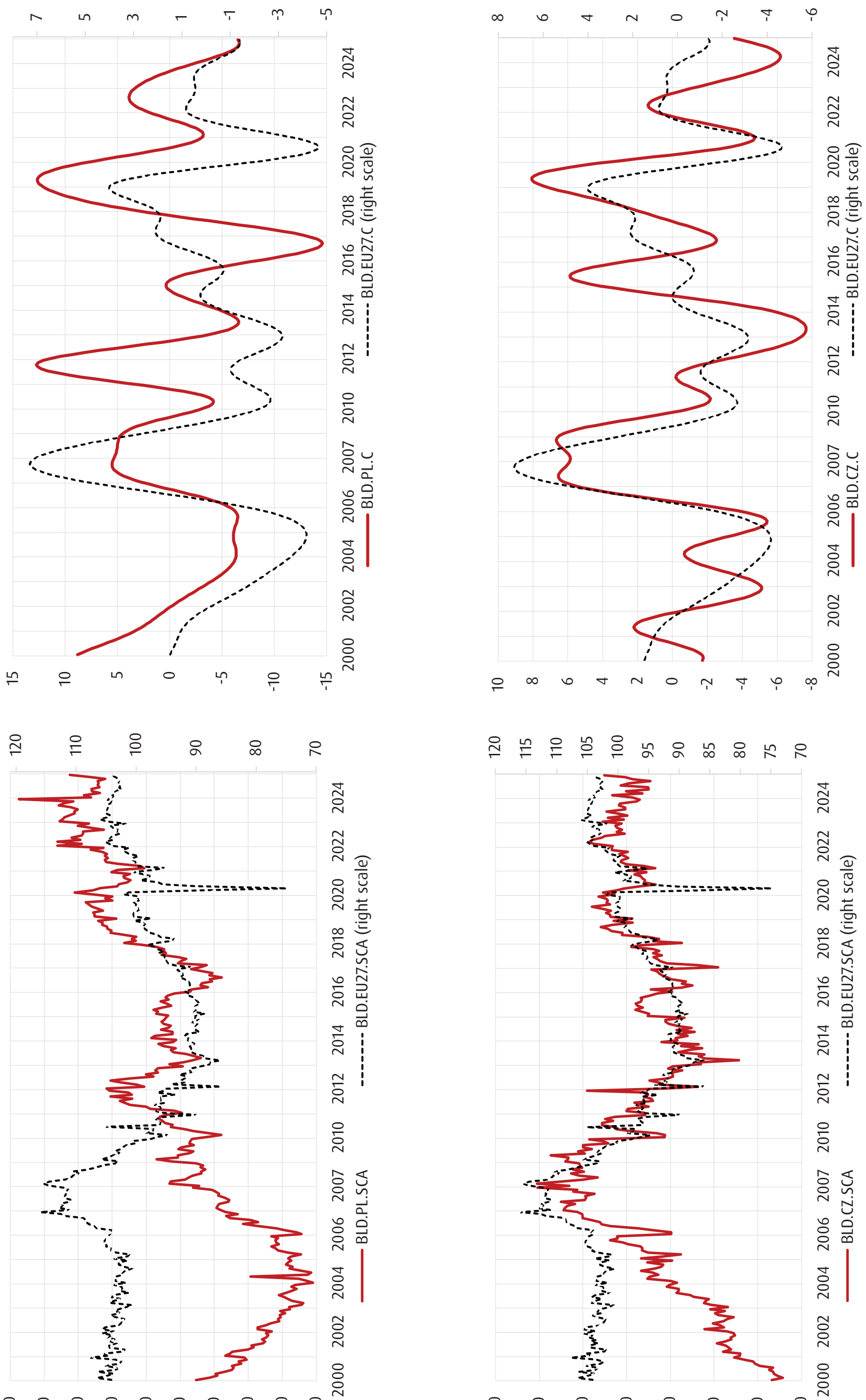

ICI.SI.SA
ICI.EU27.SA (right scale)

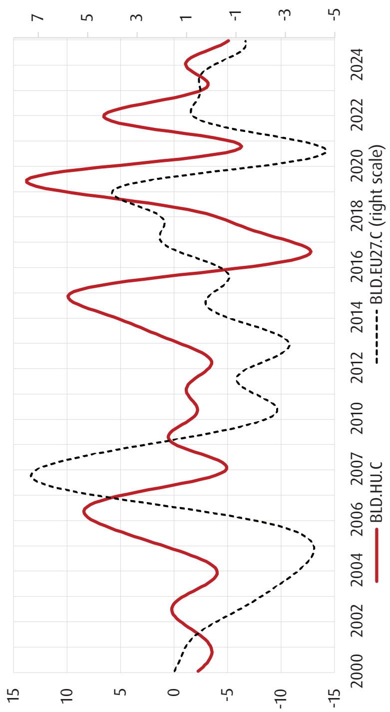

ICI.SI.C
ICI.EU27.C (right scale)

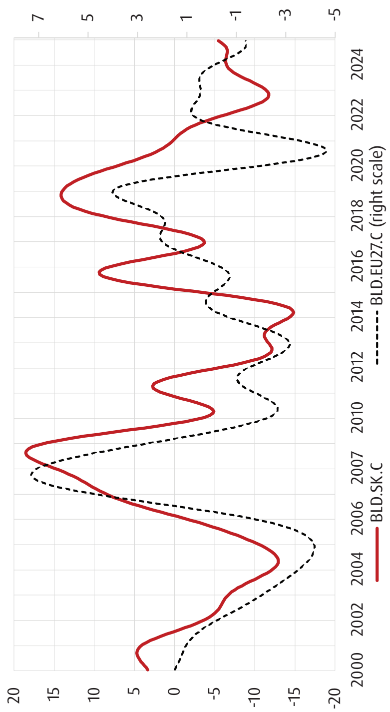

ICI.HR.SA
ICI.EU27.SA (right scale)
ICI.HR.C
ICI.EU27.C (right scale)
ICI.SB.SA
ICI.EU27.SA (right scale)
ICI.SB.C
ICI.EU27.C (right scale)

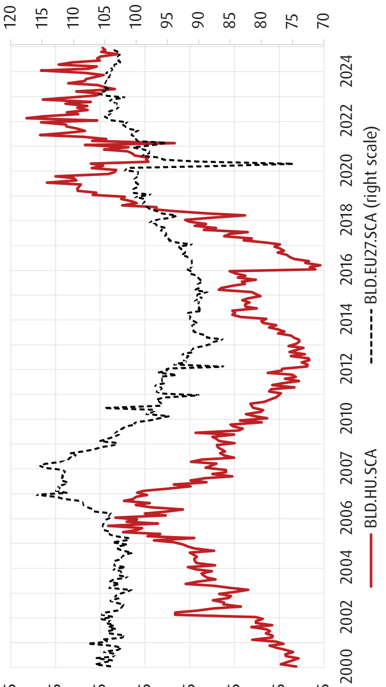
Construction and assembly production

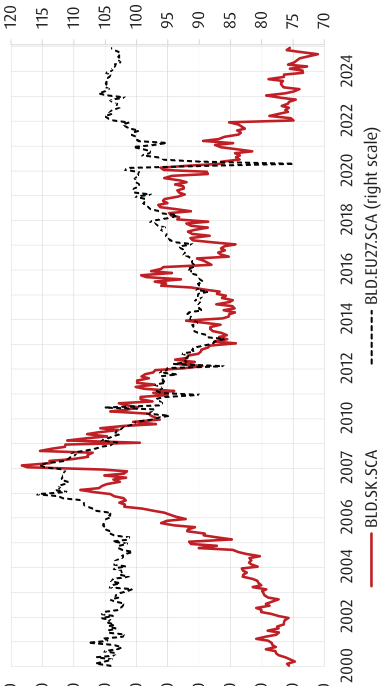


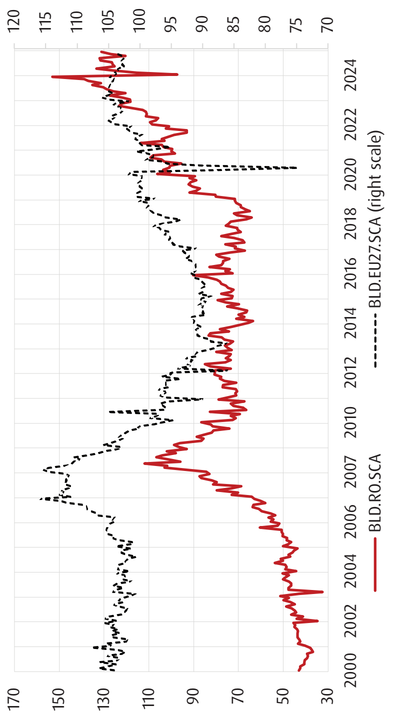

BLD.PL.SCA
BLD.EU27.SCA (right scale)
BLD.PL.C
BLD.EU27.C (right scale)
BLD.CZ.SCA
BLD.EU27.SCA (right scale)
BLD.CZ.C
BLD.EU27.C (right scale)

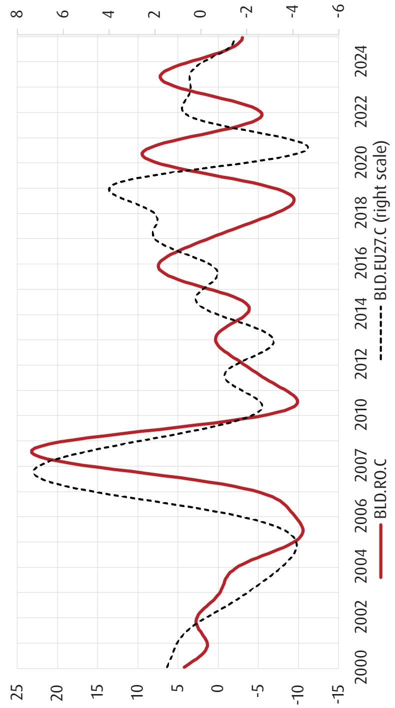

BLD.HU.C
BLD.EU27.C (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
15 10 5 0 -5 -10 -15
7 5 3 1 -1 -3 -5

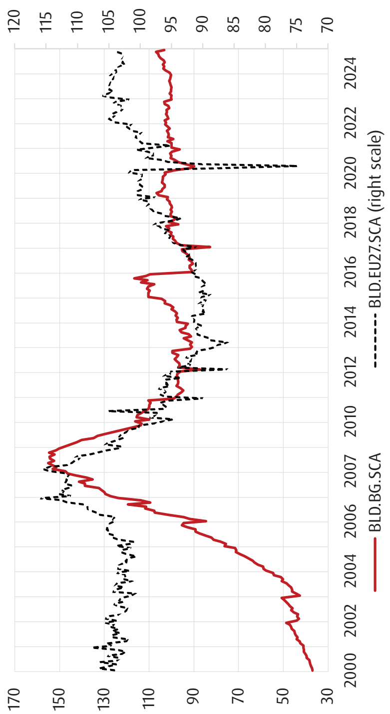

BLD.SK.C
BLD.EU27.C (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
20 15 10 5 0 -5 -10 -15 -20
7 5 3 1 -1 -3 -5

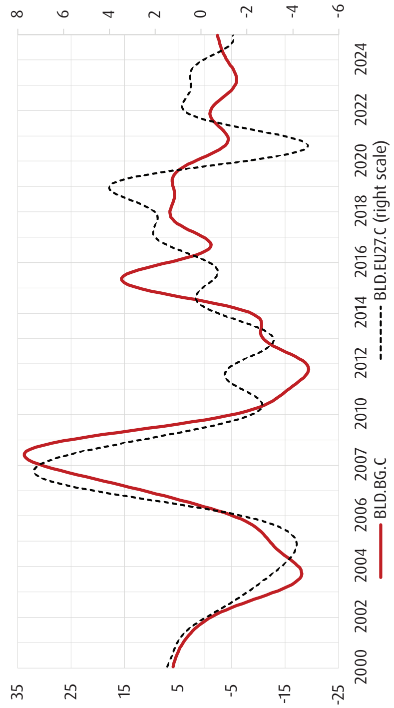

BLD.HU.SCA
BLD.EU27.SCA (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
115 105 95 85 75 65 55 45
120 115 110 105 100 95 90 85 80 75 70

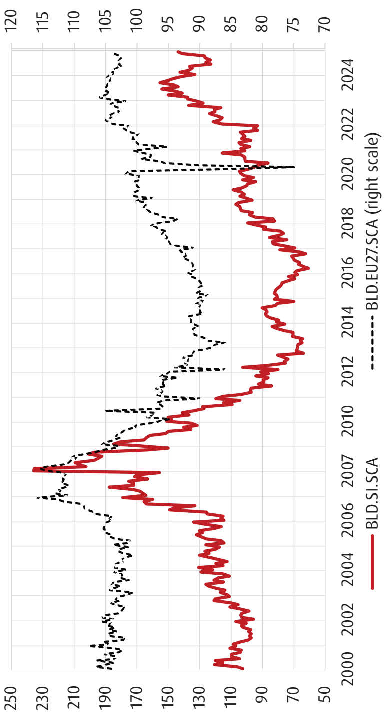

BLD.SK.SCA
BLD.EU27.SCA (right scale)
2000 2002 2004 2006 2007 2010 2012 2014 2016 2018 2020 2022 2024
170 160 150 140 130 120 110 100 90 80 70
120 115 110 105 100 95 90 85 80 75 70

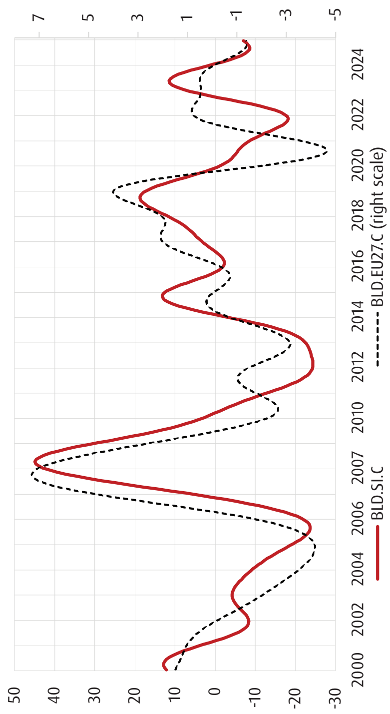

BLD.RO.SCA
BLD.EU27.SCA (right scale)


BLD.RO.C
BLD.EU27.C (right scale)

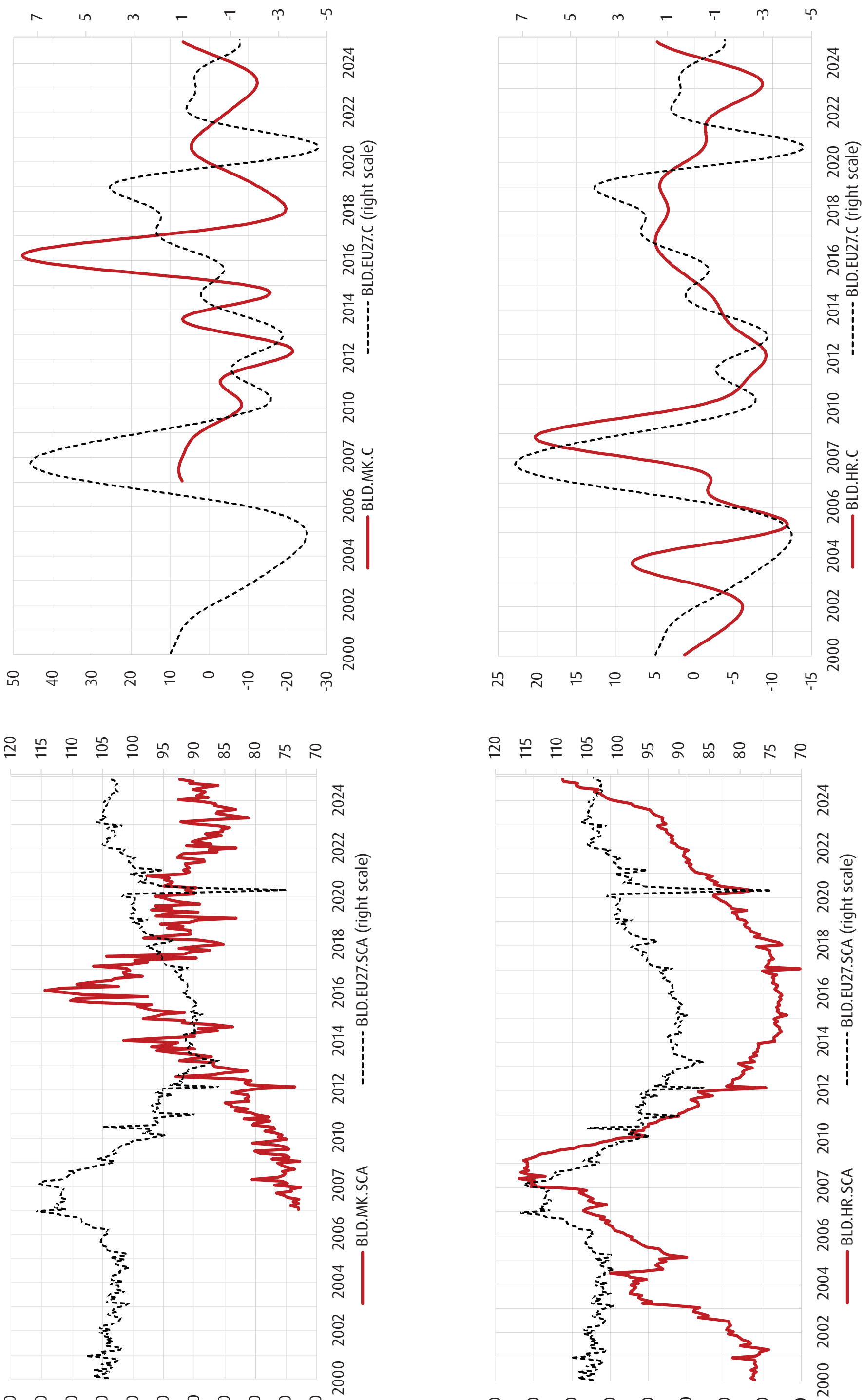

BLD.BG.SCA
BLD.EU27.SCA (right scale)

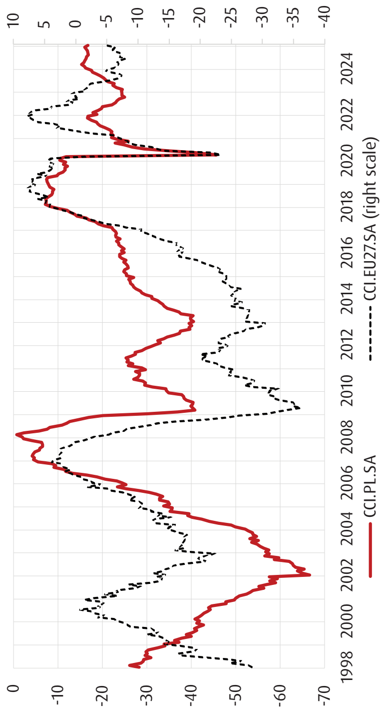

BLD.BG.C
BLD.EU27.C (right scale)

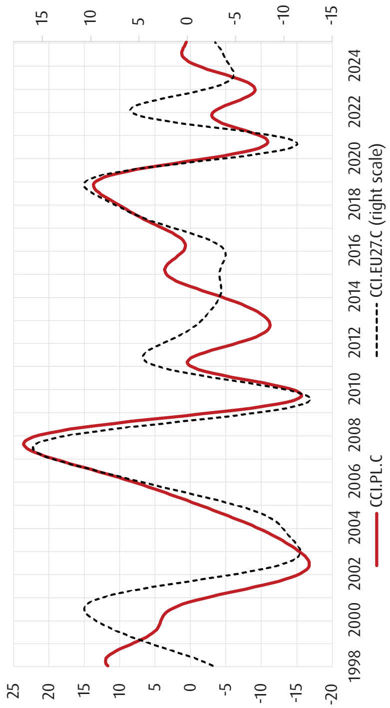

BLD.SI.SCA
BLD.EU27.SCA (right scale)

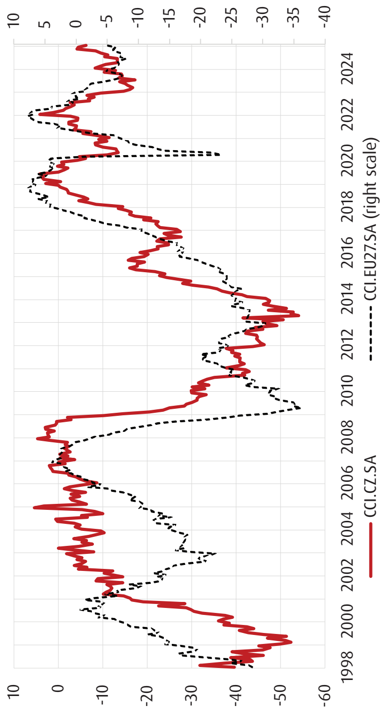

BLD.SI.C
BLD.EU27.C (right scale)

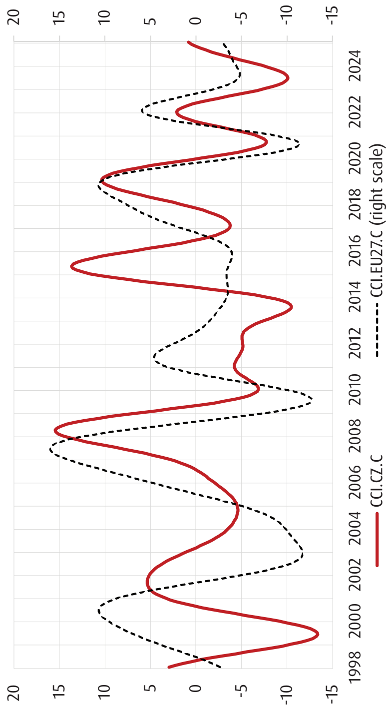
Business sentiment indicator in the construction industry

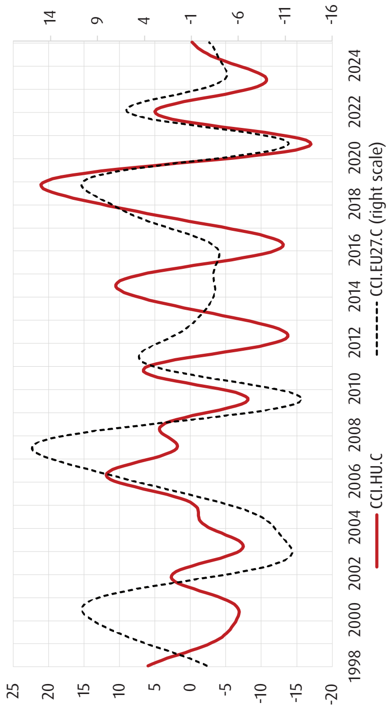


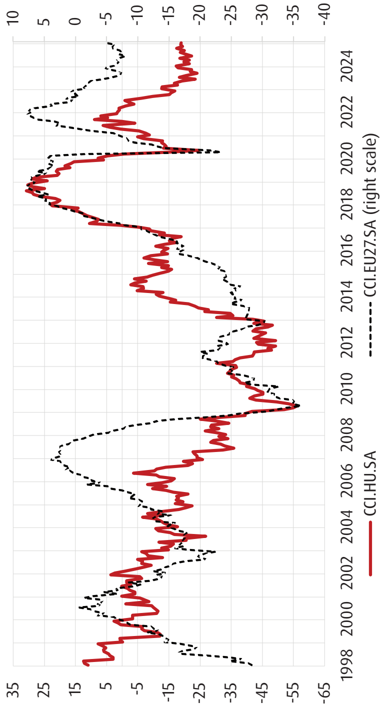

CCI.PL.SA
CCI.EU27.SA (right scale)

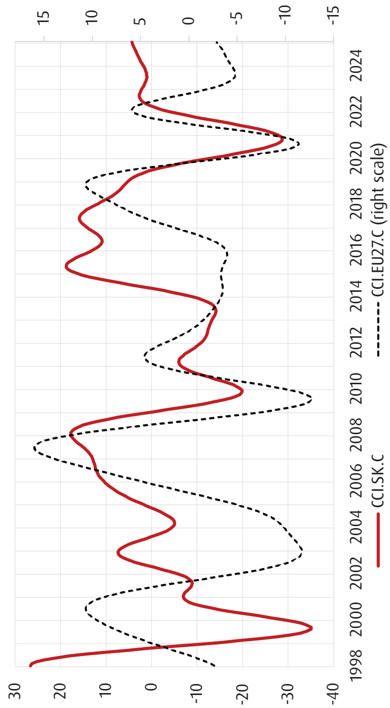

CCI.PL.C
CCI.EU27.C (right scale)

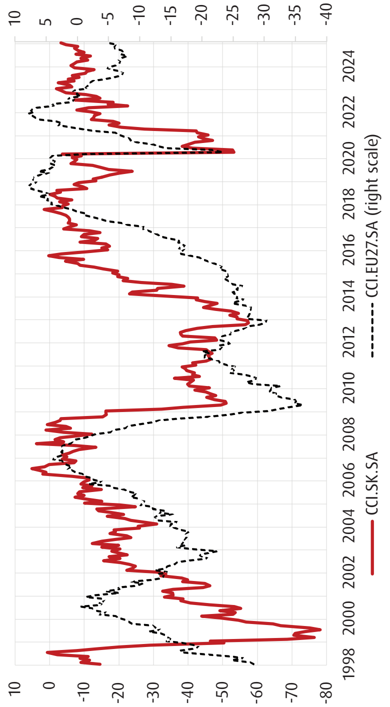

CCI.CZ.SA
CCI.EU27.SA (right scale)

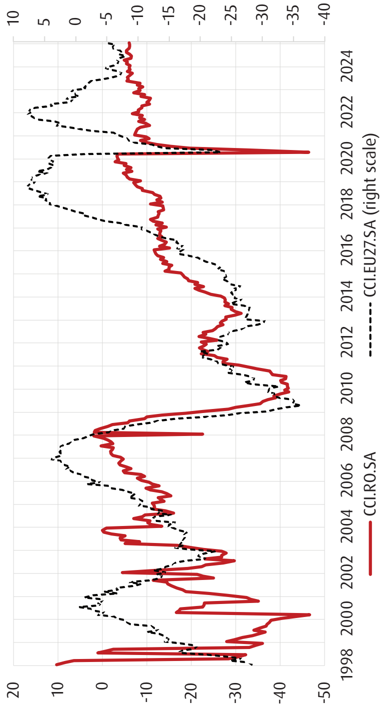

CCI.CZ.C
CCI.EU27.C (right scale)

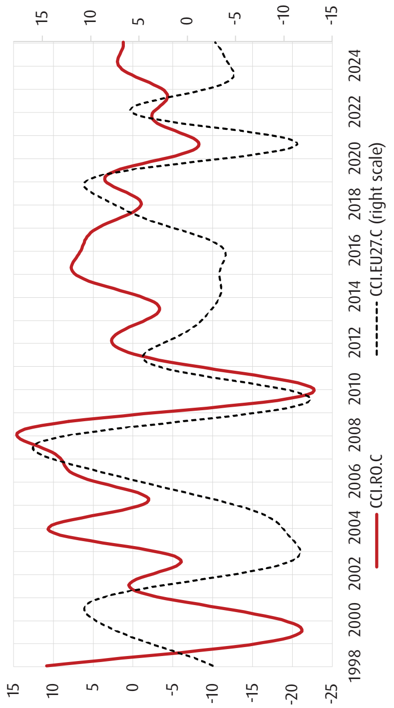

CCI.HU.C
CCI.EU27.C (right scale)

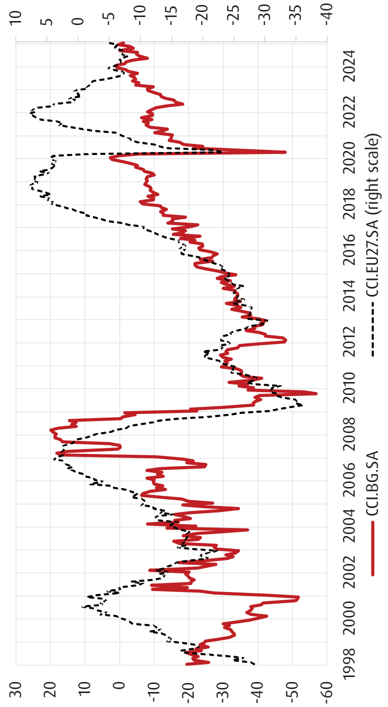

CCI.HU.SA
CCI.EU27.SA (right scale)

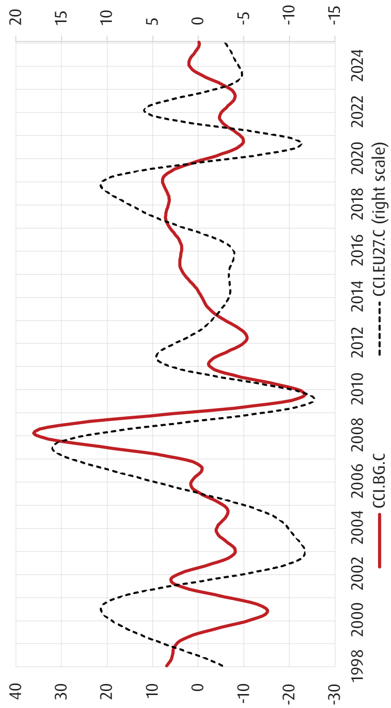

CCI.SK.C
CCI.EU27.C (right scale)

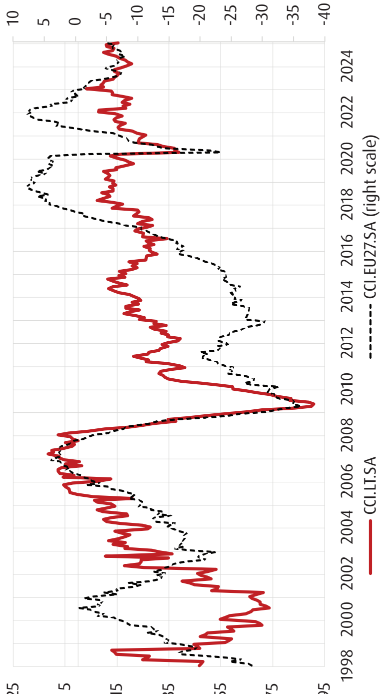

CCI.SK.SA
CCI.EU27.SA (right scale)

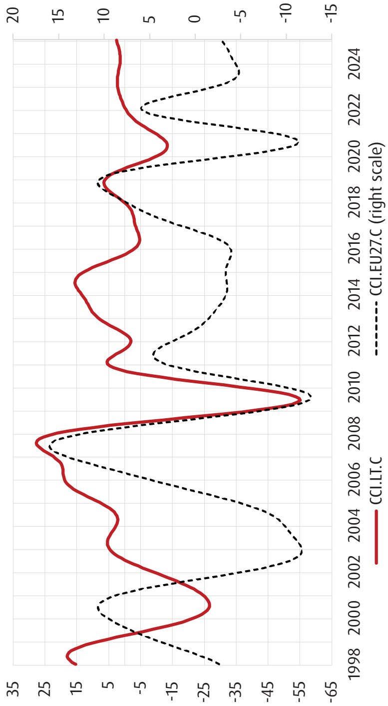

CCI.RO.SA
CCI.EU27.SA (right scale)

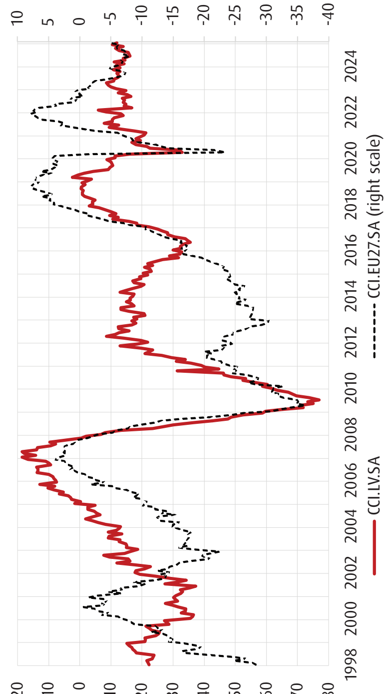

CCI.RO.C
CCI.EU27.C (right scale)

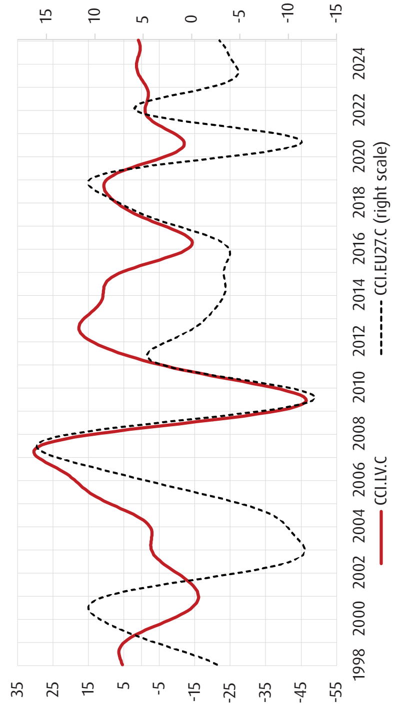

CCI.BG.SA
CCI.EU27.SA (right scale)

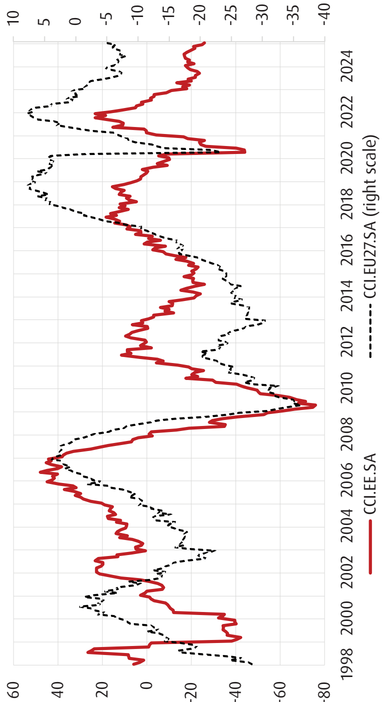

CCI.BG.C
CCI.EU27.C (right scale)

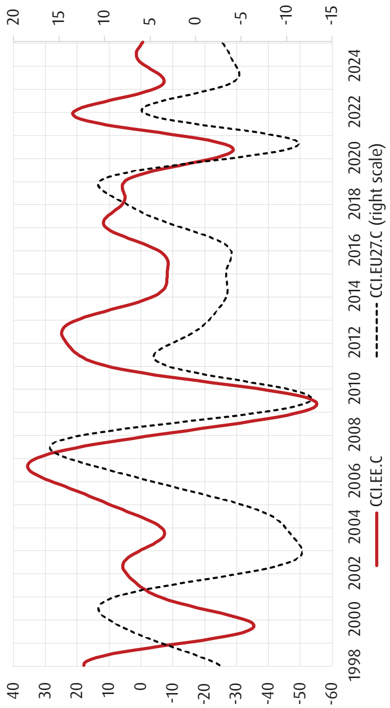

CCI.LT.SA
CCI.EU27.SA (right scale)

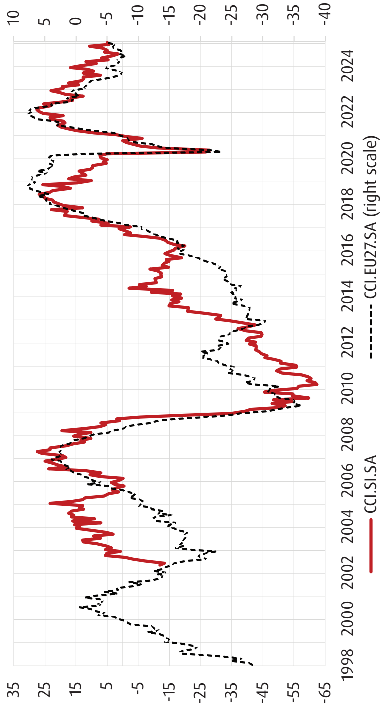

CCI.LT.C
CCI.EU27.C (right scale)

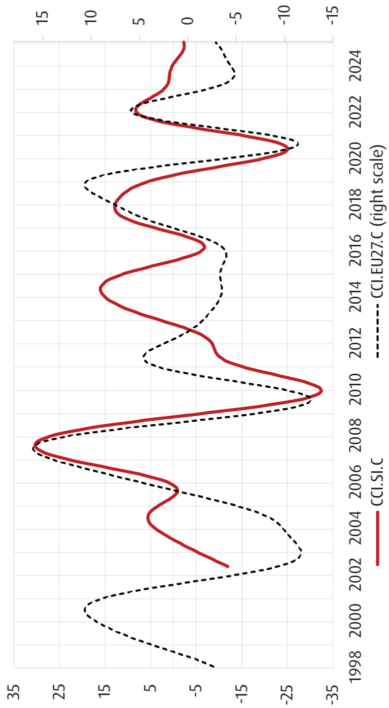

CCI.LV.SA
CCI.EU27.SA (right scale)

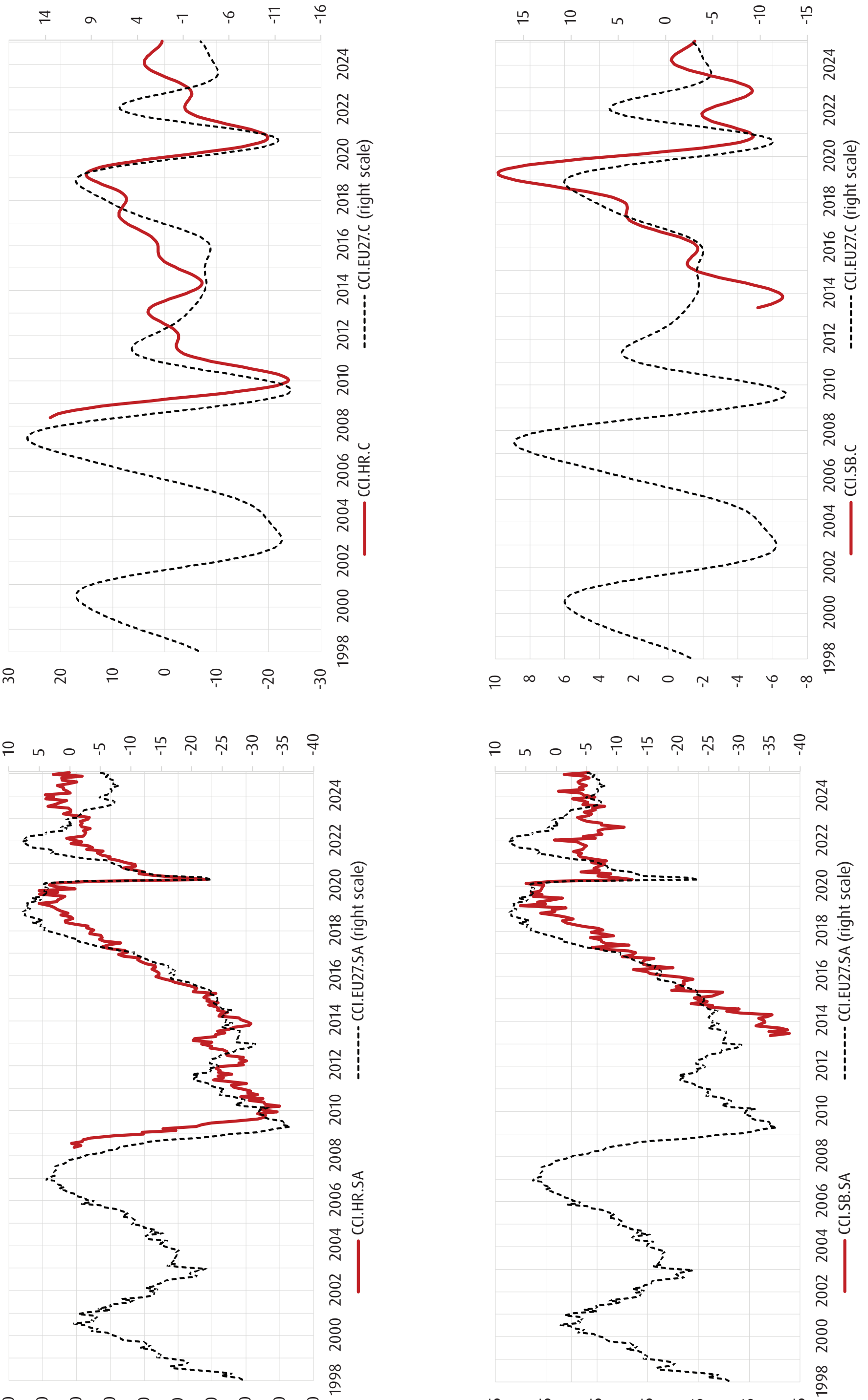

CCI.LV.C
CCI.EU27.C (right scale)


CCI.EE.SA
CCI.EU27.SA (right scale)

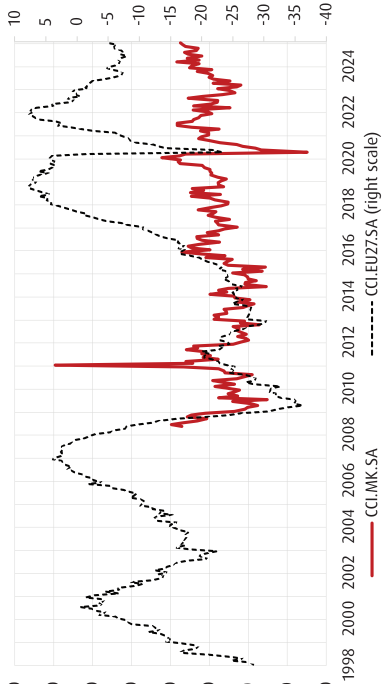

CCI.EE.C
CCI.EU27.C (right scale)

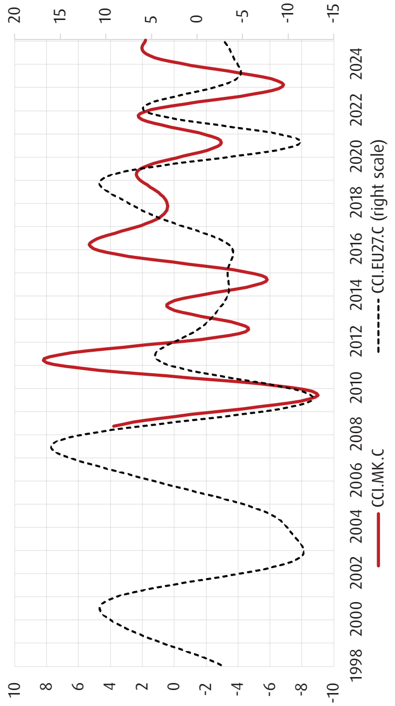

CCI.SI.SA
CCI.EU27.SA (right scale)

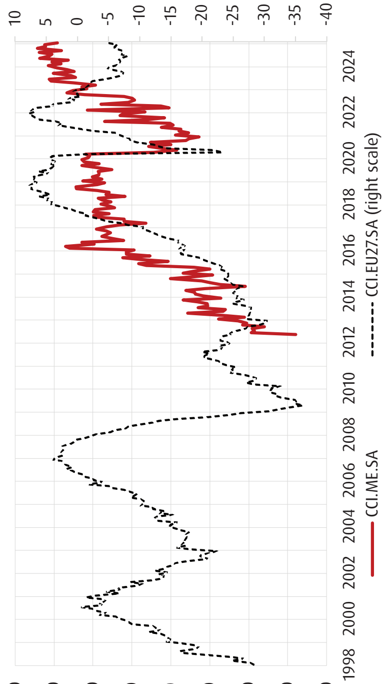

CCI.SI.C
CCI.EU27.C (right scale)

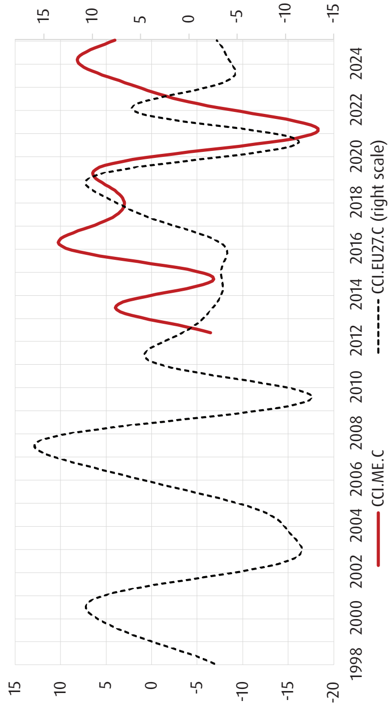

CCI.HR.SA
CCI.EU27.SA (right scale)
CCI.HR.C
CCI.EU27.C (right scale)
CCI.SB.SA
CCI.EU27.SA (right scale)
CCI.SB.C
CCI.EU27.C (right scale)

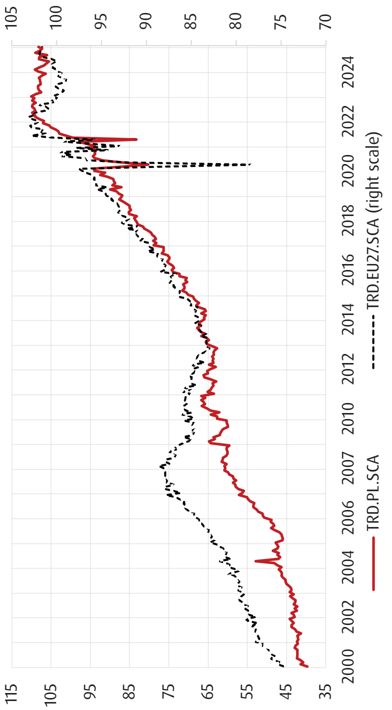
Retail

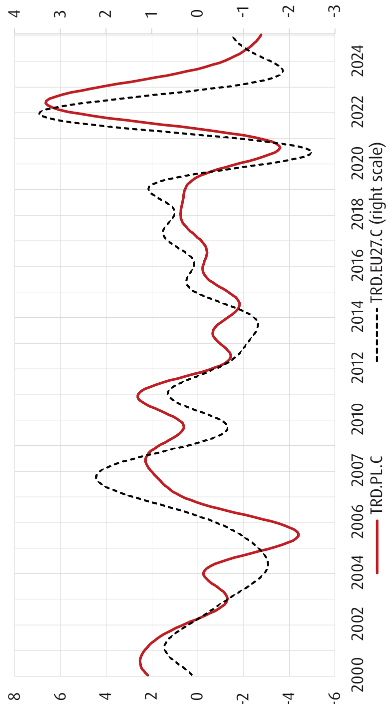

CCI.MK.SA
CCI.EU27.SA (right scale)
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
40 30 20 10 0 -10 -20 -30 -40
10 5 0 -5 -10 -15 -20 -25 -30 -35 -40

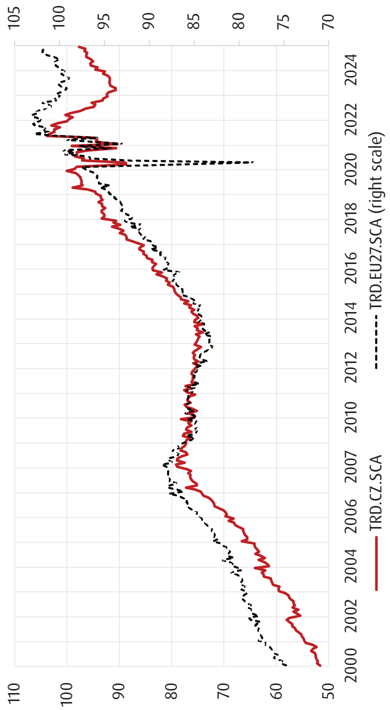

CCI.MK.C
CCI.EU27.C (right scale)
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
10 8 6 4 2 0 -2 -4 -6 -8 -10
20 15 10 5 0 -5 -10 -15

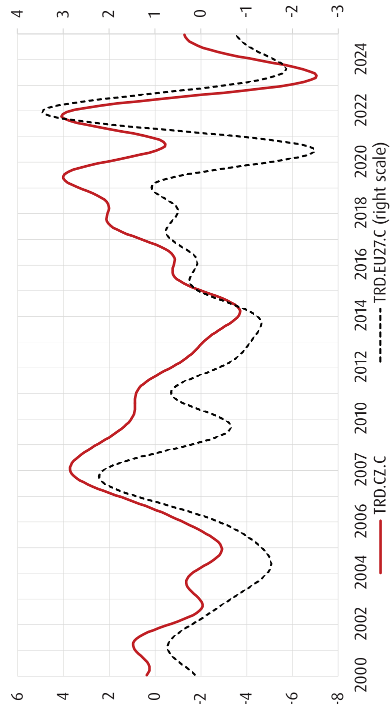

CCI.ME.SA
CCI.EU27.SA (right scale)
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
20 10 0 -10 -20 -30 -40 -50 -60
10 5 0 -5 -10 -15 -20 -25 -30 -35 -40

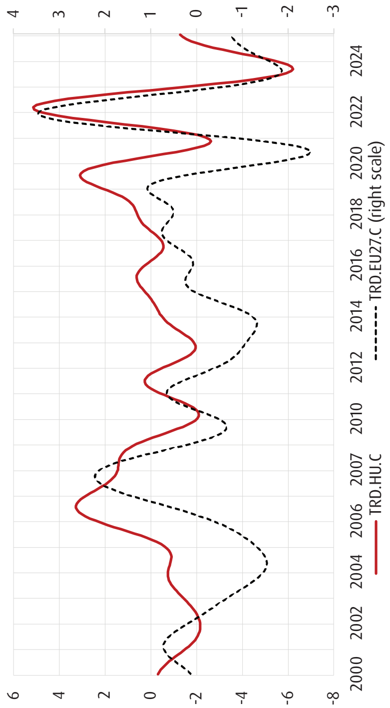

CCI.ME.C
CCI.EU27.C (right scale)
1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
15 10 5 0 -5 -10 -15 -20
15 10 5 0 -5 -10 -15

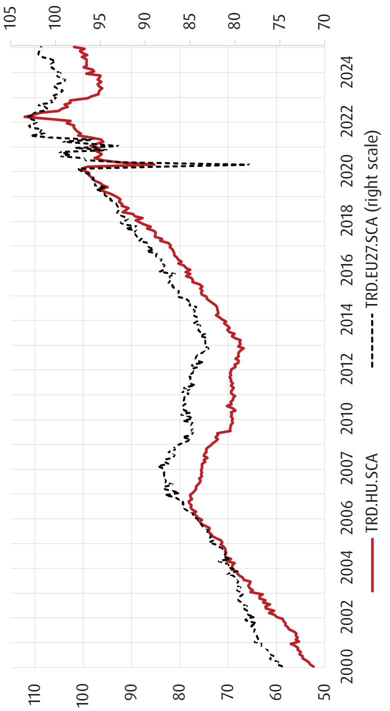

TRD.PL.SCA
TRD.EU27.SCA (right scale)

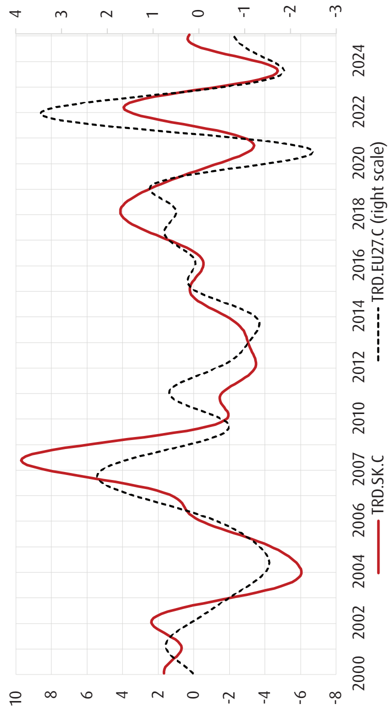

TRD.PL.C
TRD.EU27.C (right scale)

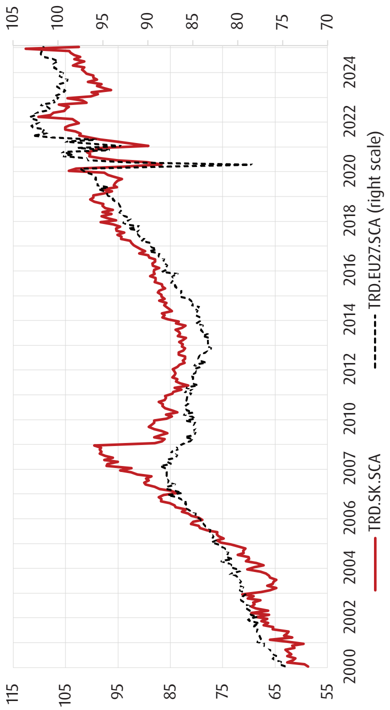

TRD.CZ.SCA
TRD.EU27.SCA (right scale)

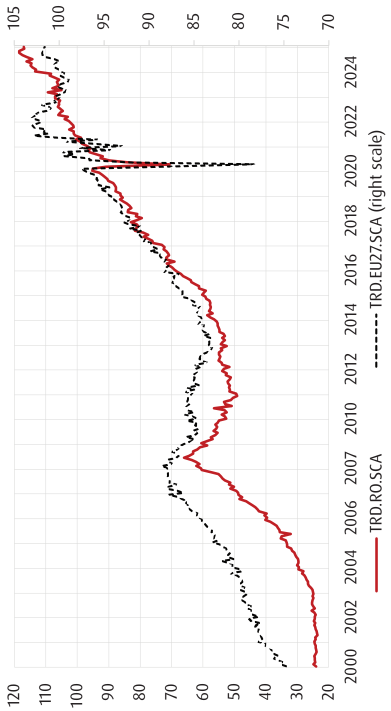

TRD.CZ.C
TRD.EU27.C (right scale)

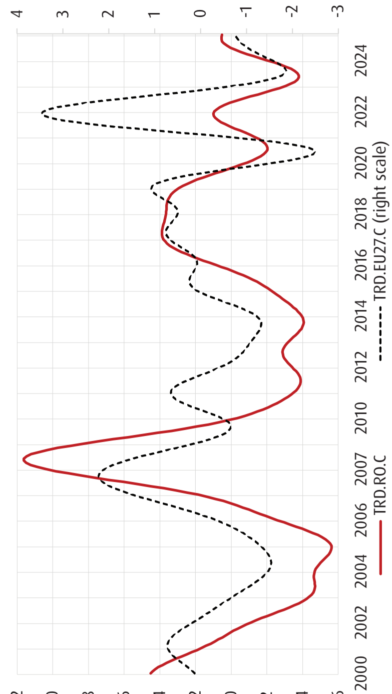

TRD.HU.C
TRD.EU27.C (right scale)

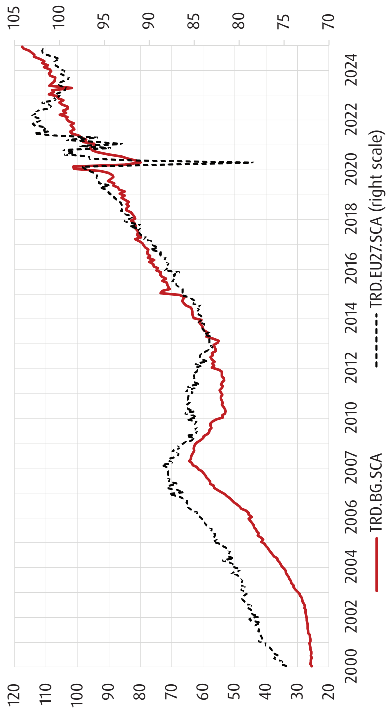

TRD.HU.SCA
TRD.EU27.SCA (right scale)

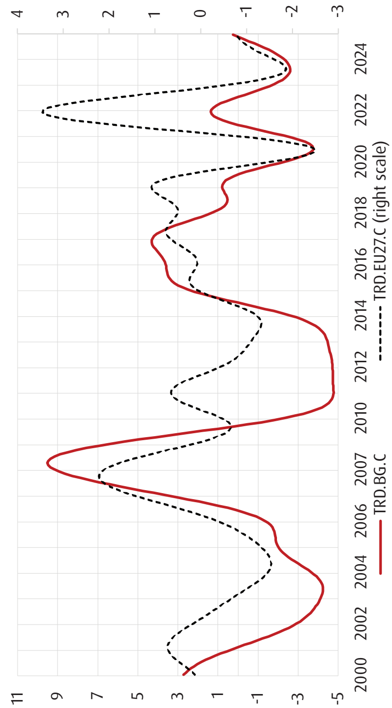

TRD.SK.C
TRD.EU27.C (right scale)

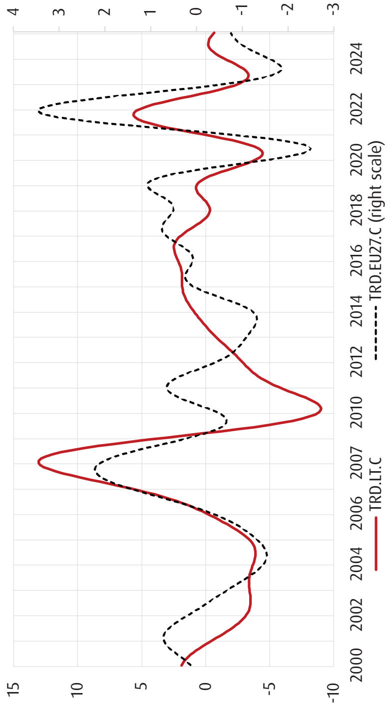

TRD.SK.SCA
TRD.EU27.SCA (right scale)

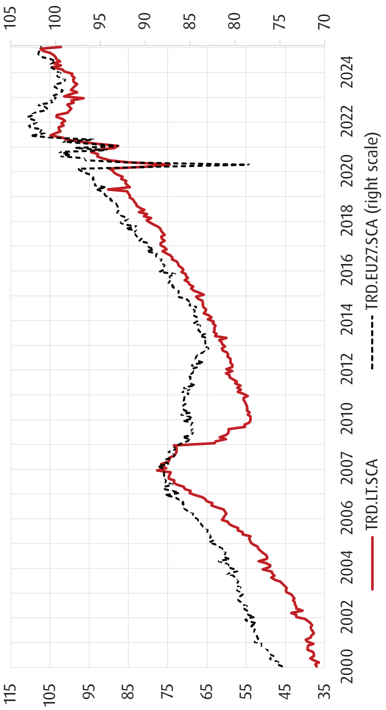

TRD.RO.SCA
TRD.EU27.SCA (right scale)

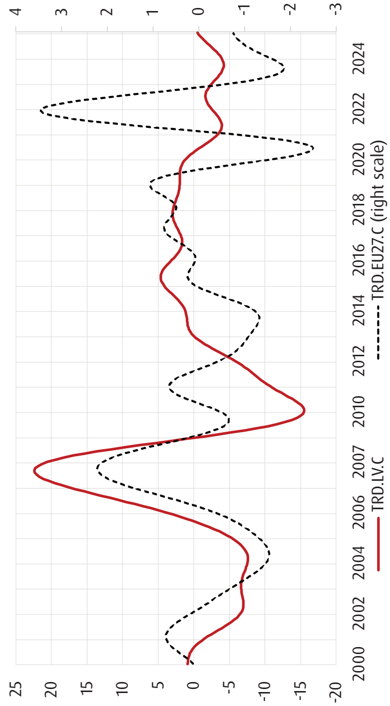

TRD.RO.C
TRD.EU27.C (right scale)

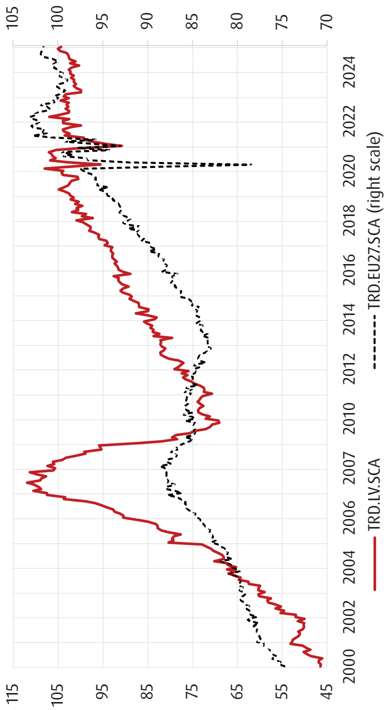

TRD.BG.SCA
TRD.EU27.SCA (right scale)

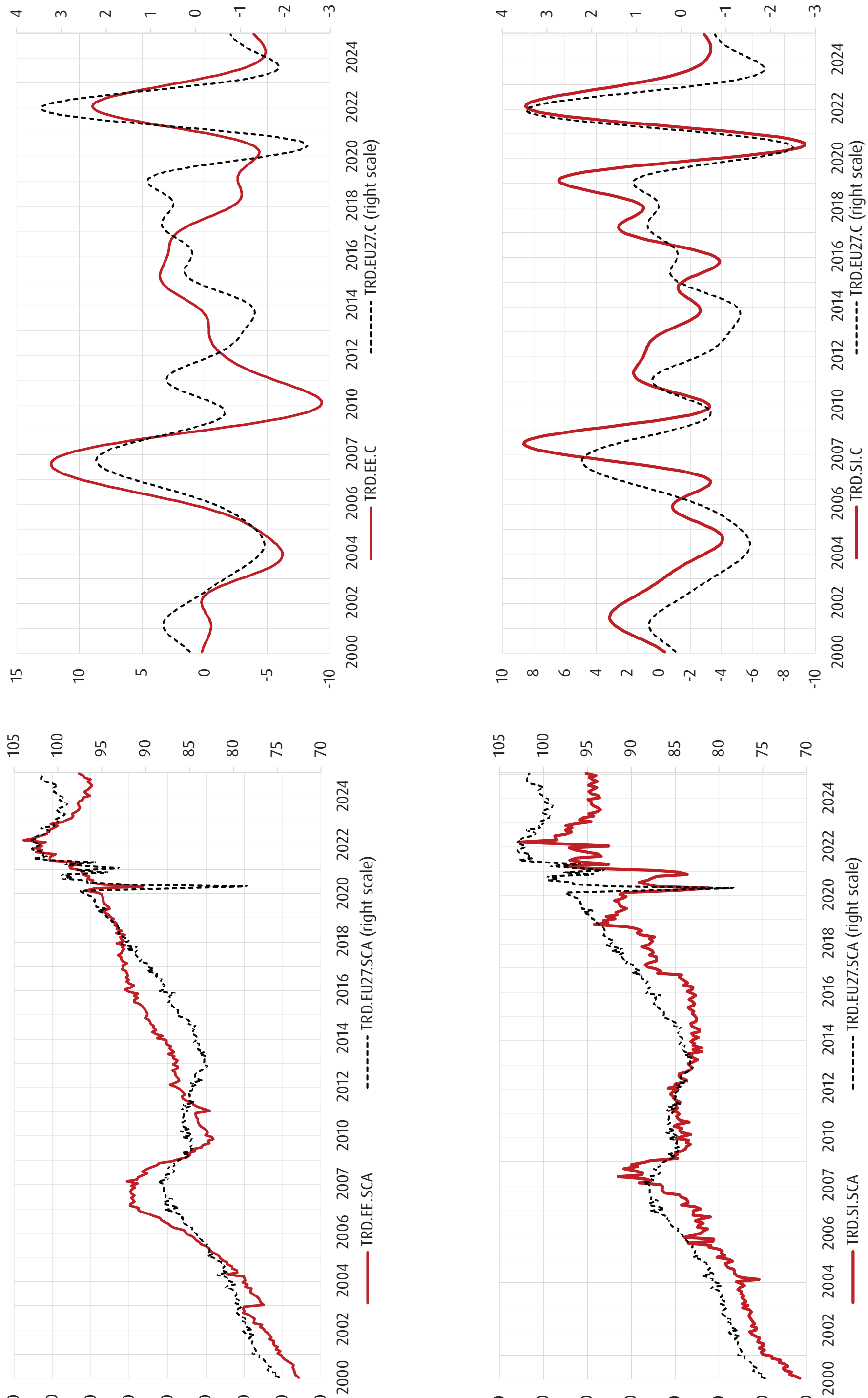

TRD.BG.C
TRD.EU27.C (right scale)

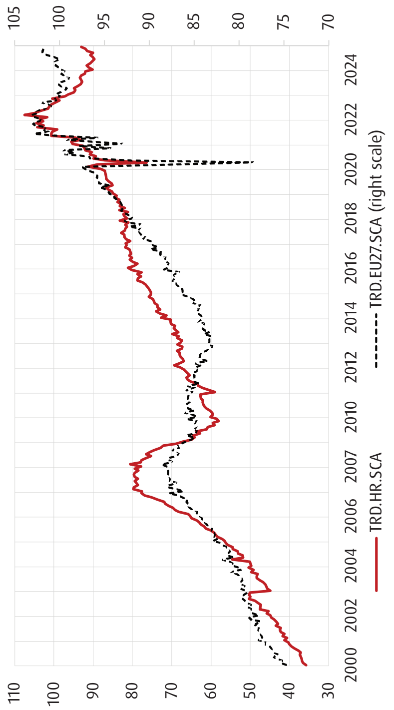

TRD.LT.C
TRD.EU27.C (right scale)

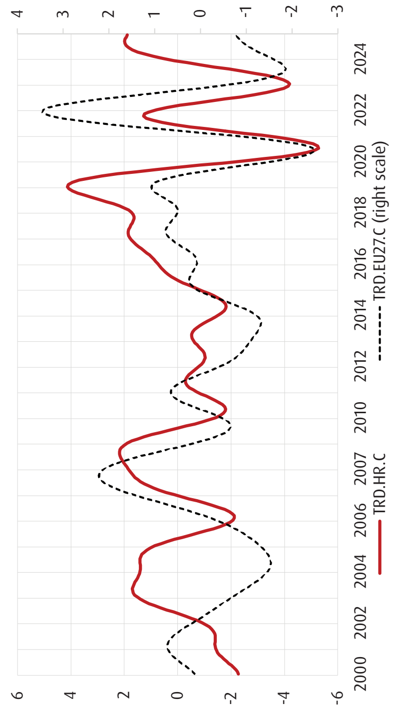

TRD.LT.SCA
TRD.EU27.SCA (right scale)

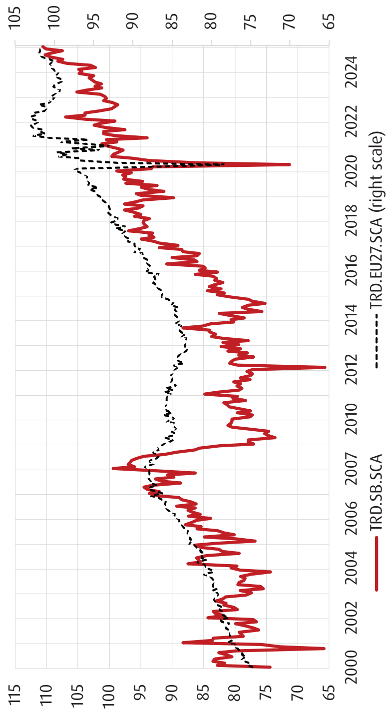

TRD.LV.C
TRD.EU27.C (right scale)

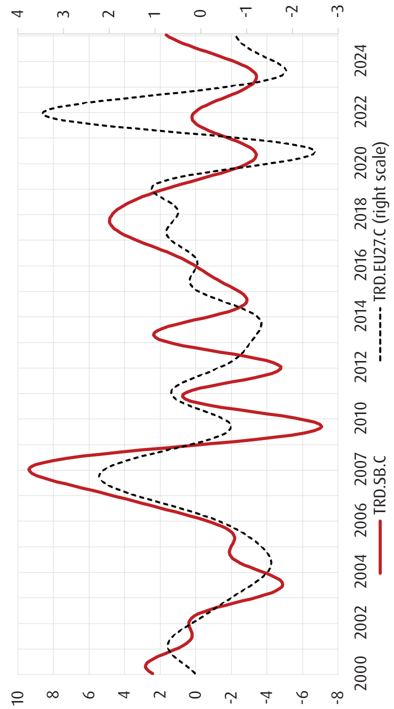

TRD.LV.SCA
TRD.EU27.SCA (right scale)

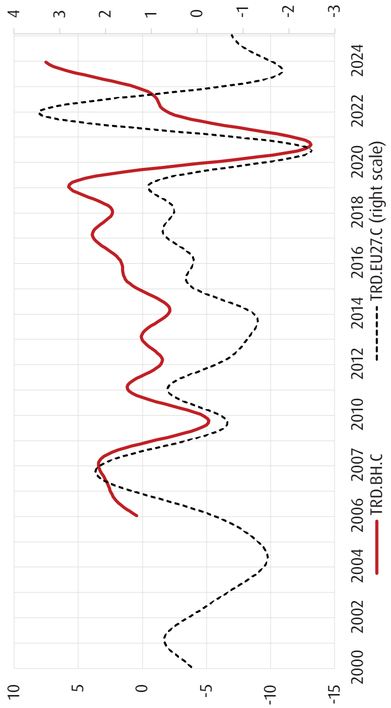

TRD.EE.SCA
TRD.EU27.SCA (right scale)
TRD.EE.C
TRD.EU27.C (right scale)
TRD.SI.SCA
TRD.EU27.SCA (right scale)
TRD.SI.C
TRD.EU27.C (right scale)

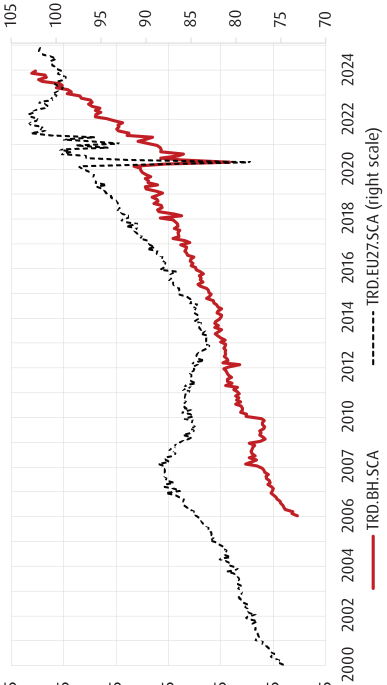

TRD.HR.SCA
TRD.EU27.SCA (right scale)


TRD.HR.C
TRD.EU27.C (right scale)

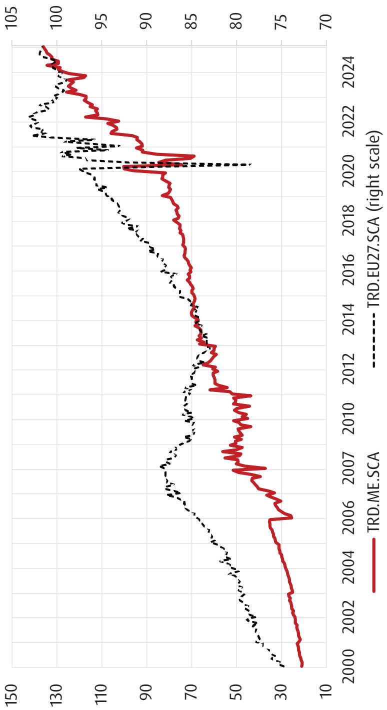

TRD.SB.SCA
TRD.EU27.SCA (right scale)

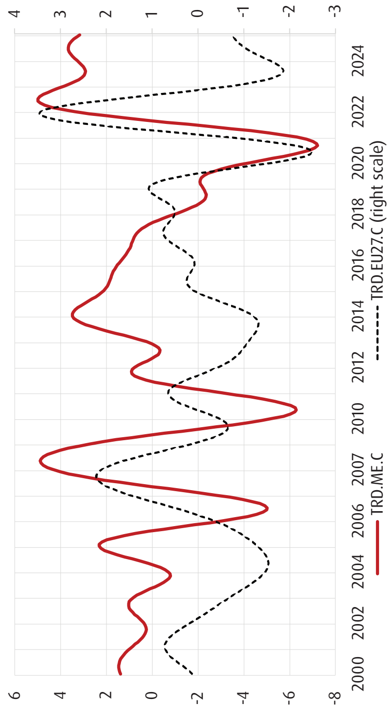

TRD.SB.C
TRD.EU27.C (right scale)

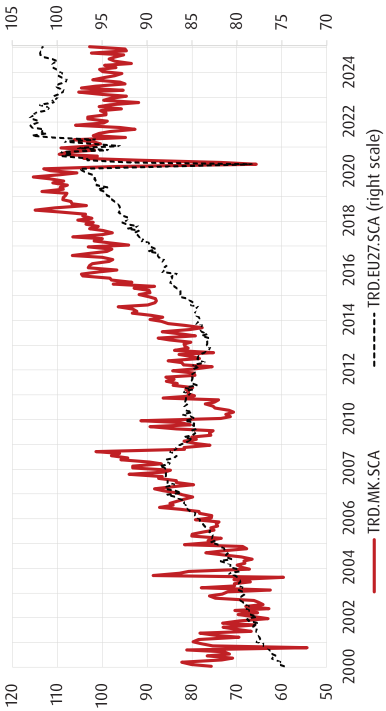

TRD.BH.C
TRD.EU27.C (right scale)
10
5
0
-5
-10
-15
4
3
2
1
0
-1
-2
-3
2000
2002
2004
2006
2007
2010
2012
2014
2016
2018
2020
2022
2024

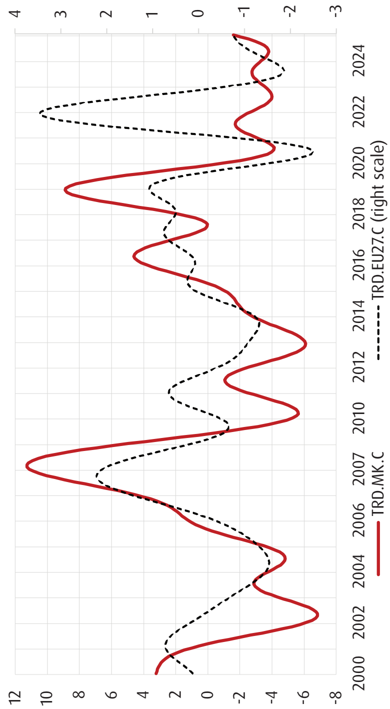

TRD.BH.SCA
TRD.EU27.SCA (right scale)
145
125
105
85
65
45
25
105
100
95
90
85
80
75
70
2000
2002
2004
2006
2007
2010
2012
2014
2016
2018
2020
2022
2024

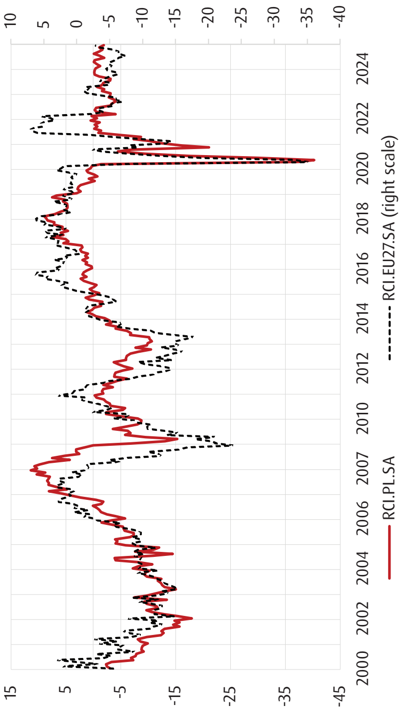
Trade economic indicator

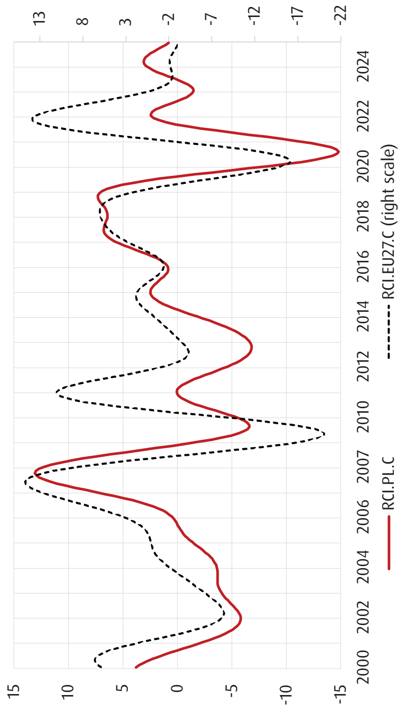


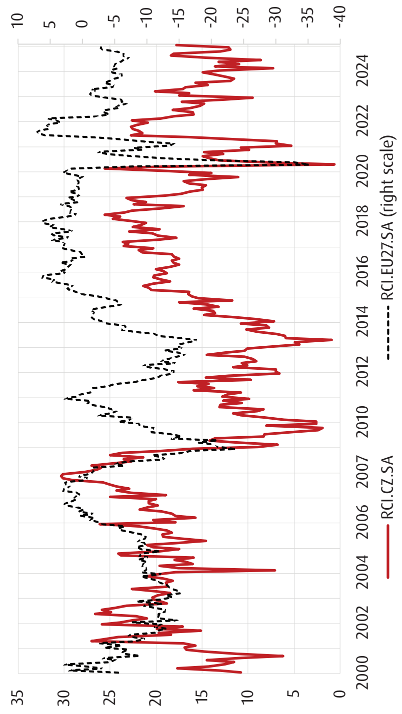


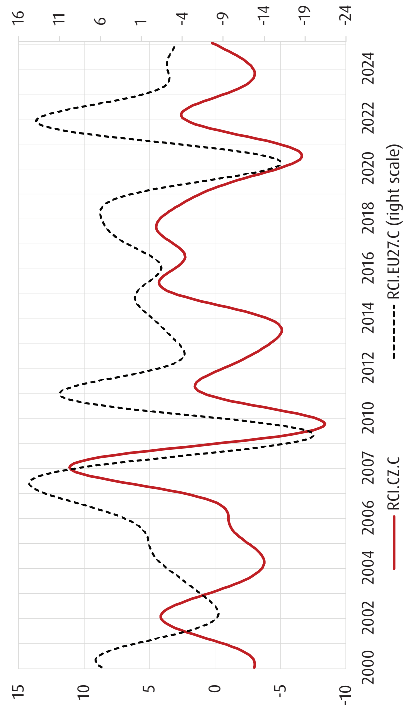


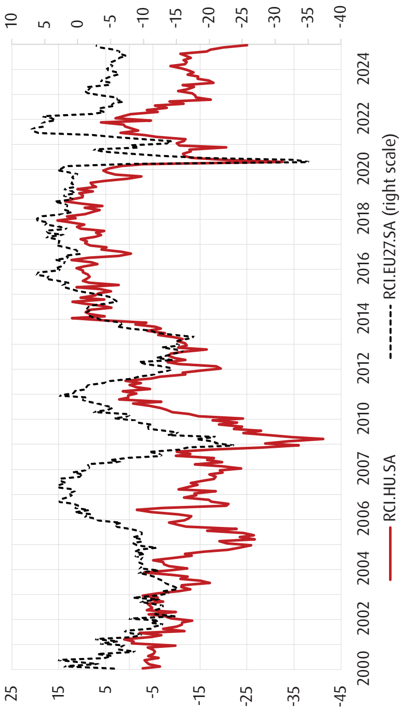


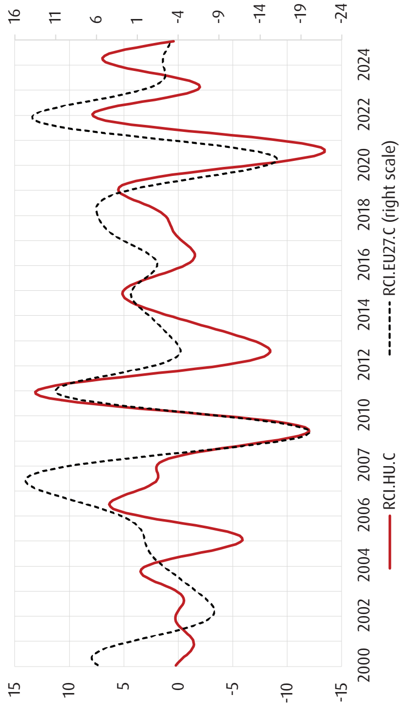

RCI.PL.SA
RCI.EU27.SA (right scale)

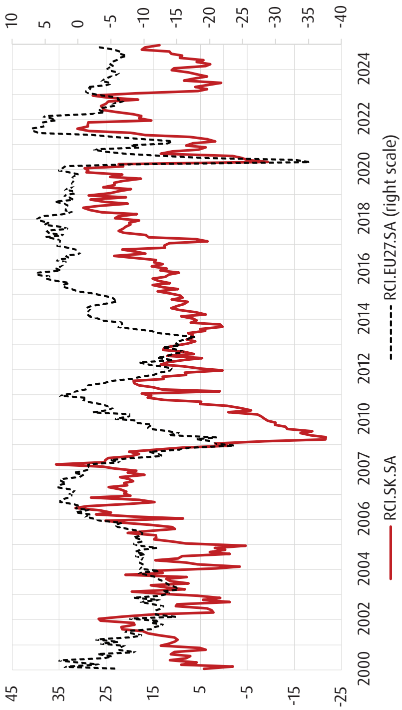

RCI.PL.C
RCI.EU27.C (right scale)

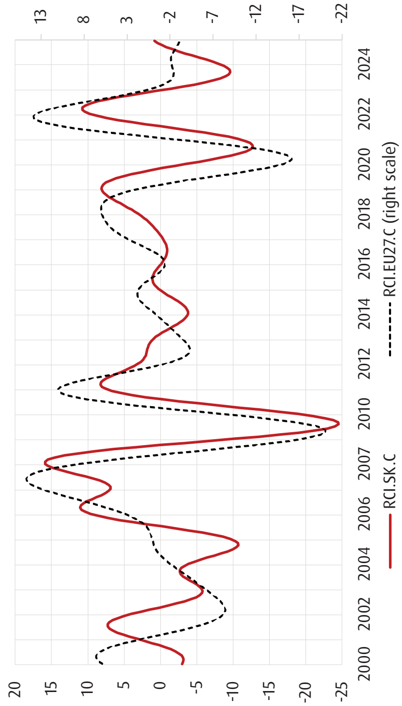

RCI.CZ.SA
RCI.EU27.SA (right scale)

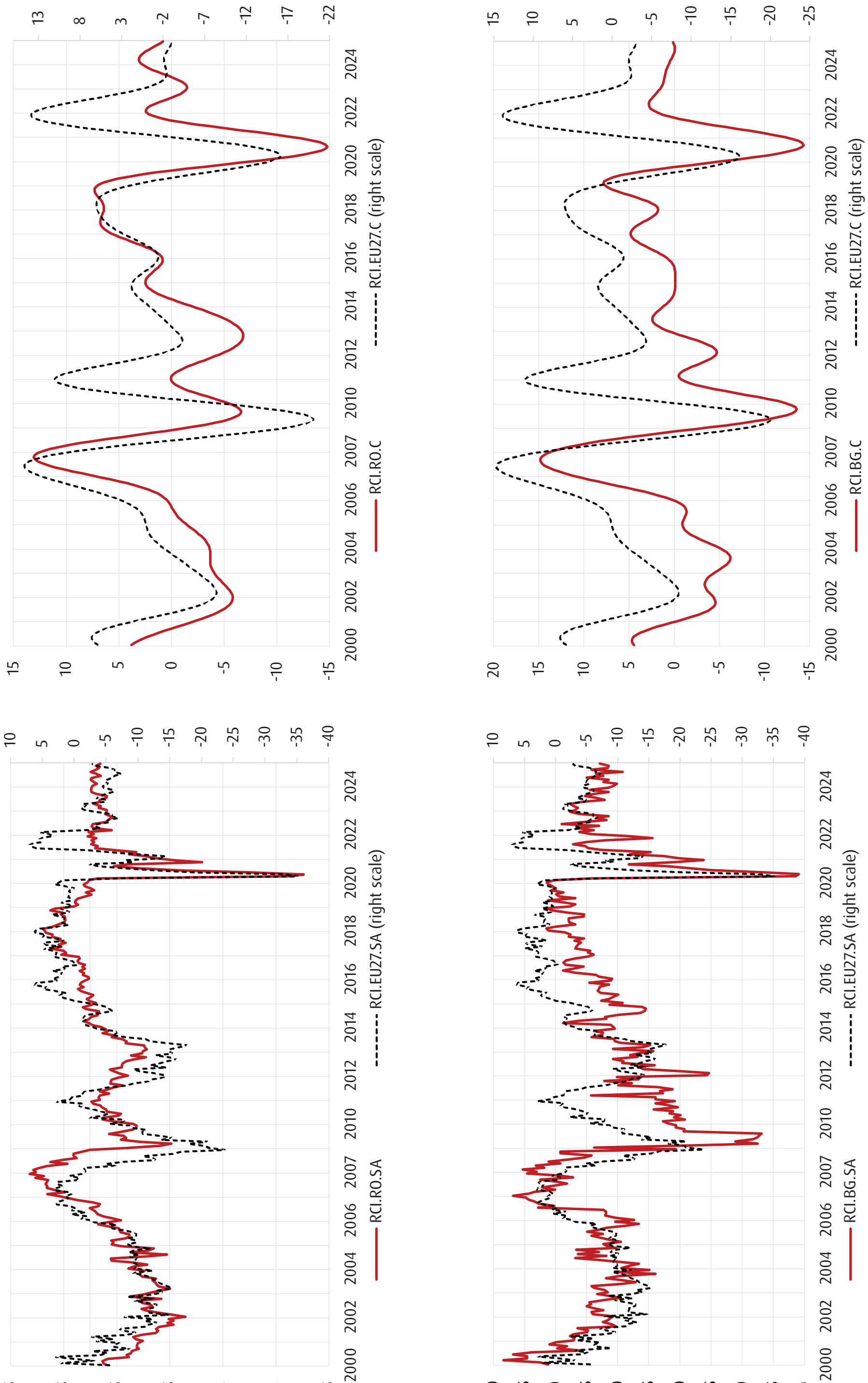

RCI.CZ.C
RCI.EU27.C (right scale)

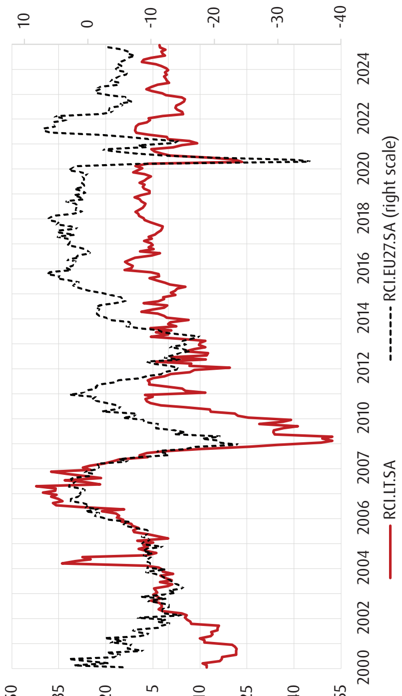

RCI.HU.SA
RCI.EU27.SA (right scale)

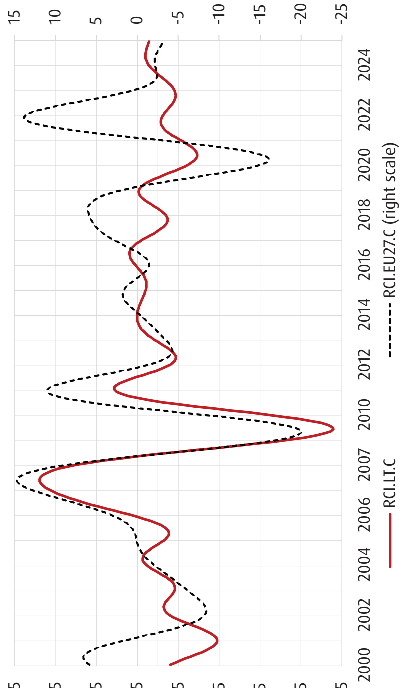

RCI.HU.C
RCI.EU27.C (right scale)

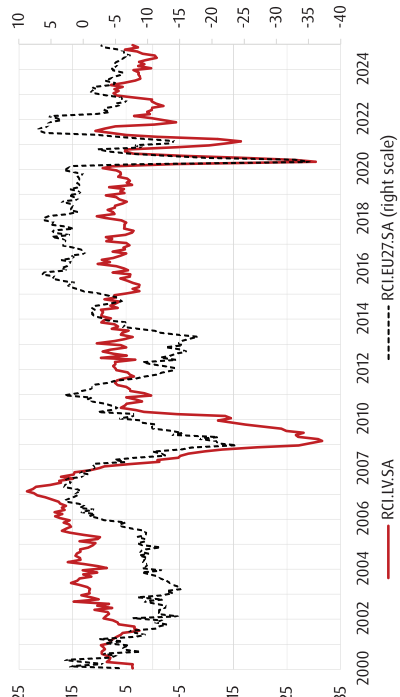

RCI.SK.SA
RCI.EU27.SA (right scale)

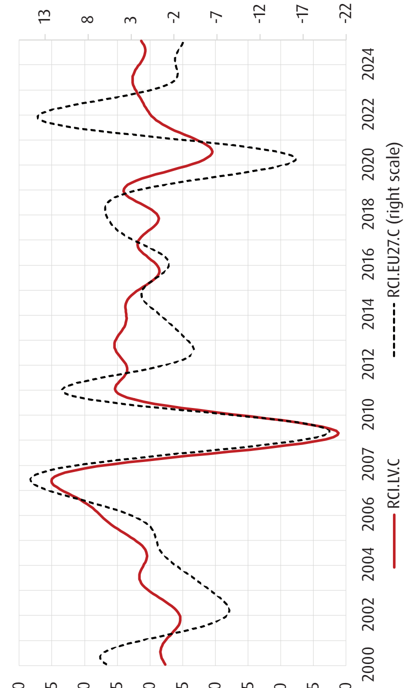

RCI.SK.C
RCI.EU27.C (right scale)

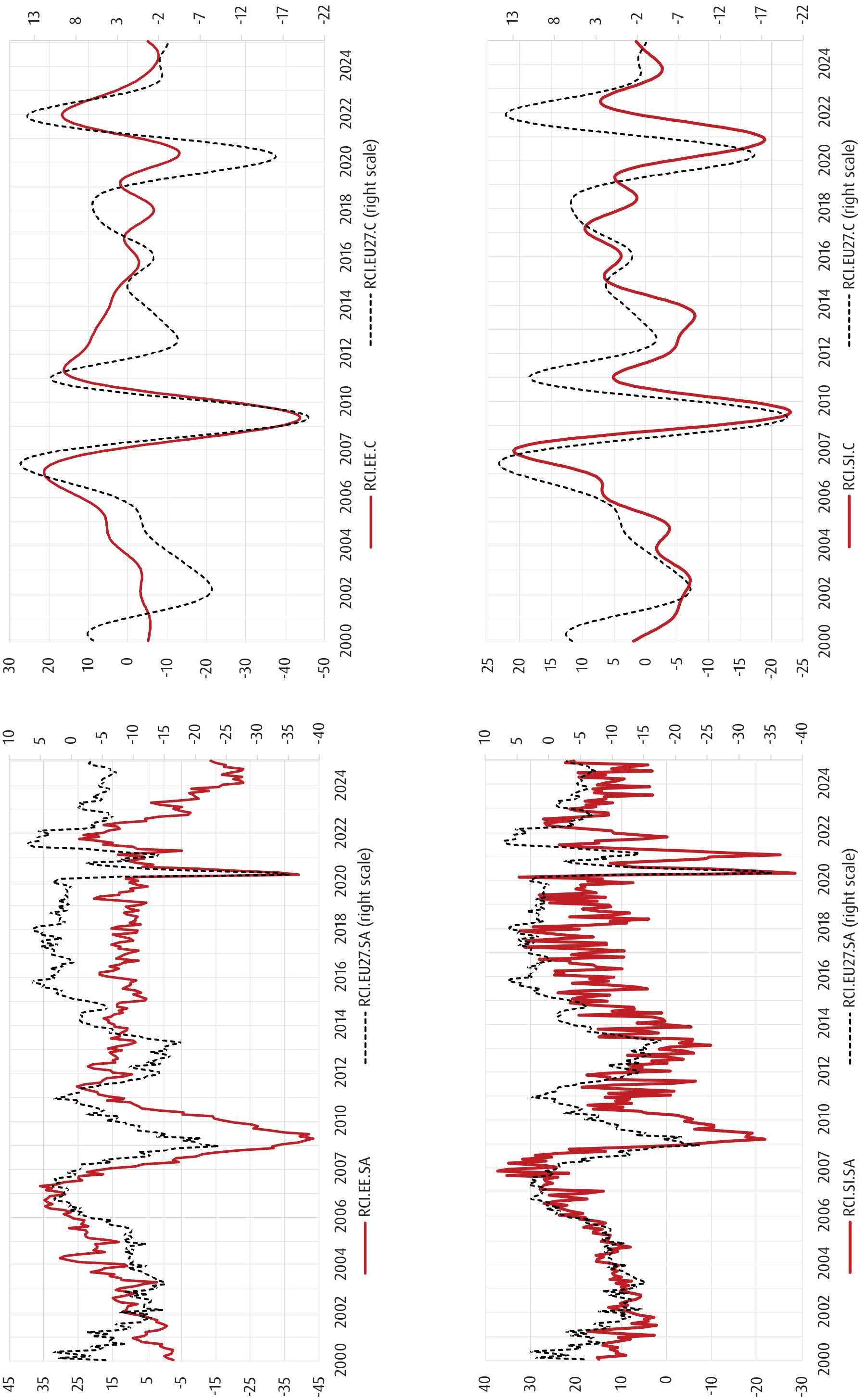

RCI.RO.SA
RCI.EU27.SA (right scale)
RCI.RO.C
RCI.EU27.C (right scale)
RCI.BG.SA
RCI.EU27.SA (right scale)
RCI.BG.C
RCI.EU27.C (right scale)

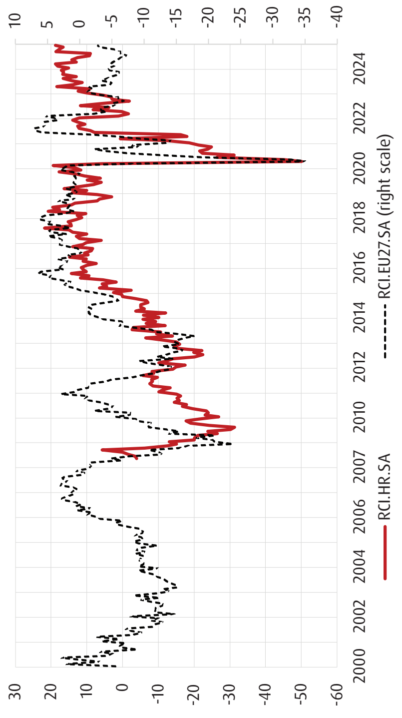

RCI.LT.SA
RCI.EU27.SA (right scale)

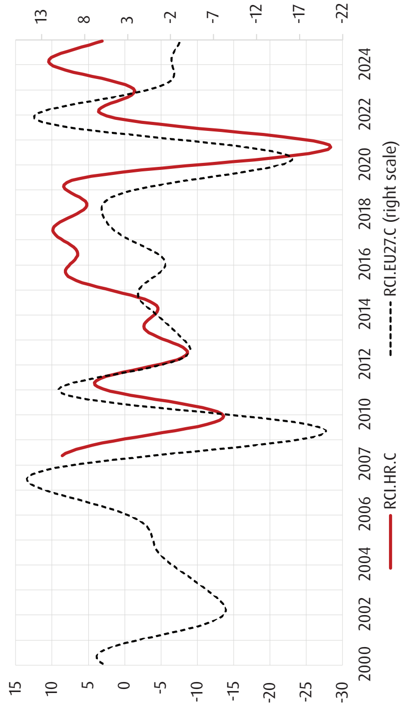

RCI.LT.C
RCI.EU27.C (right scale)

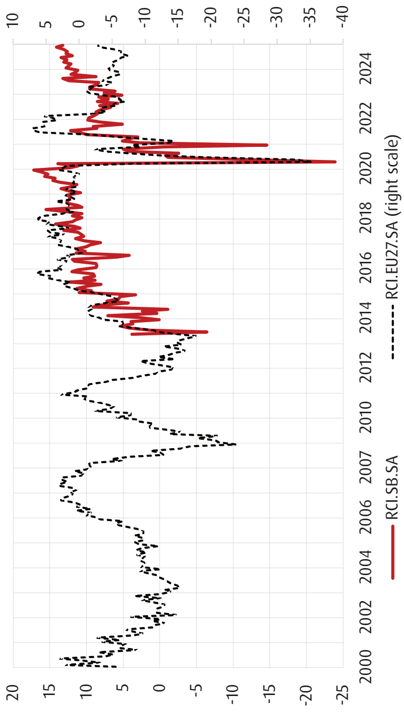

RCI.LV.SA
RCI.EU27.SA (right scale)

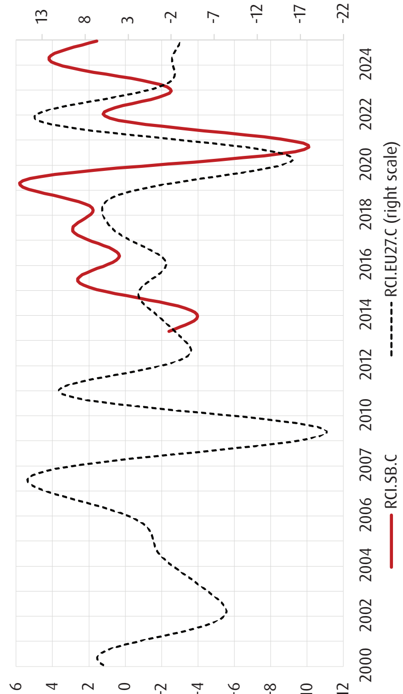

RCI.LV.C
RCI.EU27.C (right scale)


RCI.EE.SA
RCI.EU27.SA (right scale)
RCI.EE.C
RCI.EU27.C (right scale)
RCI.SI.SA
RCI.EU27.SA (right scale)
RCI.SI.C
RCI.EU27.C (right scale)









Źródło: opracowanie własne na podstawie danych Eurostatu.

References

Bartosiak, J. (2025). *Oczy szeroko otwarte. Polska strategia na czas wojny światowej*. Kraków: Wydawnictwo Literackie.

Druchin, S., Klucznik, M., Rybacki, J., Sajnóg, S., Sułkowski, D. (2024). *PEI Economic Review: Spring 2024*. Warszawa: Polski Instytut Ekonomiczny.

European Commission (2024). *European Economic Forecast. Autumn 2024.* Institutional Paper 296, November.

Eurostat (2025). *Glossary: Confidence Indicator*, https://ec.europa.eu/eurostat/statistics-explained/index.php? title=Glossary:Confidence_indicator. (accessed: 23.06.2025).

GUS (2025a). *Dynamika sprzedaży detalicznej w grudniu 2024 r*. Warszawa: Główny Urząd Statystyczny.

GUS (2025b). *Sytuacja społeczno-gospodarcza kraju w 2024 r*. Warszawa: Główny Urząd Statystyczny.

GUS (2025c). *Wstępny szacunek produktu krajowego brutto w 4 kwartale 2024 r.* Warszawa: Główny Urząd Statystyczny.

JLL (2025). *Rynek inwestycyjny w Europie Środkowo-Wschodniej 2024*, https://www.jll.pl/pl/trendy-i-analizy/badanie/rynek-inwestycyjny-w-europie-srodkowo-wschodniej (accessed: 11.04.20025).

Księżopolski, K.M. (2022). Wojna gospodarcza Rosji ze strefą euroatlantycką, *Gazeta SGH Insight*, 370 (wydanie specjalne), pp. 24–25.

Księżopolski, K.M. (2024). Gospodarka wodorowa w dobie niestabilnego świata, *Gazeta SGH Insight*, 383 (wydanie specjalne), pp. 24–26.

Lucas Jr., R.E. (1975). An Equilibrium Model of the Business Cycle, *Journal of Political Economy*, 83(6), pp. 1113–1144.

Lucas Jr., R.E. (1977). Understanding Business Cycles, *Carnegie-Rochester Conference Series on Public Policy*, 5, pp. 7–9.

Ministry of Development Funds and Regional Policy (2024). *Rok inwestycji i reform z Krajowego Planu Odbudowy*, https://www.gov.pl/web/fundusze-regiony/rok-inwestycji-i-reform-z-krajowego-planu-odbudowy (accessed: 27.03.2025).

Monetary Policy Council (2025). *Raport o inflacji – marzec 2025 r*. Warszawa: Narodowy Bank Polski.

Polish Bank Association (2024). *Polska i Europa 2024. Innowacje, inwestycje, wzrost cd* (ed. 9). Warszawa.

Radło, M.J. (2022). Bezpieczeństwo łańcuchów dostaw, *Gazeta SGH Insight*, 370 (wydanie specjalne), pp. 20–22.

Radło, M.J. (2024). Czy tracimy odporność?, *Gazeta SGH Insight*, 383 (special edition), pp. 12–14.

Radło, M.J., Sagan, M. (2021). Awans krajów Europy Środkowo-Wschodniej w łańcuchach wartości przed pandemią i po jej wygaśnięciu – szanse i wyzwania na przyszłość. In: *Raport SGH i Forum Ekonomicznego 2021* (pp. 341–374), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (red.). Warszawa: Oficyna Wydawnicza SGH.

IMPACT OF ENERGY TRANSITION ON ECONOMIC GROWTH IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

Maciej Mróz
Tomasz P. Wiśniewski
Bartosz Witkowski
Grażyna Wojtkowska-Łodej

DOI: 10.33119/978-83-8030-742-1.205_223

Abstract

The study discusses energy transition in relation to the economic growth in the Central and Eastern European (CEE) countries. The main objective of the study is to diagnose the impact of energy transition and decarbonisation processes on the economic growth rate of the CEE countries. Besides attempting to identify the key relationships between the share of renewable energy sources (RES) in the energy mix and economic growth in the CEE region, the study includes a review of the literature on the relationship between RES and economic growth and their mutual impact as well as a discussion on the growing importance of RES in the economy. The methods applied include the Granger causality analysis for the CEE economies and estimation of the economic growth model for these economies, accounting for the share of RES as a growth factor. The conclusions drawn from the study may be an important contribution to discussion on more effective energy transition and further energy policy development in the CEE region.

Authors

Maciej Mróz – PhD, Assistant Professor, Department of Economic Geography, SGH Warsaw School of Economics. Specialises in issues related to energy markets, including energy commodity prices and energy transition. Author of publications on energy security.

Tomasz P. Wiśniewski – PhD, Assistant Professor, Institute of International Economic Policy, SGH Warsaw School of Economics. His research interests include welfare economics and energy economics as well as international economic policy, including energy policy.

Bartosz Witkowski – Professor, Director of the Institute of Econometrics, SGH Warsaw School of Economics. Deals scientifically with the applications of econometrics, in particular microeconometrics and panel econometrics.

Grażyna Wojtkowska-Łodej – Professor, Institute of International Economic Policy, SGH Warsaw School of Economics. Her research interests focus on international economics, economic integration, economics of sustainable development and EU economic policy, including energy and environmental policy.

The main objective of the study is to diagnose the impact of the energy transition and decarbonisation process on the rate of economic growth in the countries of Central and Eastern Europe (CEE). In the course of our deliberations, we made an attempt to identify the key relationships between the share of renewable energy sources (RES) in the energy mix and economic growth in order to develop recommendations supporting more effective transformation and energy policy in the CEE region.

The objectives of the study include

a) comparative analysis of the energy mix of the CEE countries;
b) analysis of the growing importance of RES with regard to energy transition and decarbonisation of the CEE economies;
c) examination of differences in the dynamics of RES development in the CEE countries;
d) determination of the relationship between the share of RES in the energy mix and economic growth (GDP) and key macroeconomic indicators on the example of the CEE economies;
e) assessment of the dynamics of changes in the share of RES in the energy mix as a determinant of economic growth in the extended economic growth model.

The study presents a diagnosis of factors related to the process of energy transition and decarbonisation and determines their impact on the economic growth of the CEE countries.

The study of impact is based on the Granger causality panel test, using operationalised data on the share of RES in the energy mix of the economy (energy transition intensity (ETI) annual data) and the dynamics of ETI, i.e. the rate of change in the share of renewable energy sources in the energy mix of the economy (ETR annual data), as well as GDP, inflation, unemployment rate, investments or government spending in the CEE countries. At the same time, a model of economic growth was developed for the countries of the region in a panel approach, accounting for the share of RES in the energy mix of the economy as a growth factor.

A growing importance of RES with regard to energy transition and decarbonisation in CEE economies

The shift towards sustainable development, which has been observed for a long time in the global economy, including in the European Union (EU), is identified with the socio-ecological transformation of economies counteracting climate change.

The energy transition means a radical, comprehensive and fundamental change in the type and manner of energy supply as well as its use. One of its main aspects is moving away from fossil energy carriers used so far and replacing them with renewable energy carriers (RES). At the same time, the energy transition assumes the possibility of using other, new and clean, energy technologies as well as energy storage and distribution on the supply and demand side.

In the process of energy transition, dynamic technological progress taking place in all areas of energy generation, transmission, distribution, storage, use and management plays an active and stimulating role. The profound changes associated and identified with the energy transition concern the modern economy and have a local, regional and global dimension. It is a long-term process, determined by economic, social, sociological, technological and economic policy factors.

An in-depth and comprehensive way to achieve climate neutrality in the EU is described in the EU documents, such as the Energy Union Strategy, the European Green Deal and the Strategy for Building a Carbon-Neutral Economy by 2050. They provide a kind of roadmap for the EU member states to transform their energy sectors[1] and economies, accounting for the state of knowledge of existing technologies and their level of development.

Nowadays, there is an increased and more and more common use of renewable energy sources recognised by the market as economically and technologically available, and their wide use in each country causes significant changes in existing technologies, infrastructure and management systems. Therefore, it can be assumed that these phenomena are identified with the first phase of energy transition, which is already underway. They trigger the emergence of new phenomena which contribute to complex interactions of many technologies, development of new business models and new technologies, a new situation for many industry associations or discussions on public goods and services or common goods [Markard, 2018, pp. 628–633].

A growing need for transformations in economies, related to the current energy transition and activities aimed at reducing greenhouse gas emissions, is related to the need to finance investments connected with replacement of conventional energy

1 The term “sector” is used in the study in the context of industry rather than a three-sector economy.

sources used so far with renewable energy sources and other low- and non-emission sources, as well as – due to the dispersion and low stability of these sources – with demand for investments in power infrastructure (including distribution and transmission) and flexible conventional generation capacity [Wiśniewski, 2025, pp. 83–94].

It should be noted that it is often assumed that the energy transition results from the state and dynamics of changes in the structure of the (electro) energy mix of the economy, which is one of the three aspects included in a broad definition of energy transformation by Grubler [2004]. Such an approach to the study of the energy transition phenomenon directly takes into account the issue of transformation of energy sources and generation capacity, while the accompanying aspects, in particular the issue of transformation of transmission and distribution infrastructure, are considered in this approach only indirectly [Wiśniewski, 2025]. Despite a diversity of national economies and their energy mixes, the transformation of energy sources in the global economy focuses on the paradigm of replacing fossil fuels, which are carbon-intensive energy sources, with zero-emission sources, including primarily RES, which is referred to as decarbonisation. The scale and pace of this process vary. The International Energy Agency (IEA) postulates that "each country should find its own path" in the energy transition [IEA, 2023, p. 6]. In this respect, it should be noted that while each of the CEE economies follows its own way due to the heterogeneous structure of their energy mixes, their actions follow the common framework of the EU energy policy, determined by international and EU climate policy, which is intended to promote the development of renewable energy sources (which is also the EU's treaty paradigm).[2] Moreover, according to the conducted research, besides national strategies supporting the development of RES and the market effects of regulatory tools in the field of CO2 emission allowances under the EU ETS, the growing share of RES in the energy mix of the CEE countries has also been affected in recent years by external phenomena, such as rising prices of fossil energy resources [Mróz, Niedziółka, Wiśniewski, Witkowski, Wojtkowska-Łodej, 2023].

Moving on from the causes to the effects of the growing share of RES, it should be noted that another study showed that among the CEE economies – as a rule – a lower average level of stock electricity prices[3] was common in recent years in the countries with a higher share of RES in the structure of electricity mix, while in the countries where the share of RES in the mix was relatively low, higher energy prices were in force. How-

2 Cf. Article 194 (1c) of the Treaty on the Functioning of the European Union [Official Journal of the European Union, C 326, 26.10.2012]. The paradigm of promoting renewable energy sources and increasing their importance is also in line with the sustainable development goals adopted by the UN SDGs. One of the specific goals of SDG7 is to significantly increase the share of energy from renewable sources in the global energy mix by 2030 [UN, 2025].

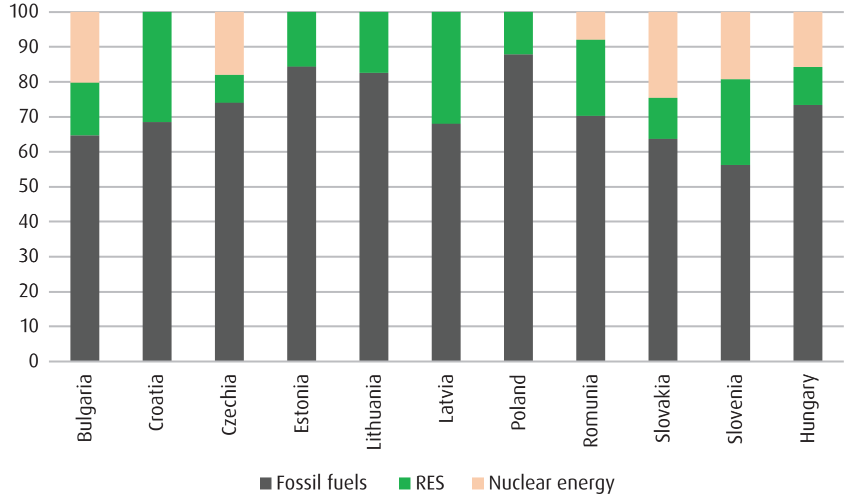
3 Day-ahead prices.

ever, exceptions to this rule were also observed, such as the Polish economy, which, despite a significant dominance of fossil fuels in the (electro) energy mix, recorded some of the lowest stock prices of electricity. The study also showed that in CEE countries with significant generation capacity in the case of RES, the CO2 emissions of the economy are significantly lower [Mróz, Niedziółka, Wiśniewski, Witkowski, Wojtkowska-Łodej, 2024]. In addition to the aforementioned issues related to the causes and effects of the growing importance of RES, it is also worth noting that one of the key aspects of the decarbonisation of economies is to be the electrification of transport, which may result in the replacement of fossil fuels with RES generated electricity. This is a specific paradigm of the current energy transition, which has been an important foundation of the EU energy and climate policy for a long time.

Comparative analysis of energy mix, including the diversity of RES development dynamics in the CEE economies

The energy mix in the CEE economies in terms of primary energy consumption is structurally differentiated between countries, with fossil fuels (coal, oil and natural gas) playing a dominant role everywhere.

Figure 1. Structure of energy mix in CEE economies in 2023 (%)



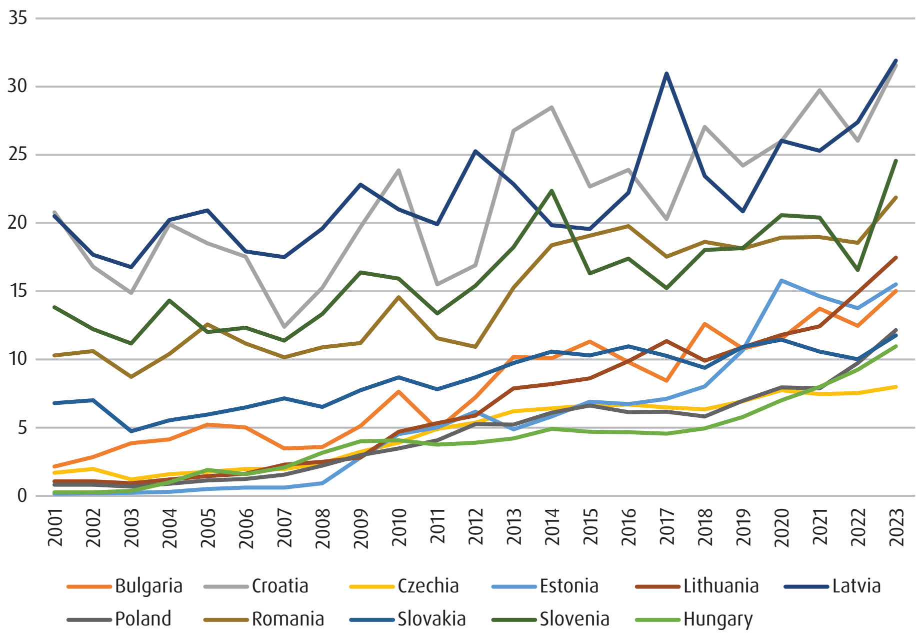
Notes: the energy mix is presented in terms of primary energy consumption by the entire economy; fossil fuels include coal, oil and natural gas, while RES consist of all non-fossil energy sources (including hydropower) excluding nuclear energy.

Source: Authors' own compilation based on the Energy Institute data [2024].

The highest dependence on these fuels is recorded in Poland (almost 88%), Estonia (almost 85%) and Lithuania (over 82%), while the lowest dependence is in Slovenia (56%). The share of RES ranges from 8% (Czechia) to almost 32% (Latvia, Croatia), with the majority of CEE countries at the level of several percent, with the regional average of 18.3%. It is also worth noting that only six of the 11 economies in the region have nuclear energy (Bulgaria, Czechia, Romania, Slovakia, Slovenia and Hungary), which accounts for 8–25% of their total energy mix.

A characteristic feature of all economies is an explicitly growing share of RES. It should be noted that in some CEE countries, sources classified as RES may include hydropower from various types of hydroelectric power plants, including pumped-storage power plants. Currently, the highest share of RES in the region overall energy mix is in Latvia and Croatia (over 31%), while the lowest level has been recorded in recent years in Czechia (nearly 8%). As shown in Figure 2, the share of RES is growing in the long term in all CEE economies, but the dynamics of this growth is highly volatile.

Figure 2. Share of RES in the overall energy mix in CEE economies in 2001–2023 (%)



Notes: the energy mix is presented in terms of primary energy consumption by the entire economy; RES consist of all non-fossil energy sources (including hydropower) excluding nuclear energy.

Source: Authors' own compilation based on the Energy Institute data [2024].

The largest increase in the share of RES in the period 2001–2023 was recorded by Lithuania (+16.4), Estonia (+15.4) and Bulgaria (+12.9 pp), with the Estonian economy also achieving the highest growth rate, measured by a compound annual growth rate (CAGR) of 23%. On the other hand, the smallest increase in the share of RES in the analysed period took place in Slovakia (+4.9) and Czechia (+6.3 pp), but it was the Croatian and Latvian economies that showed the lowest dynamics of such a growth (CAGR of about 2%). In Poland, the share of RES increased from only 0.8% in 2001 to 12.2% in 2023, i.e. by 11.4 pp, which is in line with the average calculated for all CEE economies (+11.1 pp). The dynamics of this growth in the Polish economy, measured by the CAGR value, amounted to an annual average of 13%, which translated into one of the four best results in the region (the share of RES grew faster only in Estonia, Hungary and Lithuania).

Table 1. Analysis of the dynamics of the share of RES in the overall energy mix in CEE economies in 2001–2023 (%)[*]

Country	Share of RES in 2001	Share of RES in 2023	CAGR in 2001–2023	Trend $y = ax + bw$ in 2001–2023	Country	Share of RES in 2001	Share of RES in 2023	CAGR in 2001–2023	Trend $y = ax + bw$ in 2001–2023
Bulgaria	2.2	15.0	9	$a = 0.0054$	Poland	0.8	12.2	13	$a = 0.0045$
Croatia	20.8	31.6	2	$a = 0.0059$	Romania	10.3	21.9	3	$a = 0.0055$
Czechia	1.7	8.0	7	$a = 0.0034$	Slovakia	6.8	11.8	3	$a = 0.0028$
Estonia	0.2	15.5	23	$a = 0.0074$	Slovenia	13.8	24.5	3	$a = 0.0042$
Lithuania	1.1	17.5	14	$a = 0.0072$	Hungary	0.3	11.0	18	$a = 0.0039$
Latvia	20.5	31.9	2	$a = 0.0044$					

[*] Except for trend indicators.

Source: Authors' own work.

The share of RES in the energy mix and economic growth in the light of scientific research

The literature review indicates[4] that some of the studies published so far focusing on the relationship between RES and economic growth and their mutual impact prove the existence of a cause-and-effect relationship between the share of RES in energy

[4] A review of publications from first and second quartile journals (according to the SJR index) published between 2010 and 2025. All publications referred to in this discussion (except one) had more than 100 citations.

mix and economic growth. However, the results of these studies are not universal as they are limited to selected economies. They remain ambiguous to some extent, also suggesting a two-way causality. With regard to the diversity in the level of share of RES in the CEE economies, what deserves special attention is the result of a study published in 2020 in *Energy Policy*[5] – one of the leading scientific journals dealing with energy policy. It suggests that the impact of renewable energy consumption on economic growth may depend on the level of RES use. It was noted that in the case of developing economies, positive effects are achieved only after exceeding a certain threshold of RES in the energy mix, while below this level their impact is negative. Importantly, however, from the perspective of Poland and other CEE countries, the study suggests that while this feature applies to developing economies, in the case of OECD economies[6], a linear positive impact of RES on economic growth is identified [Chen, Pinar, Stengos, 2020]. Another study of OECD economies, published in 2022 in the prestigious scientific journal Energy7, indicates that such a conclusion should be more nuanced. Its authors note that, as a rule, the consumption of energy from renewable sources is conducive to economic development. Nevertheless, they indicate that the OECD economies with lower general country risk operate in a more stable environment, in which the use of RES has a greater positive impact on economic development [Wang, Dong, Li, Wang 2022]. This conclusion suggests that the effectively positive impact of RES on economic growth in the OECD countries is in a sense conditional.

A study conducted by Ntanos et al. [2018] on selected European economies considers a moderating role of a factor other than the general risk profile for a given economy. It suggests that the correlation between the use of renewable energy sources (renewable energy consumption) and economic growth is stronger in countries with higher GDP. Interestingly, quite opposite conclusions, referring to the moderating role of the level of economic development (the level of GDP), can be drawn from the research of Singh, Nyuur and Richmond [2019] describing a different group of economies. They indicate that the use of renewable energy has a positive impact on economic growth, and this impact is stronger in developing countries (i.e. those with lower GDP levels) than in developed countries.

It is also worth citing research conclusions which suggest a two-way causality of the growing importance of RES and economic growth [Bhuiyan et al., 2022; Halkos, Gkampoura, 2020]. According to Apergis and Danuletiu [2014], the correlation

---

5 Impact Factor 9.3 (Journal Citation Reports 2023; cf. https://www.sciencedirect.com/journal/energy-policy).

6 OECD member states from the CEE region are (in alphabetical order): Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia; and Bulgaria, Croatia and Romania currently have a candidate status [cf. OECD, 2025].

7 Impact Factor 9.0 (Journal Citation Reports 2023; cf. https://www.sciencedirect.com/journal/energy).

between RES consumption and economic growth indicates that renewable energy contributes to economic growth, and economic growth encourages more use of RES. In connection with this two-way relationship, Kazar and Kazar [2014] presented an interesting conclusion, claiming in particular that in the short term there is a two-way cause-and-effect relationship between RES production and economic development, while in the long term the relationship between them is non-directional, as in this case economic development leads to an increase in the production of energy from renewable sources.

Methodological and taxonomic (definitional) issues also deserve to be emphasised. Referring to all studies and analyses covering the issue of the interdependence of the share of renewable energy sources in the energy mix and economic growth, in addition to the obvious differences possible in research methodology, special attention should be paid to how renewable sources are defined. While wind and solar energy can always be classified as RES, hydropower and biomass are not, due to the fact that some types of these generation capacities are not strictly renewable, and what is more, they can also be emission sources [Mróz et al., 2024].

Regardless of these conclusions and methodological differences, it should be noted that previous studies covering different countries or groups of countries and different time ranges implied a positive impact of the use of RES on economic growth and a negative impact, resulting, for example from the need to incur large capital costs related to the development of RES, and even the lack of causality between energy consumption and economic growth [Chen et al., 2020]. Therefore, the study of the impact of RES on economic growth should always account for the specific current context of the described interdependence or causality.

Empirical analysis of the impact of RES on economic growth in the CEE region in 2001–2023

In the face of the global energy transition, the growing importance of RES is becoming a key issue from the perspective of economic policy and macroeconomics. The CEE countries are intensively modernising their energy sectors, which may have significant consequences for the dynamics of economic growth. This study focuses on the analysis of the impact[8] of energy transition and decarbonisation on the economies of the region, with particular emphasis on the share and growth rate of RES,

[8] Analysis of dependencies (interdependencies) and causality leading to the achievement of specific objectives (d–e) indicated in the introduction.

which in the case of the CEE countries are highly diversified (see Figures 1–2). In this respect, there is a significant heterogeneity of trends between each country, which reflects differences in energy policies, available resources and the pace of implementation of the green transition.

The study is based on the Granger causality panel tests, allowing to determine the direction of relationship between the share of renewable energy sources in the energy mix (ETI), and the rate of change of this share (ETR) and economic growth, i.e. GDP growth. The confirmation of causation (in the Granger sense) justifies treating ETI/ETR as growth drivers in a GDP growth model based on a panel of countries representing a specific region. This analysis covers data from 2001 to 2023 for 11 CEE economies. The growth model accounts for key macroeconomic indicators of both physical and human capital, in particular investment, inflation, unemployment and government spending. The presence of a lagged logarithmic GDP per capita in the equation is an emanation of the beta GDP convergence hypothesis, and the introduction of time effects into the model is not only necessary for its correct estimation, but also allows for the observation of the crisis and boom periods in the CEE economies. The data used for the estimation come from international databases, including the International Monetary Fund and the BP/EI Statistical Review of World Energy.

The study consists of two stages:

1) in the first one, the Granger causality tests were carried out to identify the very fact and the potential direction of the interaction between the share and rate of change of the share of RES and GDP growth;
2) in the second stage, the dynamic model of economic growth was estimated in a panel approach, accounting for the impact of renewable energy sources and other determinants of economic growth.

As part of the analysis, the following research results were obtained.

Granger causality tests

The results of the Granger tests confirm the existence of a causal relationship between the share of renewable energy sources and economic growth, which justifies the inclusion of this variable in the GDP growth model (Wald test = 48.577; $p < 0.01$). This means that the increase in the share of RES in the energy mix can significantly support the dynamics of the economy. A reciprocal effect was also observed – a higher level of GDP is conducive to greater investments in renewable energy sources (Wald test = 54.972; $p < 0.01$), which suggests that economic development stimulates further energy transition. In the case of the variable defined as the total share of nuclear energy and RES in the energy mix, no significant causality was found with respect to economic growth (Wald test = 1.5950; $p = 0.2066$). This means that the total share of RES and nuclear energy did not have a statistically significant impact on the GDP growth in the CEE countries in the analysed period. However, the opposite relationship was observed – a higher level of GDP increases the willingness of countries to invest in both renewable energy sources and nuclear energy (Wald test = 18.5950; $p < 0.0001$).

GDP, on the other hand, has a significant impact on the dynamics of the energy transition (Wald test = 4.1495; $p = 0.0416$), which means that a higher level of GDP is a factor accelerating the rate of change in the structure of the energy mix towards RES. A clear relationship applies to the transformation involving in particular both renewable sources and nuclear energy (Wald test = 11.1043; $p = 0.0009$), suggesting that macroeconomic stability is conducive to investment in low-carbon technologies with a long return horizon. At the same time, the impact of ETR growth on GDP was not statistically confirmed (Wald test = 1.7342; $p = 0.1879$). This means that although economic growth contributes to a faster energy transition, the pace of changes in the structure of energy mix does not have a direct impact on GDP growth in the short term. The results obtained indicate that the process of dynamic energy transition may be a side effect of economic development, but not necessarily its catalyst in the short term. The long-term effects of ETR on GDP may depend on the structure of energy investments and policies that support technological innovation and energy efficiency.

To sum up, the results of analysis confirm the legitimacy of the inclusion of the share of RES in the economic growth model, pointing to their important role as a factor supporting the development of economy. At the same time, the extension of this model to include nuclear energy is not confirmed in the light of the results obtained.

Estimation of the growth model

The confirmation of causality hypothesis indicates the legitimacy of estimation of the GDP growth model, in which the share of RES in the energy mix was considered as one of the factors. The estimation was carried out with the (one-step) Blundell – Bond GMM system estimator. The model took into account the previously indicated growth factors, which were treated as endogenous components (temporal effects were considered to be exogenous factors). For the estimation, one- and two-period lags (as well as three-period lags in the benchmark model) were used as instruments. The limitation of the sample clearly indicates the need for robust estimation errors.

Model 1. The impact of RES on GDP growth

The analysis showed a significant positive impact of the share of RES on economic growth (coefficient = 0.0592; $p < 0.01$). It is confirmed by the conclusion based on the Granger causality tests, increased share of RES in the energy mix is conducive to economic development. This may result from increased energy efficiency, increased investment in modern technologies and improved energy security, for example due to the diversification of energy sources and partial independence of foreign suppliers.

Furthermore, Table 2 indicates that

- investments have a significant positive impact on GDP (coefficient = 0.0016; $p < 0.01$), which is consistent with classical theories of economic growth emphasising the key role of capital accumulation in the case of long-term economic activity;
- inflation has a significant negative impact on GDP growth (coefficient = –0.0017; $p < 0.01$), which confirms that price increases reduce the purchasing power of consumers and destabilise the conditions for doing business;
- unemployment rate also has a negative impact on GDP (coefficient = –0.0030; $p < 0.01$), which indicates a loss of potential production resulting from unused labour resources;
- government spending is negatively correlated with GDP (coefficient = –0.0012; $p < 0.05$), which may suggest that a greater state intervention in the economy hinders growth – it is confirmed by the hypothesis of the effectiveness of private sector in generating growth;
- the applied model points to the existence of strong GDP convergence in the CEE countries (of a relative nature).

Table 2. Estimation coefficient values in Model 1

Variables	Coefficient	Standard error	*z*-value	*p*-value
Lagged lnGDP	0.9438	0.0151	62.41	0.000
Investments	0.0016	0.0005	2.93	0.003
Inflation	−0.0017	0.0004	−4.00	0.000
Unemployment rate	−0.003	0.0009	−3.10	0.002
Government spending	−0.00012	0.0005	−2.42	0.016
Share of RES	0.0592	0.0225	2.62	0.009

Source: Authors' own work.

The results of the Arellano – Bond test (Table 3) indicate a significant first-order autocorrelation ($p = 0.0264$), which is consistent with the assumptions concerning dynamic models, but there is no significant second-order autocorrelation ($p = 0.0543$), which confirms that the specification of the estimated model is correct.

Table 3. Results of the Arellano–Bond autocorrelation test in Model 1

Autocorrelation order	*z*-value	*p*-value
First order	−2.2205	0.0264
Second order	−1.9247	0.0543

Source: Authors' own work.

In conclusion, the results show the stability of the model and its compliance with the theory of economic growth, at the same time confirming that RES are an important element in shaping the long-term dynamics of economy.

Model 2. Joint impact of RES and nuclear energy on GDP growth

Extending the model to include a variable covering both RES and nuclear energy did not show a significant impact on economic growth (coefficient = –0.0072; $p = 0.837$), which confirms the conclusions of the Grangers causality analysis. The potential reasons why GDP growth depends on the share of RES in the energy mix and the extension of this share to nuclear energy does not show statistical significance can be found in such economic factors as:

- a long payback period for investments in nuclear energy, which may make its impact on economic growth invisible in the short or medium term;
- high investment and regulatory costs in nuclear energy require significant capital expenditure and long-term financial commitment, which may limit the availability of funds for other, more flexible and faster infrastructure projects;
- possible institutional and social constraints that slow down the development of nuclear energy projects in some countries in the region.

However, it should be remembered that this can also be caused by the "dilution" of the key RES factor through its unjustified extension to nuclear energy.

Table 4. Estimation of the coefficient values in Model 2

Variables	Coefficient	Standard Error	*z*-value	*p*-value
Lagged lnPKB	0.9442	0.016	59.00	0.000
Investments	0.0019	0.0005	3.44	0.001
Inflation	−0.0018	0.0004	−4.26	0.000

cont. Table 4

Variables	Coefficient	Standard Error	z-value	p-value
Unemployment rate	−0.0027	0.0011	−2.52	0.012
Government spending	−0.0012	0.0004	−2.98	0.003
Share of RES and nuclear energy	−0.0072	0.0348	−0.21	0.837

Source: Authors' own work.

The results of the Arellano – Bond test (cf. Table 5) indicate a significant first-order autocorrelation ($p = 0.0262$), which is consistent with the assumptions concerning dynamic models. However, there is no significant second-order autocorrelation ($p = 0.0731$).

Table 5. Results of the Arellano – Bond autocorrelation test in Model 2

Autocorrelation order	z-value	p-value
First order	−2.2237	0.0262
Second order	−1.7921	0.0731

Source: Authors' own work.

Other variables in Model 2 lead to similar effects as in Model 1, which confirms the stability of the estimates and the consistency of results with the theory of economic growth.

Time effects and macroeconomic events

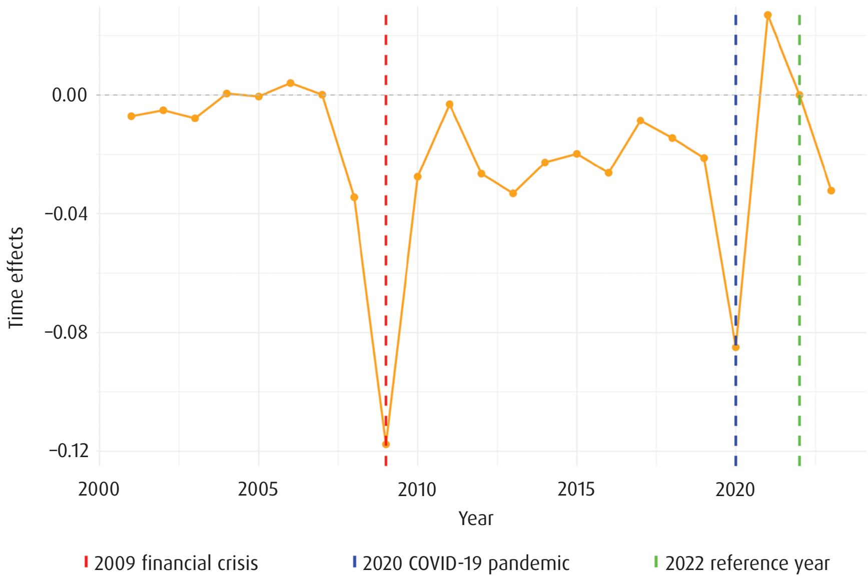
Accounting for time effects allowed to identify three key events affecting the economies of the region in the analysed period (Figure 3):

- 2009 – the global financial crisis resulted in a significant slowdown in growth,
- 2020 – the COVID-19 pandemic caused a sharp collapse in GDP,
- 2022 – adopted as a neutral reference point for time effects.

These results confirm that the CEE economies were vulnerable to macroeconomic shocks, which is reflected in the estimated models.

Taken together, the results of the study provide evidence that the energy transition towards renewables can contribute to economic growth in the CEE countries. No significant effect in the case of the combined share of RES and nuclear energy in the energy mix indicates the need for further research on the optimal structure of energy mix. These results can provide valuable guidance for policymakers in shaping energy and economic strategies.

Figure 3. Time effects and macroeconomic events



Source: Authors' own work.

Conclusions and recommendations

The change in the energy mix consists in replacing fossil energy carriers with renewable energy sources and other low- or non-emission generation capacity. However, this does not mean that such conditions will not change in the future in light of the development potential of energy storage technologies or hydrogen economy.

The assessment of the role and impact of RES on the economy of each CEE country, i.e. the analysis and attempt to answer the question of how the processes of energy transition and decarbonisation (increase in the share of RES and its dynamics in energy mixes) affected the development of economies, suggests that the share of RES in the overall energy mix of the economy is an important factor supporting its development. In addition, a reciprocal effect has also been observed, according to which a higher level of economic development (GDP) is conducive to greater investment in renewables, indicating that economic development stimulates further energy transition. On the basis of the analysis, it may be stated that while economic growth contributes to a faster energy transition, the pace of changes in the structure of the energy mix does not have a direct impact on GDP growth in the short term. It means that the process of dynamic energy transition may be a side effect of economic development, but not necessarily a catalyst in the short term. The long-term effects of energy transition rate (and thus the pace of change in the energy mix) on GDP may depend on the structure of investments in the energy sector and on policies supporting technological innovation and energy efficiency. It should be noted that the analysis does not allow analogous conclusions to be drawn with regard to the total share of renewable energy sources and nuclear energy, which requires further in-depth research.

In addition, the analysis carried out for the CEE countries confirmed that as part of economic growth modelling, the increase in the share of RES in energy mix, besides the level of investment in the economy, is conducive to economic development. It may result from increased energy efficiency, increased investment in modern technologies and improved energy security through diversification of energy sources or partial independence from foreign suppliers. However, the results obtained should be interpreted with some caution, because – as indicated above – the study of the impact of RES on economic growth should always take into account the relevant current context of the analysed interdependence or causality.

The analysis of the share and growth rate of RES in the CEE economies allows us to conclude that there is a significant heterogeneity of both levels and trends between individual countries in this respect. This reflects differences in the initial structures of the economies analysed, the energy mix and energy policies, available resources or the pace of implementation of initiatives in the field of the so-called green transformation. The share of RES ranges from less than 10% (Czechia) to over 30% (Latvia, Croatia), with the CEE countries reaching a level of several percent with a regional average of just over 18%. A characteristic feature of all the analysed economies is the long-term growing share of RES, but the dynamics of this growth is characterised by high volatility (from the lowest in the Croatian and Latvian economies to the highest in the Estonian and Hungarian economies, with the base effect playing an important role in this case). The largest increase in the share of RES in the years 2001–2023 was recorded by the economies of Lithuania, Estonia and Bulgaria, while the smallest was recorded by the economies of Slovakia and Czechia.

In Poland, the share of RES increased from just under 1% in 2001 to over 12% in 2023, which is in line with the average increase calculated for all the CEE countries (+11.1 percentage points). The dynamics of this growth in the Polish economy, measured by CAGR, amounted to an annual average of 13%, which is one of the four best results in the region (the share of RES grew faster only in the economies of Estonia, Hungary and Lithuania). When examining the structural differentiation of energy mixes in the CEE countries in terms of the share of RES, it is also worth pointing to the diversity of their economies dependence on fossil fuels, which RES are gradually replacing. In this case, it should be noted that the highest dependence on these fuels is observed in Poland, Estonia and Lithuania, while the lowest in Slovenia (in all the CEE economies, however, these are still the dominant fuels, accounting for more than half of the share in the energy mix).

The macroeconomic effects of RES development in the economies of CEE countries can be summarised as follows:

- The energy transition towards climate neutrality, expressed in the ongoing decarbonisation processes and the growing importance of RES in CEE countries, has an impact, according to the study, on the economic growth. At the same time, GDP growth is conducive to investments in renewable energy sources and structural changes in the energy mix.
- The growing use of renewable energy sources in the CEE countries may translate into a reduction in greenhouse gas emissions and improved energy security through greater use of local, renewable energy sources and a reduction in dependence on imports of fossil energy carriers.

In the light of the conducted research on further directions of RES development and economic growth, specific recommendations can also be formulated to support effective transformation, including energy policy in the region.

According to the research, the process of energy transition and decarbonisation in CEE, reflected in the growing share of RES in the energy mix, shows a general upward trend. At the same time, significant differences are observed between the countries in the region – both in terms of the current pace of growth of the importance of RES and the current level of their share in the energy structure. It means that, on the one hand, each country pursues its own unique path of development, and on the other hand, regional cooperation is necessary for an effective transition towards a clean and inclusive energy future, which is a serious challenge in the current reality.

Attention should be primarily paid here to huge financial challenges faced by this process. According to some estimates, the investment needs of the EU economies in the transformation of the energy sector alone (excluding other sectors of economy) may reach even more than USD 7 trillion by 2050 [Wiśniewski, 2025, pp. 83–94]. It should be noted that the CEE economies, and in particular the Polish economy, account for a significant part of this demand. For example, in the case of Poland, it is estimated that the cost of achieving the objectives of the EU energy policy may amount to over EUR 500 billion [Kardaś, 2023], and the planned expenditures on the energy transition in the coming years alone (2026–2030) and only in relation to the power sector are estimated at PLN 328 billion [Ministry of Climate and Environment, 2024]. In this connection, not only will national public and private financial resources be important for the implementation of investments in RES, but also EU funds and support programmes implemented under national energy policies.

Other supporting policies will also be important from the perspective of further development of RES in the CEE region, such as research and development policy focused on technological innovations, including the energy sector, policy to support activities in favour of energy efficiency or energy poverty prevention policy.

In the further course of current energy transition and decarbonisation, it will be important to effectively coordinate and manage the processes of structural changes in the area of energy management, as part of the transition from the current to the future economic model based on clean energy technologies. Finding appropriate solutions in the ongoing energy transition process is important not only with regard to climate change, but also the development of the region economies, their competitiveness and security and well-being of citizens.

The study shows that while a higher share of RES in the energy mix has a positive impact on the economic growth in the CEE countries (for example, by increasing investment in modern technologies or creating new jobs related to the transition to clean forms of energy), the process of further development of RES and striving for zero-emission (decarbonisation) of economies faces many economic and social challenges.

References

Apergis, N., Danuletiu, D.C. (2014). Renewable Energy and Economic Growth: Evidence from the Sign of Panel Long-Run Causality, *International Journal of Energy Economics and Policy*, 4(4), pp. 578–587.

Bhuiyan, M.A., Zhang, Q., Khare, V., Mikhaylov, A., Pinter, G., Huang, X. (2022). Renewable Energy Consumption and Economic Growth Nexus – A Systematic Literature Review, *Frontiers in Environmental Science*, 10. DOI: 10.3389/fenvs.2022.878394.

Chen, C., Pinar, M., Stengos, T. (2020). Renewable Energy Consumption and Economic Growth Nexus: Evidence from a Threshold Model, *Energy Policy*, 139, 111295. DOI: 10.1016/j.enpol.2020.111295.

Energy Institute (2024). *Statistical Review of World Energy* (73rd ed.).

Grubler, A. (2004). Transitions in Energy Use. In: *Encyclopedia of Energy* (vol. 6, pp. 163–177), C.J. Cleveland (Ed.). Amsterdam: Elsevier.

Halkos, G.E., Gkampoura, E.C. (2020). Reviewing Usage, Potentials, and Limitations of Renewable Energy Sources, *Energies*, 13(11), 2906. DOI: 10.3390/en13112906.

International Energy Agency (2023). *World Energy Outlook 2023*. Paris: IEA Publications.

Kardaś, S. (2023). *From Coal to Consensus: Poland's Energy Transition and Its European Future. The European Council on Foreign Relations*, https://ecfr.eu/publication/from-coal-to-consensus-polands-energy-transition-and-its-european-future/#summary (accessed: 28.03.2025).

Kazar, G., Kazar, A. (2014). The Renewable Energy Production-Economic Development Nexus, *International Journal of Energy Economics and Policy*, 4(2), pp. 312–319.

Markard, J. (2018). The next phase of the energy transition and its implications for research and policy, *Nature Energy*, 3(8), pp. 628–633. DOI: 10.1038/s41560-018-0171-7.

Ministerstwo Klimatu i Środowiska (2024). *Projekt Krajowego Planu w dziedzinie Energii i Klimatu do 2030 r. – wersja do konsultacji publicznych z 10.2024 r. wraz z prognozą oddziaływania na środowisko z 02.2025 r.*, https://www.gov.pl/web/klimat/projekt-krajowego-planu-w-dziedzinie-energii-i-klimatu-do-2030-r--wersja-do-konsultacji-publicznych-z-102024-r (accessed: 28.03.2025).

Mróz, M., Niedziółka, D., Wiśniewski, T.P., Witkowski, B., Wojtkowska-Łodej, G. (2023). Bezpieczeństwo energetyczne krajów Europy Środkowo-Wschodniej wobec procesu dekarbonizacji i transformacji rynków energii. In: *Raport SGH i Forum Ekonomicznego 2023* (pp. 219–240), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (ed.). Warszawa: Oficyna Wydawnicza SGH.

Mróz, M., Niedziółka, D., Wiśniewski, T.P., Witkowski, B., Wojtkowska-Łodej, G. (2024). Znaczenie odnawialnych źródeł energii w kreowaniu współczesnego bezpieczeństwa energetycznego gospodarek państw Europy Środkowo-Wschodniej. In: *Raport SGH i Forum Ekonomicznego 2024* (pp. 209–232), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (ed.). Warszawa: Oficyna Wydawnicza SGH.

Ntanos, S., Skordoulis, M., Kyriakopoulos, G., Arabatzis, G., Chalikias, M., Galatsidas, S., Batzios, A., Katsarou, A. (2018). Renewable Energy and Economic Growth: Evidence from European Countries, *Sustainability*, 10(8), 2626. DOI: 10.3390/su10082626.

OECD (2025). *Members and Partners*, https://www.oecd.org/en/about/members-partners.html (accessed: 17.03.2025).

Singh, N., Nyuur, R., Richmond, B. (2019). Renewable Energy Development as a Driver of Economic Growth: Evidence from Multivariate Panel Data Analysis, *Sustainability*, 11(8), 2418. DOI: 10.3390/su11082418.

Traktat o funkcjonowaniu Unii Europejskiej (consolidated version, Official Journal of the European Union, C 326, 26.10.2012, pp. 1–390).

UN (2025). *SDG: Ensure access to affordable, reliable, sustainable and modern energy*, https://www.un.org/sustainabledevelopment/energy/ (accessed: 17.03.2025).

Wang, Q., Dong, Z., Li, R., Wang, L. (2022). Renewable Energy and Economic Growth: New Insight from Country Risks, *Energy*, 238 (C), 122018. DOI: 10.1016/j.energy.2021.122018.

Wiśniewski, T.P. (2025). Transformacja energetyczna Polski i pozostałych gospodarek unijnych – potrzeby inwestycyjne a potencjał finansowania. In: *Współczesne problemy międzynarodowej polityki gospodarczej. Dylematy integracji europejskiej* (pp. 83–94), G. Wojtkowska-Łodej (ed.). Warszawa: Oficyna Wydawnicza SGH.

INVESTMENT CLIMATE IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

Kamil Gemra
Piotr Zaborek
Aneta Waszkiewicz
Przemysław Konieczka
Szymon Okoń

DOI: 10.33119/978-83-8030-742-1.225_241

Abstract

This chapter analyses the impact of selected global events – the COVID-19 pandemic, the outbreak of war in Ukraine and the 2024 US presidential election – on the capital markets of Central and Eastern European (CEE) countries. The study applies the event study methodology and cross-sectional regression models accounting for market liquidity and potential structural regional segmentation. The empirical findings demonstrate heterogeneous market responses, the war in Ukraine had the most adverse effects, the COVID-19 pandemic had a moderately negative and the US election moderately positive impact. A higher market liquidity is associated with lower exposure to destabilisation, emphasising the role of portfolio investments as a sensitive indicator of financial system responsiveness to external shocks. The introduction of a binary segmentation variable enabled the identification of groups of countries whose response was similar, suggesting the existence of subregional patterns of risk perception across the CEE region. The results carry significant policy implications, highlighting the need to further integrate capital markets, improve their liquidity and strengthen resilience to global disturbances.

Authors

Kamil Gemra – PhD, Assistant Professor, Collegium of Business Administration, Warsaw School of Economics. Lecturer at MBA studies. Capital market and investor relations advisor. Experienced member of supervisory boards of private companies listed on the Warsaw Stock Exchange and State Treasury companies. Winner of the student competitions Inspiration of the Year 2022 and Inspiration of the Year 2023. In professional and scientific work, he deals with corporate financing, bond market and investor communication.

Piotr Zaborek – Professor at SGH, Department of International Business, SGH Warsaw School of Economics, where he teaches research methods, statistical analysis and computer analysis of quantitative data. Specialises in structural modelling and multivariate static analysis using the R and Python software and popular statistical packages such as SPSS, AMOS and Stata. His research interests include issues concerning the relationship between operational and financial efficiency of enterprises and business models, organisational culture, innovation management and corporate social responsibility (CSR). He has also conducted research on new concepts in marketing such as value co-creation and service dominant logic. Visiting professor at Pepperdine University in Los Angeles and at Richmond University.

Aneta Waszkiewicz – PhD, Assistant Professor, Department of International Finance, Vice-Dean of the Collegium of World Economy, SGH Warsaw School of Economics. Lecturer at all levels of education. Carried out a project financed by the National Science Centre (NCN) entitled "Alternative financing of SMEs in Poland – development prospects". Her research focuses on international finance, financial innovation, including innovative sources of financing, especially crowdfunding, social innovation, as well as international financial markets. She is the author and co-author of articles, as well as books and book chapters on securitisation, shadow banking, financial market risk, financial innovation and crowdfunding. She has cooperated as an expert with scientific and research institutions, including the National Science Centre (Poland) and the Centre for Research and Analysis of the Financial System ALTERUM (Poland). Member of the Academy of International Business (AIB), the Editorial Board of the *International Journal of Health Economics and Policy*.

Przemysław Konieczka – PhD, Assistant Professor, Institute of International Economics, SGH Warsaw School of Economics. His research interests include capital markets in Poland and worldwide, including alternative investments (private debt, commercial real estate, etc.) and the issue of asset allocation by financial institutions, behavioural finance and corporate financial strategies.

Szymon Okoń – PhD, Assistant Professor, Institute of International Economics, SGH Warsaw School of Economics. His research interests include legal and financial aspects of the capital market, regulatory aspects of the financial market as well as financial strategies of enterprises and transactions on the capital market, including those involving private equity funds and venture capital funds.

Global changes – such as pandemics, armed conflicts or key political events in the world's largest economies – have been the subject of intensive research in relation to their impact on financial markets for years. The literature analyses the responses of capital markets to external economic, political or health shocks [Alfaro, Chari, Greenland, Schott, 2020; Liu, Manzoor, Wang, Zhang, Manzoor, 2020; Del Giudice, Paltrinieri, 2017]. In the conducted research, special attention was paid to portfolio investment flows, which, unlike foreign direct investment (FDI), are characterised by higher liquidity and susceptibility to the volatility of investor sentiment. Their scale and direction are largely determined by the perception of systemic risk and global volatility, which makes them a kind of barometer of the investment climate [Fernandez-Arias, Hausmann, 2001; Broner, Didier, Erce, Schmukler, 2013].

In this respect, Central and Eastern Europe (CEE) seems to be a particularly interesting research area. Although the countries in the region are formally integrated into global capital markets – many of them have joined the European Union (EU) and some have also joined the euro area – they are still classified as emerging markets, exposed to periodic capital outflows in an environment of heightened uncertainty [Becker et al., 2010; Koepke, 2019]. The fluctuating responses of CEE markets to global shocks may therefore reflect not only different economic foundations, but also a relative importance of portfolio investments and their sensitivity to external stimuli.

The aim of this study is to empirically verify the impact of three key events – the outbreak of the COVID-19 pandemic, the beginning of Russia's invasion of Ukraine and the 2024 US presidential election – on the performance of capital markets in selected CEE countries, i.e. Poland, Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia, Slovenia and Poland. The research deals with the period 2019–2024.

The analysis focuses on the volatility of rates of return on stock market indices, being aggregates of portfolio investors' expectations, which is to enable the assessment of investment attractiveness in the short and medium term. The study is part of the literature describing the information efficiency of markets and responses to exogenous shocks [Baur, Lucey, 2010; Bouri, Jain, Roubaud, Kristoufek, 2020], and at the same time raises the issues of internal cohesion of the region and potential differences in its investment structure.

In the study, we seek answers to the following research questions:

1) Is the CEE area homogeneous, or are the countries of the region significantly different from each other with regard to the impact of global shocks on the investment climate?
2) How did stock markets in CEE countries react to global shocks such as the COVID-19 pandemic, the war in Ukraine and the US presidential election?
3) Can we observe significant differences in the volatility of stock market in each country in response to these shocks?
4) Do the stock markets of the CEE countries react differently to the aforementioned events than the stock markets in Western Europe?

Unlike previous research, which focused mainly on single markets or comparative approaches with developed markets [Jaworski, 2021; Borowski, 2022], this study brings a new value to the consideration of the presented issue through a simultaneous analysis of the responses of stock markets from 14 countries applying the event study method and regression models allowing for the identification of systematic determinants of cumulative abnormal rates of return (CAR). In this way, it fills the research gap regarding a comprehensive regional approach to the vulnerability of CEE markets to global shocks.

The main thesis of the paper is an assumption that the CEE countries – despite the common experience gained from the political transformation and similar regulatory frameworks – do not form a homogeneous investment area and their responses to external shocks are diversified. The results of empirical analysis indicate explicitly that markets with higher liquidity and higher turnover like Poland or Hungary are less susceptible to disturbances and more often generate positive CAR values. At the same time, the use of a binary variable allowing for the classification of markets according to their level of institutional integration and investor structure translated into a significant increase in the predictive power of the regression model, which points to the existence of subregions with different risk perception characteristics. These findings provide an important contribution to the consideration of international portfolio capital flows and the resilience of emerging markets to systemic shocks.

Research methodology

The research makes use of the event study approach to assess how markets react to specific events with a potentially significant impact on asset valuations. The subject of the analysis was changes in the selected stock indices in response to three key events which occurred in a specific time horizon. First, daily data on the value of indices for each capital market and data on the core index (S&P 500) were collected and daily rates of return on these markets in the analysed period were calculated. In the next step, using the pre-event period (the so-called estimation window) in the range of –105 to –5 calendar days before each event, the so-called normal rates of return were determined on the basis of the market model, where the current rate of return of a given market is explained by the rate of return of the underlying index.

In order to estimate the "normal" rates of return, a market model was used, in which it is assumed that for each stock market *i* the daily rate of return $R_{i,t}$ is described by the equation:

$$R_{i,t} = \alpha_i + \beta_i R_{S\&P500,t} + \varepsilon_{i,t},$$

where α_i (*alpha*) is a free term, interpreted as a part of the rate of return independent of the movements of the entire market, while β_i (*beta*) measures the sensitivity of the rate of return of the stock market to changes in the S&P 500 underlying index.

Coefficient $\beta_i > 1$ indicates that the stock market reacts more strongly than the reference market, while $\beta_i < 1$ suggests less susceptibility to index fluctuations. In a situation where α_i takes a significantly positive value, we can talk about generating above-average rates of return (beyond what the market explains), while negative α_i means a tendency to obtain rates of return lower than expected. The values of α_i and β_i then allow to determine the "normal" rates of return during the event period and compare them with the observed rates, which enables the calculation of unforeseen deviations.

The difference between the actual rate and the estimated rate of the model gave the so-called abnormal returns, which were then added up within the estimation window, on the basis of which the cumulative abnormal returns (CAR) could be calculated during the post-event period. For each of the three events considered, a time period of the same length was determined, covering the period from –105 to –5 calendar days preceding the event from which the data needed to estimate the model of "normal" rates of return were taken, and the period of 30 days following the event for which the deviated rates of return were calculated. The next stage of analysis was an attempt to create a regression model for the previously presented grouped cross-sectional data in order to identify additional systematic factors which – in addition to the average turnover – could have affected the CAR values. Although the adopted method of estimating "normal" rates of return implicitly took into account many macroeconomic features and political factors which were different on each market studied, the introduction of these variables into the model did not increase its predictive properties. Therefore, an attempt was made to divide the analysed markets into two subgroups and to include such a variable in the model. The approach used here was exploratory, focused on finding such a dividing line of 14 markets that would allow for the greatest possible increase in the ability of the base model (taking into account only standardised logarithms of average turnover in the analysed markets) to predict CAR. For this purpose, 9907 zero-one variables were created, representing all possible ways of dividing 14 markets into two groups, based on the formula for the number of possible combinations. Each binary variable was then included in a baseline regression (considering logarithmic rotation and binary variables representing the events in question) to create a new model and estimate its parameters.

Results of the analysis of impact of selected events on the analysed markets

The results of the analysis of events are presented below in three separate tables containing the parameters of market models, the cumulative deviations from the "normal" rate of return (CAR) and the total rate of return in the period of 30 days after the occurrence of the event. The result is a comparison of the strength and direction of responses of different markets to key events over the period under review, accounting for the differences in the performance of emerging and developed markets.

Table 1 presents the results of analysis of the impact of the COVID-19 pandemic on the stock indices of the analysed markets. The date of the event was 11 March 2020, i.e. the moment when the pandemic was declared by the World Health Organisation. The outbreak of the COVID-19 pandemic became a subject of wide interest in the literature, which resulted in numerous papers attempting to quantify its impact on stock markets [Jaworski, 2021; Liu et al., 2020; Alfaro et al., 2020]. However, the COVID-19 pandemic was not the first health crisis whose impact on stock indices was studied. Previous publications include a paper by Delisle [2003], who described the impact of the SARS epidemic on Asian stock indices or an article by Del Giudice and Paltrinieri [2017], documenting the impact of Ebola infections on African stock indices.

Table 1. Results of the event analysis for the beginning of the COVID-19 pandemic (11 March 2020)*

Market	α	β	CAR (%)	Total rate of return over the event period (%)	Average daily turnover during the event period (EUR thousands)
Bulgaria	−0.033	0.040	−9.152	−9.98	281.510
Croatia	−0.136	0.222	−0.557	−4.86	2454.497
Czechia	−0.140	0.329	−3.670	−7.96	32 187.104
Estonia	0.031	0.225	−13.130	−12.90	2068.814
Hungary	−0.081	0.471	−9.221	−12.03	57 809.795
Latvia	−0.041	0.122	3.499	0.03	65.751
Lithuania	−0.026	0.332	1.287	−5.33	899.436
Poland	−0.205	0.469	4.991	−1.21	266 572.995
Romania	−0.026	0.371	−5.060	−6.79	9912.880
Slovakia	0.034	−0.017	−9.616	−8.68	13.432
Slovenia	−0.026	0.211	−3.593	−5.09	2502.815
DAX	−0.170	0.551	6.754	0.85	6 549 698.973
FTSE	−0.140	0.577	2.829	−1.97	6 898 767.938
NASDAQ	0.074	1.024	−0.843	−2.29	55 063 884.190
SP500				**−3.21**	

* Market model estimation period: from –105 to –5 days before the event; event period: 30 days after the event.

Source: Authors' own work.

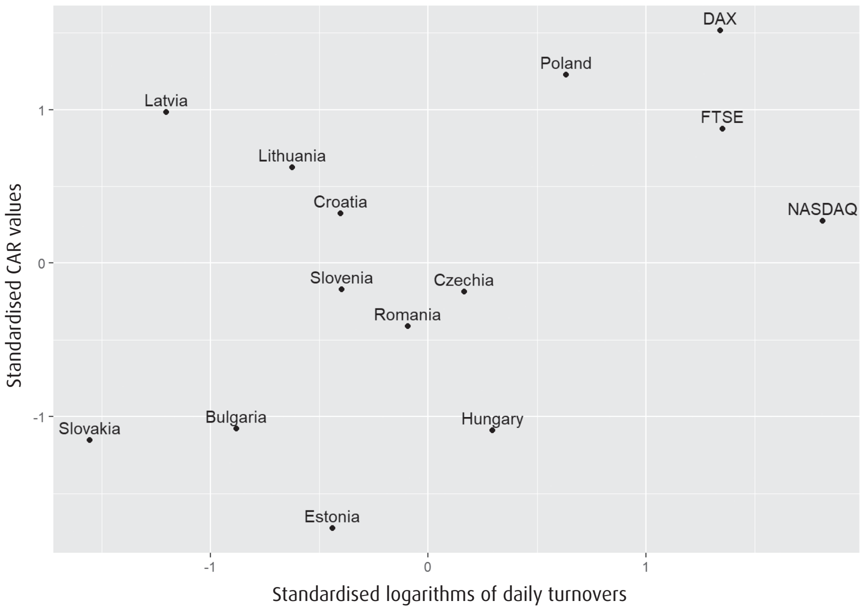
The data presented in Table 1 indicate that the largest difference between the actual rate of return during the event period and the model rate of return in the analysed CEE countries was in Estonia and amounted to 13.13%. Large differences could also be observed in Bulgaria, Slovakia and Hungary, where CAR came up to over 9%. Interestingly, the stock markets in Lithuania, Latvia and Poland recorded a positive CAR, which means that during the period of disruption caused by the COVID-19 pandemic, they achieved a higher rate of return than would result from the extrapolation of trend based on correlation with the S&P 500 index in the period of one hundred days preceding the event. It is worth noting that out-of-trend returns do not have to be positive in the absolute sense – they are only better than expected. This is evident when comparing the columns containing the CAR values and the total returns during the event period – only two markets (Latvia and DAX) recorded a slight increase. The special positions of Lithuania and Latvia may be due to the fact that they are small and low-liquidity stock markets. The case of Poland is less explicit, but a relatively small negative rate of return would suggest that the losses resulting from the exposure of the Polish stock market to the effects of the COVID-19 pandemic were assessed by investors as less significant than in most other markets. The answer to this question can be found in the way restrictions are introduced and low effectiveness of detecting new cases in our country. Moreover, the Polish stock market has been struggling with structural problems for years. These include the actual dismantling of Open Pension Funds in 2014 or the serious crisis of investor confidence in 2018–2020, related to the so-called GetBack scandal [Rogowski, Gemra, 2018], as a result of which a negative attitude towards the market intensified while expectations regarding future rates of return declined. An expression of negative sentiment, irrespective of changes in global stock markets, is the largest negative α ratio among the analysed countries. The response to the announcement of the COVID-19 pandemic may have displaced the previous prejudices against the Polish market, which were the source of such expectations. A negative effect was further mitigated by a relatively strong positive correlation with the S&P 500 market (reflected in the β factor), as mature markets performed better than extrapolating the trend would indicate.

The cases of Lithuania, Latvia and Poland may also lead to the conclusion that there was no widespread trend of capital outflows from emerging markets in order to mitigate the risk arising from negative events during the period under review. Apparently, investors were selective about it.

The data shown in Figure 1 indicate that the market size is an important determinant of the CAR value. The positive correlation suggests that markets with higher volumes have weathered the shock of the COVID-19 pandemic more smoothly. This applies primarily to the markets of Western Europe and Poland.

Below, we present the results of the analysis of the impact of Russia's invasion of Ukraine, which began on 24 February 2022. This event had a significant impact on the economies and financial markets in Europe at the time due to several key issues. Firstly, it was the first full-scale armed conflict in a European country neighbouring the EU and NATO countries. It should be noted here that after the annexation of Crimea by Russia in 2014, a further escalation of hybrid warfare was taken into account, but over the years the risk of a larger armed conflict decreased. Secondly, Russia's invasion of Ukraine caused a big surprise among investors, despite predictions and announcements by intelligence agencies, resulting from the large concentration of Russian troops on the border with Ukraine. It resulted in a large sell-off in stock markets across Europe on the day of invasion, which resulted from the materialisation of high risk aversion and investors' concerns about the further escalation of the conflict to other European countries as well as the impact of a long-term conflict on economies weakened by the pandemic period. These concerns were particularly related to the dependence of European economies on imports of raw materials from Russia as well as agri-food and metallurgical products from Ukraine. The potential impact of sanctions imposed on Russia on a further increase in inflation in Europe and globally, already high after a period of strong stimulation of economies weakened by the COVID-19 pandemic, was also significant. The results of the analysis are presented in Table 2.

Figure 1. Relationship between standardised logarithms of average daily turnover and standardised CAR values for the "beginning of COVID-19 pandemic" event (Pearson correlation coefficient $r = 0.47$)



Source: Authors' own work.

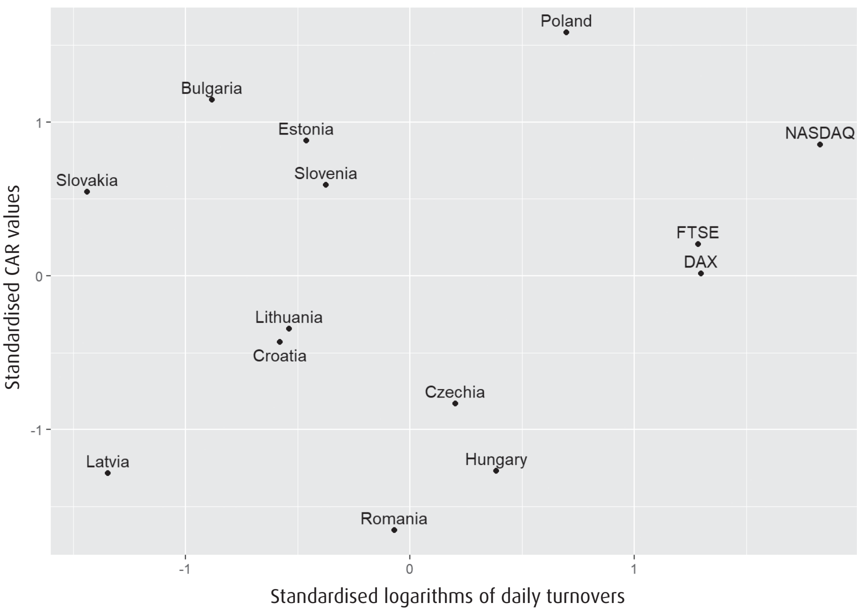
Table 2. Results of the event analysis for the outbreak of war in Ukraine (24 February)*

Market	α	β	CAR (%)	Total rate of return over the event period (%)	Average daily turnovers during the event period (EUR thousands)
Bulgaria	0.061	0.033	1.712	2.79	377.335
Croatia	0.087	0.133	−5.583	−3.01	1471.775
Czechia	0.103	0.206	−7.438	−4.19	48 153.033
Estonia	−0.009	0.291	0.477	0.89	2478.925
Hungary	−0.030	0.214	−9.453	−10.46	109 647.751
Latvia	0.005	−0.003	−9.524	−9.87	47.441
Lithuania	−0.012	0.119	−5.173	−4.71	1759.273
Poland	−0.050	0.156	3.727	2.54	441 161.824
Romania	0.167	0.284	−11.241	−5.98	14 351.146
Slovakia	0.037	0.017	−1.058	−0.25	31.616
Slovenia	0.101	0.244	−0.858	2.74	3669.160
DAX	−0.012	0.317	−3.519	−2.23	6 490 286.994
FTSE	0.072	0.163	−2.642	−0.2	6 069 124.609
NASDAQ	−0.088	1.387	0.357	8.68	69 478 422.910
SP500				**7.52**	

* Market model estimation period: from –105 to –5 days before the event; event period: 30 days after the event.
Source: Authors' own work.

The analysis of the impact of outbreak of war in Ukraine on stock markets suggests that investors' reactions may have been affected by the geographical distance from the place of conflict. It is indicated by the highest and clearly positive total returns for US indices (S&P 500 and NASDAQ). Market liquidity did not matter as much here as in the case of the COVID-19 pandemic, which is confirmed by the negative performance of the DAX and FTSE indices and low correlation between CAR and market size ($r = 0.16$), which is illustrated in Figure 2. It seems that the key factor here was difficult anticipation of the course of conflict and its effects on the global economy – while investors had to deal with disruptions caused by epidemics or financial crises in the past, the armed conflict in Europe involving one of the nuclear powers was unprecedented. A varying scale of unfavourable responses may be a consequence of the expected negative effects of the sanctions introduced, for example, as a result of energy dependence on Russia (Hungary, Romania and Slovakia) and the perception of some countries as potential future targets of Russian aggression (Lithuania and Latvia). In particular, the Latvian stock market had the lowest (after Romania) cumulative abnormal rate of return (–9.52%). On the other hand, CAR positive result for Poland may have resulted from the removal of direct threat to our country as a result of Russian failures on the front (although the threat related to the Baltic states could still be considered significant) and lower exposure to sanctions due to relatively weak economic ties with Russia. The results concerning the Polish stock market are also related to a strong increase in the quotations of companies from the so-called war industries, related to the arms or food industries, in the window after the event. The results of analysis are consistent with observations made by other authors examining the impact of the conflict on financial markets [see Borowski 2022].

Figure 2. Relationship between standardised logarithms of average daily turnovers and standardised CAR values for the "outbreak of war in Ukraine" event (Pearson correlation coefficient *r* = 0.16)



Source: Authors' own work.

The data presented in Table 3 show that the largest difference between the actual rate of return during the event period and the model rate of return in the examined CEE countries was in Hungary and amounted to 7.49% (positive result). The second market with the highest positive abnormal rate of return was Poland (3.73%). Other markets which performed higher than the correlation trend extrapolated with the S&P 500 index in the period of one hundred days prior to the event were Slovenia, Croatia, Czechia and Latvia. On the other hand, the highest negative abnormal rates of return were observed in Lithuania (– 2.76%) and Bulgaria (– 2.35%). Other countries which performed worse than could be extrapolated from the correlation trend with the S&P 500 in the period of one hundred days prior to the event included were Romania, Estonia and Slovakia.

Table 3. Results of the event analysis for Donald Trump's victory in the US presidential election (5 November 2024)*

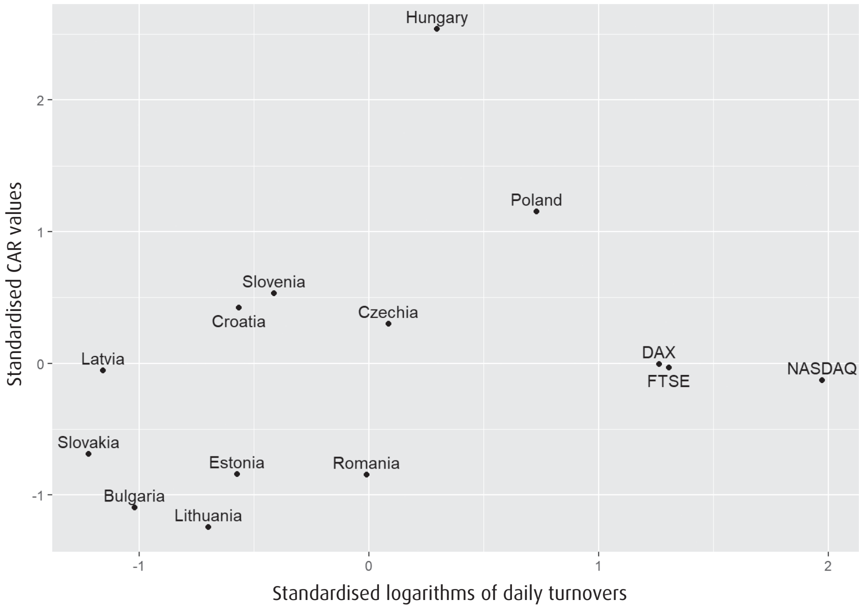
Market	α	β	CAR (%)	Total rate of return over the event period (%)	Average daily turnovers during the event period (EUR thousands)
Bułgaria	−0.04	0.252	−2.35	−0.41	137.090
Chorwacja	0.107	0.033	1.758	2.75	1018.089
Czechy	0.006	0.383	1.424	2.07	18 286.838
Estonia	−0.03	0.199	−1.661	−1.29	983.035
Węgry	−0.024	0.289	7.49	6.33	46 686.034
Łotwa	−0.065	0.101	0.467	−0.59	74.471
Litwa	0.066	0.175	−2.756	−0.38	564.860
Polska	−0.172	0.543	3.733	1.71	316 009.097
Rumunia	−0.109	0.281	−1.68	−5.45	11 964.243
Słowacja	−0.011	−0.055	−1.253	−1.98	56.502
Słowenia	−0.079	0.398	2.062	1.97	2020.900
DAX	0.027	0.565	0.602	5.07	3 385 985.552
FTSE	−0.028	0.344	0.532	2.00	4 073 883.443
NASDAQ	−0.034	1.374	0.262	7.03	78 307 169.450
SP 500				**5.25**	

* Market model estimation period: from –105 to –5 days before the event; event period: 30 days after the event.
Source: Authors' own work.

The analysis of results in Table 3 shows a clear difference in the response of capital markets to Donald Trump's victory in the 2024 presidential election. Some stock markets recorded positive CAR values, which suggests that investors operating in these markets positively perceived possible changes in the US economic policy or took advantage of possible political risks in advance. Other markets responded with a decline, which could have been due to concerns about the protectionist actions of the presidential administration. It is worth noting that the highest positive CAR for Hungary and Poland also corresponds to the highest average daily turnovers observed in these markets. From the investment perspective, Donald Trump's victory could be identified by market participants with an opportunity to quickly end the war in Ukraine, and thus to stabilise the geopolitical situation in the region, as a result of which the most liquid markets became beneficiaries of the inflow of new capital and an exceptionally positive response.

A clue to the source of different responses is a conspicuous positive impact of market size and liquidity on the achieved rates of return. It seems that larger stock markets are more effective at absorbing political uncertainty, which is confirmed by positive CAR values in the case of, for example, DAX or NASDAQ.

Figure 3. Relationship between standardised logarithms of average daily turnovers and standardised CAR values for the event "Donald Trump's victory in the US presidential election" (Pearson correlation coefficient *r* = 0.33)



Source: Authors' own work.

The analysis of the CAR value and the total rate of return indicates that each market reacted differently to the analysed events. Some stock markets recorded clearly negative CAR, suggesting a negative impact of the event, while others showed smaller declines or even slight increases.

The analysed events were characterised by a varied total impact on the profitability of the reviewed markets. The average CAR value calculated for all markets and events amounted to –1.84%. The outbreak of war in Ukraine had the most negative impact on CAR (– 3.59%). The COVID-19 pandemic was associated with a 2.53% decrease in CAR values, while Donald Trump's victory in the presidential election had a minimally positive impact on the markets (0.62%).

The figures and Pearson's correlation coefficients presented above indicate that the market size was an important factor related to the value of CAR – positive correlations prove that markets with higher turnovers went through shocks more smoothly and in some cases were even able to turn the event into positive returns. It is consistent with the general hypothesis that higher liquidity and maturity of the market reduce its susceptibility to sharp and prolonged declines.

Varying correlation coefficients – from 0.16 for the outbreak of war in Ukraine to 0.33 for Donald Trump's victory in the presidential election to 0.47 for the outbreak of the COVID-19 pandemic – suggest that events with the potentially least predictable and most severe consequences are less mitigated by the market size. Such an event is exemplified by the war in Ukraine and the related risk of escalation, bringing a potentially catastrophic global conflict with it.

Donald Trump's victory in the 2024 election had 30-day effects which varied across markets, with some countries posting positive CARs and others negative. The markets with higher turnovers and capitalisation did generally better, which proves an important role of liquidity and global integration in absorbing political information.

Regression model for grouped cross-sectional data

As noted in the section on methodology, the data grouped by countries and events were used to estimate the regression equations summarising the analyses of impact of each event on CAR described in this study. Table 4 shows the baseline model, taking into account the standardised natural logarithms of euro turnovers and zero-one variables describing the event from which the observation originates. The base model was supplemented with a zero-one variable corresponding to the division of the analysed markets into two groups, which increased the model predictive ability to the greatest extent. In statistical terms, the resulting model was characterised by the lowest value of the AIC index and the highest value of the coefficient of determination *R2* among 9907 possible options.

The result model explains the 37.6% variance of CAR and indicates a positive effect of the value of trading in a market ($\beta = 0.64$), which means that larger or more liquid markets tended to achieve relatively higher (or less negative) abnormal rates of return in the period following the events under consideration.

In contrast to the base event (the war in Ukraine, for which there is no separate variable in the model), Trump's victory in the election was associated with a significantly higher CAR ($\beta = 0.92$, $p = 0.006$). The impact of the COVID-19 pandemic was not statistically much different from the impact of the war ($p = 0.430$).

Table 4. Regression model to explain the level of standardised CAR for each event

Predictors	Regression *coefficient* β	95% CI	*p*	Regression *coefficient* β	95% CI	*p*
Constant	−0.37	from −0.87 to 0.12	0.137	−0.90	from −1.47 to −0.33	**0.003**
Standardised logarithms of daily average turnovers	0.30	form 0.01 to 0.59	**0.044**	0.64	from 0.29 to 0.99	**0.001**
Event: COVID-19 pandemic	0.23	from −0.47 to 0.93	0.509	0.25	from −0.39 to 0.89	0.430
Event: Trump's Victory	0.88	from 0.18 to 1.58	**0.015**	0.92	from 0.28 to 1.56	**0.006**
Binary division of markets				1.02	from 0.34 to 1.71	**0.005**
Number of observations	42			42		
R^2 / R^2 adjusted	0.223/0.162			0.376/0.309		

Source: Authors' own work.

The introduction of a variable dividing markets into two groups had a statistically significant positive effect on CAR ($\beta = 1.02$, $p = 0.005$). Moreover, this variable had a stronger impact on the explanation of CAR than the volume of turnover itself. Markets in Group 1 (defined below) tended to achieve higher CAR, even after the adjustment for the impact of trading turnover and type of event.

The "binary division of markets" variable used in the above analysis represents a classification developed according to the following key:

- Group 1 (binary variable value = 1): Bulgaria, Croatia, Latvia, Lithuania, Poland, Slovakia and Slovenia;
- Group 0 (binary variable value = 0): Czechia, Germany (DAX), Estonia, United Kingdom (FTSE), Hungary, USA (NASDAQ) and Romania.

When attempting to interpret a binary variable, it should be borne in mind that the differences between the groups do not apply to the turnover values which have already been taken into account in the base variant of the model. Subgroups 1 and 0 are also heterogeneous irrespective of the euro in use, the level of GDP or different aspects of political stability and institutional maturity.

All markets classified in Group 1 are the countries which went through the economic transformation after 1990, and except for Poland, they are relatively small economies in the region, where a similar regulatory and investor environment may exist.

Some of the markets included in Group 1 (Latvia, Lithuania, Slovakia, Slovenia and Croatia) joined the euro area, while others underwent a similar EU accession process. Although Group 0 also includes the economies of the euro area (Germany, Estonia), it can be assumed that the countries in Group 1 are perceived by investors more uniformly in terms of the pace of institutional development and integration into the common market.

The markets listed in Group 1 may have a similar foreign investor structure and portfolio capital pressure level. The Polish market is the largest, but it is also characterised by a significant share of foreign investors interested in the CEE region as a whole. Similar risk perceptions and potential "bundled" capital inflows to these stock markets may lead to similar, in this case relatively more favourable, responses to global events, which was captured by the use of a binary variable in the regression model.

Conclusions and recommendations

The aim of this study was to empirically verify the impact of selected global shocks – the COVID-19 pandemic, Russia's invasion of Ukraine and Donald Trump's victory in the US presidential election – on the investment climate in the CEE countries. The analysis covered 14 countries. It applied the event study method and cross-sectional regression accounting for market variables, including the level of liquidity and belonging to separate structural groups.

As far as the answer to the first research question is concerned, the obtained research results explicitly indicate that the CEE region does not form a homogeneous investment area. The responses of capital markets in each country to global events varied in terms of direction and intensity. The volatility resulted not only from local economic foundations, but also from differences in the level of market liquidity and institutional perception. The use of a binary variable allowing to distinguish two groups of countries (e.g. Poland, Slovenia and Lithuania vs Romania, Czechia and Hungary), significantly increased the ability to explain the volatility of cumulative rates of return (CAR), which confirms the existence of sub-regional patterns of investment sensitivity.

With regard to the second research question, the analysis showed that the war in Ukraine triggered the most negative response from investors (average CAR = –3.59%), while the COVID-19 pandemic had a moderately negative impact on investor sentiment (CAR = –2.53%). The US presidential election, on the other hand, on the average, brought a positive response (CAR = +0.62%), which can be associated with expectations regarding foreign policy and potential geopolitical stability. Poland, Lithuania and Hungary were among the markets which were best at withstanding the analysed events – they often achieved higher CAR than those forecast based on models based on the S&P 500 index.

The third research question, concerning the differences in market volatility between the CEE countries, is also confirmed by the conducted analyses. Volatility (measured by CAR) was significantly higher in smaller and less liquid markets such as Estonia, Slovakia and Latvia. At the same time, positive correlations between the logarithm of average turnover and CAR values ($r = 0.47$ for the pandemic, $r = 0.33$ for the US election) indicate that market liquidity is a factor cushioning the effects of external shocks. Large capital markets, such as Poland and Czechia, were more stable and able to absorb negative information in the analysed period.

In relation to the fourth research question, a comparative analysis with the markets of Western Europe (DAX, FTSE) and the US (NASDAQ, S&P 500) revealed clear differences in the response to the discussed events. The CEE markets were more sensitive to regional factors (e.g. the war in Ukraine), while developed markets showed greater resilience or even positive responses in this respect (especially the NASDAQ after the announcement of the COVID-19 pandemic and the outcome of the US elections). This difference confirms that emerging markets are more susceptible to asymmetric risk perceptions, especially when risks are geographically close and difficult to estimate.

The results of the empirical analysis can be summarised as follows:

1) the CEE countries do not form a homogeneous group in terms of portfolio investor behaviour,
2) market responses to global shocks are asymmetric and depend on the nature of the event,
3) market liquidity has a stabilising function,
4) there are significant differences between emerging and developed markets with regard to risk perception.

Eventually, it is noteworthy that the study is an important contribution to the theory as well as practice related to investment activities. The presented results confirm that the analysis of portfolio investments – which is a sensitive indicator of investor sentiment – can be an effective tool in assessing the condition and reliability of capital markets in regions undergoing economic transformation. Further comparative studies from the dynamic perspective are needed. They should take into account not only volatility but also capital flows and their institutional and geopolitical determinants. The results have also significant practical implications –for investors allocating funds in the CEE region and for policy makers responsible for the development of local capital markets. They point to the need for increased liquidity, transparency and integration with global markets as a way to improve the resilience of financial systems to future global shocks.

References

Alfaro, L., Chari, A., Greenland, A.N., Schott, P.K. (2020). Aggregate and Firm-Level Stock Returns During Pandemics, in Real Time, *NBER Working Paper*, 26950.

Ang, A., Bekaert, G., Wei, M., (2007). The Term Structure of Real Rates and Expected Inflation, *NBER Working Paper*, 12930,

Baur, D.G., Lucey, B.M. (2010). Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold, *Financial Review*, 45(2), pp. 217–229.

Becker, T., Daianu, D., Darvas, Z., Gligorov, V., Landesmann, M., Pisani-Ferry, J., Sapir, A. (2010). *Whither Growth in Central and Eastern Europe? Policy Lessons for an Integrated Europe*. Brussels: Bruegel Blueprint Series.

Bekaert, G., Harvey, C.R., Lundblad, C.T. (2005). Liquidity and Expected Returns: Lessons from Emerging Markets, *NBER Working Paper*, 11413.

Borowski, K. (2022). Doświadczenia rynków finansowych po ataku Rosji na Ukrainę. In: *Polityka gospodarcza wobec współczesnych wyzwań* (pp. 39–68), M. Kaleta, M. Laska, D. Żukowska (ed.). Toruń: Akademia Kultury Społecznej i Medialnej w Toruniu.

Bouri, E., Jain, A., Roubaud, D., Kristoufek, L. (2020). Cryptocurrencies as an Asset Class? An Empirical Assessment, *Technological Forecasting and Social Change*, 144, pp. 155–168.

Broner, F., Didier, T., Erce, A., Schmukler, S.L. (2013). Gross Capital Flows: Dynamics and Crises, *Journal of Monetary Economics*, 60(1), pp. 113–133.

Del Giudice, A., Paltrinieri, A. (2017). The Impact of the Arab Spring and the Ebola Outbreak on African Equity Mutual Fund Investor Decisions, *Research in International Business and Finance*, 41, pp. 600–612.

Delisle, J. (2003). SARS, Greater China, and the Pathologies of Globalization and Transition, *Orbis*, 47(4), pp. 587–604.

Fernandez-Arias, E., Hausmann, R. (2001). Is Foreign Direct Investment a Safer Form of Financing?, *Emerging Markets Review*, 2(1), pp. 34–49.

Jaworski, P. (2021). Wpływ pandemii COVID-19 na główne indeksy giełdowe na świecie, *Zarządzanie Mediami*, 9(1), pp. 109–122.

Koepke, R. (2019). What Drives Capital Flows to Emerging Markets? A Survey of the Empirical Literature, *Journal of Economic Surveys*, 33(2), pp. 516–540.

Liu, H., Manzoor, A., Wang, C., Zhang, L., Manzoor, Z. (2020). The COVID-19 Outbreak and Affected Countries Stock Markets Response, *International Journal of Environmental Research and Public Health*, 17(8), 2800.

Rogowski, W., Gemra, K. (2018). Wpływ przypadku firmy GetBack na różne obszary polskiego rynku finansowego, *Kwartalnik Nauk o Przedsiębiorstwie*, 49(4), pp. 89–103.

CENTRAL AND EASTERN EUROPEAN COUNTRIES IN THE ARCHITECTURE OF NEW INTERNATIONAL ECONOMIC RELATIONS

Adam A. Ambroziak
Elżbieta Kawecka-Wyrzykowska
Dariusz Mongiało
Michał Schwabe

DOI: 10.33119/978-83-8030-742-1.243_285

Abstract

This study analyses significant changes in the architecture of international economic relations triggered by the pandemic and the war in Ukraine. These events have disrupted production and supply chains, highlighting the European Union's (EU) significant reliance on certain global trading partners. Central and Eastern European (CEE) countries also had to face the additional challenge of an unprecedented influx of forced migrants. The EU's gradual pursuit of strategic autonomy – by fostering independence from external partners and establishing industrial alliances – combined with migratory pressures, poses additional challenges for CEE countries that are now less resilient in financial and economic terms. The aim of this study is therefore to capture the changes in the position of CEE countries within the EU in the context of shifts in the architecture of new international economic relations. To this end, a statistical analysis was carried out on key indicators for state aid, trade in goods and services with external partners, and migration flows into CEE countries. The study found that CEE countries reacted differently to changes in global geopolitics. While successive multiannual financial perspectives largely determined the scope of intervention, the energy crisis had a profound impact on the main objectives of state aid policy. Trade in goods with non-EU countries and migration to CEE countries were heavily influenced by both Brexit and the war in Ukraine, while trade in services remained largely unaffected by these events. The results of the analysis suggest that, after more than 20 years of relatively stable development and economic growth within the EU, CEE countries should urgently begin to align their national interests with EU principles and policies. While keeping in mind the EU's exclusive competence in certain areas, they should employ all available measures to implement these policies efficiently.

Authors

Adam A. Ambroziak – Professor at SGH, Head of the Department of European Integration and Legal Studies, SGH Warsaw School of Economics. Specialist in EU internal market policy, EU industrial policy, state aid, EU cohesion policy, common commercial policy and the decision-making process in EU institutions. Head of Postgraduate Studies at the Warsaw School of Economics in Administration and Management, Professional Public Procurement and State Aid.

Elżbieta Kawecka-Wyrzykowska – Professor and long-standing Head of the Jean Monnet Chair of the European Union (currently Department of European Integration and Legal Studies), SGH Warsaw School of Economics. Specialist in international trade, the functioning of the World Trade Organization, EU budgetary policy and the European Green Deal.

Dariusz Mongiało – PhD, Assistant Professor, Department of European Integration and Legal Studies, SGH Warsaw School of Economics. Specialist in international trade in services, economics of the service sector, the functioning of the services market in the EU, lobbying and negotiation techniques.

Michał Schwabe – Professor at SGH, Department of European Integration and Legal Studies, SGH Warsaw School of Economics. In his research work, he focuses on the factors of economic migration, the causes of spatial segregation and the issues of sustainable development and digitalisation in the context of the competitiveness of economies. Advisor to international organisations and enterprises on global transformation projects.

A significant change in the architecture of international economic relations took place in connection with the COVID-19 pandemic and the war in Ukraine, when production and supply chains were interrupted, which revealed the high level of dependence of the European Union (EU) on certain trading partners in the world. This has strengthened protectionist and interventionist measures around the world, including in the EU, the US and China, and led to the introduction of new mechanisms to support domestic entrepreneurs, as well as the reversal of the current trends in trade and migration. At the same time, the EU, which usually acts reactively, only provided for some intervention in the market, with no financing earmarked at the EU level, which has resulted in distorted competition in the European single market, including Central and Eastern European (CEE) countries. The EU's strategic autonomy being gradually developed by making European entities independent of increasingly less trustworthy non-EU partners, and establishing industrial alliances, pose further challenges for the financially and economically weaker CEE countries. Migration issues are still a significant problem these countries are struggling with – related on the one hand to the outflow of highly qualified workers, and on the other hand (especially in recent years) to the influx of migrants, including illegal ones.

The study will therefore seek to capture changes in the position of CEE countries against the EU, as well as individual CEE countries vis-à-vis the entire group in terms of:

a) strategic autonomy built on the experience gained from the provision of state aid under the new EU industrial policy,
b) foreign trade in goods and services,
c) migration processes.

This involves answering the key question: How have changes in the architecture of new international economic relations affected the financial dimension of industrial policies, trade in goods and services, and the labour market through migration movements.

In the first part of the study, devoted to financial instruments of industrial policy, industrial state aid granted in CEE countries will be analysed for change in its intensity and the structure of supported objectives in crisis years. Then, in the context of trade in goods and services, the study will cover the international trade of CEE countries with non-EU countries. Its aim will be to answer the question of how – compared to other competitors – CEE countries have fared in foreign trade in both goods and services. In the field of migration, the analysis will focus on migration trends of CEE countries after the outbreak of the COVID-19 pandemic along with their consequences for the socio-economic situation of the region. In a further part of the study, the interpretation and discussion of the results will be presented, wrapped up with a summary and recommendations.

Methodology

The first part of the study, concerning financial instruments of industrial policy, refers to industrial state aid defined as financial support from public funds targeting certain undertakings (within the meaning of Article 107.1 TFEU), intended for one of five purposes:

1) environmental protection and energy efficiency,
2) research, development and innovation (RDI),
3) regional investments,
4) small and medium-sized enterprises (SMEs), including venture capital,
5) sectoral policy (not discussed in detail in this study).

In order to synthetically describe the involvement of member states in financial intervention on the market, the Revealed State Aid Intensity Index (RSAII) was used, which enables state aid intensity to be captured in relation to the EU-27 average [Ambroziak, 2024]. In addition, an analysis of the convergence of the objectives of industrial state aid granted with the EU-27 average was carried out using the State Aid Similarity Index (SASI) [Ambroziak, 2024].

The part on trade in goods and services presents a comparative statistical analysis of trade between CEE countries and non-EU partners. As far as trade in services is concerned, the statistics leave out transactions carried out by foreign service companies operating in a particular country.

In the layer on international migration, the study presents the results of the analysis of statistical data on migration flows and macroeconomic indicators, mainly from Eurostat and UN databases.

The period covered by the analysis includes the following turning points in the global governance architecture: fight against the COVID-19 pandemic and Brexit (2020–2021) and the war in Ukraine (from 2022) against the background of the preceding decade, i.e. 2010–2019 (with the exception of trade in services, for which, due to the availability and comparability of data, the period from 2014 on was assumed). In the part on migration, the time intervals slightly deviate from the above assumptions due to the availability of data and events that were relevant in the context of the phenomena studied.

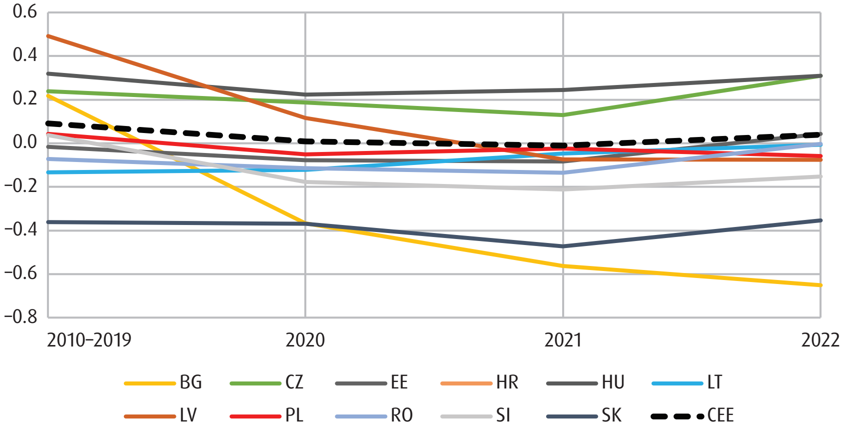
The study covers CEE countries of the EU: Bulgaria (BG), Croatia (HR), Czechia (CZ), Estonia (EE), Lithuania (LT), Latvia (LV), Poland (PL), Romania (RO), Slovakia (SK), Slovenia (SI) and Hungary (HU). In statistical analyses, the term EU is understood as the EU-27 (with Croatia from the date of accession and without the United Kingdom throughout the period under study).

Interventionism of CEE countries as a response to internal and external challenges

Intensity of financial intervention

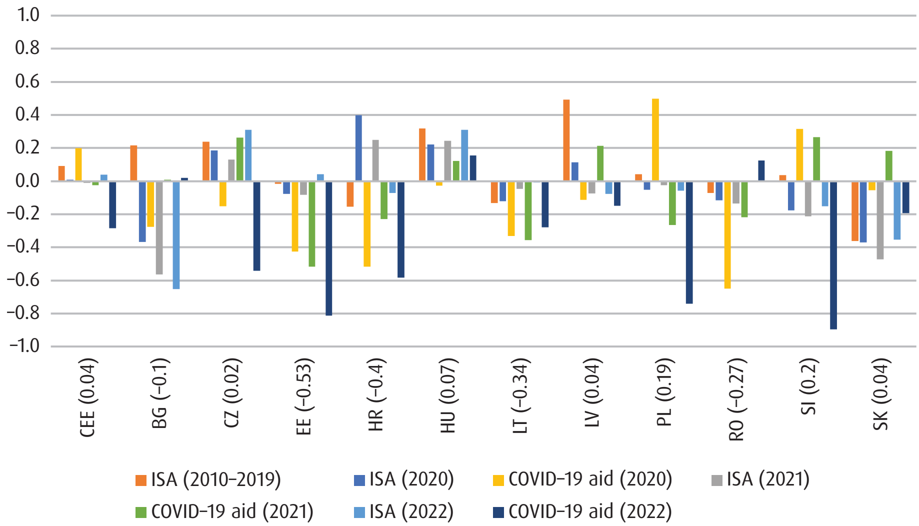
Over the reference period, i.e. 2010–2019, the intensity of industrial state aid in CEE countries was usually above the EU-27 average. At the beginning of the COVID-19 pandemic, the intensity of this support (excluding COVID-19 aid) decreased compared to the cumulative value for 2010–2019 and then started to increase from 2022 onwards. This was mainly attributable to Latvia and Bulgaria, and to a lesser extent to Estonia, Czechia, Poland and Slovenia. However, it is worth noting that only Estonia and Czechia recorded intensities above the CEE average, while all other countries recorded lower values (Figure 1).

Figure 1. Evolution of industrial state aid intensity (RSAII) in CEE countries in 2020–2022 against 2010–2019



Source: Authors' own compilation based on European Commission [2024] data.

Figure 2. Intensity of industrial state aid and COVID-19 aid in CEE countries in 2020–2022

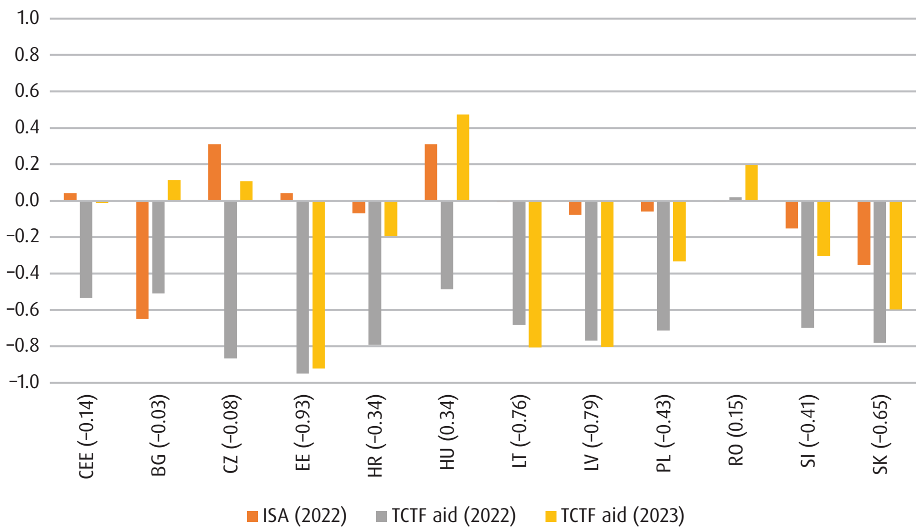


Notes: RSAII value for the years 2022–2023 is shown in parentheses on the horizontal axis.
Source: Authors' own compilation based on European Commission [2024] data.

The aforementioned decrease in the intensity of industrial state aid in the first year of the crisis period under review was correlated with a significant increase in the intensity of COVID-19 aid in CEE countries compared to the EU-27 average. This was mainly attributable to Poland and Slovenia, where this intensity significantly exceeded the characteristic indexes not only of CEE countries, but also of other EU member states. At the same time, in the same year, Croatia, Hungary and Czechia recorded a significant increase in the intensity of industrial state aid compared to the cumulative values for the previous decade (Figure 2). In the following year, the intensity of COVID-19 aid decreased markedly in Poland and slightly in Slovenia but increased in Czechia, Hungary, Latvia and Slovakia. In the case of the other CEE countries, a lower intensity of this category of aid was recorded, which overall meant average results at the EU-27 level for the entire analysed group. In 2022, the last period in which COVID-19 aid was available, CEE countries recorded a significantly lower intensity compared to the EU as a whole.

As a consequence of the budgetary constraints in CEE countries, the intensity of aid provided in connection with the war in Ukraine in 2022 decreased significantly, declining below the EU-27 average. Hungary, Romania, Bulgaria and Czechia recorded slightly higher intensity in the next year of the war (2023), while in the other CEE countries the intensity of the support provided was well below the EU average.

Figure 3. Intensity of industrial state aid and energy crisis aid in CEE countries in 2022–2023



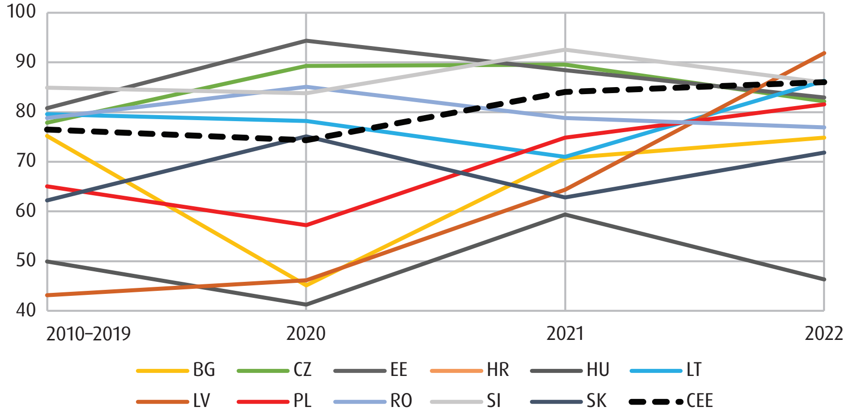
Notes: RSAII value for the years 2022–2023 is shown in parentheses on the horizontal axis.

Source: Authors' own compilation based on European Commission [2024] data.

Structure of industrial state aid

During the crisis period, from 2020, as a rule, CEE countries offered only partial aid for the purposes prevailing in the EU. In the reference years 2010–2019, Estonia, Czechia, Slovenia, Romania and Lithuania still exhibited a state aid similarity index above the CEE average; however, in the crisis years 2020–2022, most of the countries in the region moved away from EU targets, with a few exceptions: Poland, Bulgaria, Latvia and Hungary (Figures 4 and 5).

Figure 4. Evolution of the industrial state aid similarity index (SASI) in CEE countries in 2020–2022 compared to the period 2010–2019



Source: Authors' own compilation based on European Commission [2024] data.

In 2020–2022, the largest share of industrial state aid in the EU (Figure 5) was accounted for by support for environmental protection and energy transition objectives. Its level for CEE countries gradually increased not only in the run-up to the COVID-19 pandemic, but also during the pandemic and, understandably, during the war in Ukraine, to eventually exceed 54% of this state aid. Both the percentage and its change varied significantly between CEE countries. On the one hand, Bulgaria, Czechia, Estonia and Romania reached a level of around 70%, while on the other hand, Hungary recorded a share of 7–30%. As a rule, CEE countries recorded an increase in the share of this type of support compared to the pre-crisis years, but an analysis of its relative intensity (RSAII) indicates that the involvement of aid for this purpose is far below the EU average. In addition, it is worth noting that it was intended to provide, for example, production capacity, and not necessarily to drive changes aimed at the use of renewable energy sources (RES), as was the case in Poland [Ambroziak, Grzegorzewska, 2025].

Regional investment support was still an important category of aid in CEE countries. The share of this aid decreased in 2020 compared to its cumulative value in 2019–2020 and then remained relatively stable at 25–28% of industrial state aid, which is well above the result recorded in the EU (below 17%). As a general rule, during the crisis period, most CEE countries gradually abandoned this classic aid aimed at improving the investment attractiveness of the least developed regions by directly supporting entrepreneurs' new investments. One exception to this table was Hungary, where an increase in the share of this category of aid in the total value of industrial state aid could be observed. In terms of the relative intensity of the support provided, the years of the COVID-19 pandemic and the war in Ukraine did not significantly change this indicator compared to 2010–2019, and Hungary remained in the lead, along with Croatia and Poland (in third place). Other countries, including primarily Bulgaria, Slovenia, Slovakia, Lithuania, Latvia and Czechia, were phasing out their involvement in this simple investment aid over the crisis period.

RDI represented a much lower and decreasing share of industrial state aid in CEE countries during the crisis period (from 16 to 10%), as opposed to the trend followed by the EU-27 average (an increase from 12% to almost 16%). Ultimately, it was higher in the countries of the region than in the cumulative reference period 2010–2019 (12.3%). A downward trend was recorded mainly by the leaders, i.e. Slovenia, Czechia, Poland and Hungary, while a significant increase in the share of this support in industrial state aid was recorded by Lithuania and Estonia. Taking into account the relative intensity of this category of aid (in relation to the EU-27), it should be pointed out that in principle all CEE countries saw values below the average for the entire EU, with the exception of individual years in Hungary, Poland and Slovenia (and throughout the period under study in Czechia).

As for aid to SMEs, including venture capital, the share of this type of support in the EU was gradually increasing, also during the crisis period, to 4.5% in 2022, while in the CEE countries it was almost half of that in the EU-27. Both a relatively higher share of SME aid in industrial state aid and its relative intensity in the economy were achieved by Croatia, Lithuania, Latvia and Hungary, while the other CEE countries either did not spend public funds at all or did so to a very limited extent on this type of projects. A comparative analysis against the years 2010–2019 identifies the lack of a significant change in the level of these indicators, which shows that crisis phenomena had no or limited impact on this category of aid in CEE countries.

Figure 5. Change in the intensity (RSAII) and shares of the main categories of industrial state aid in CEE countries in 2020–2022 compared to the period 2010–2019

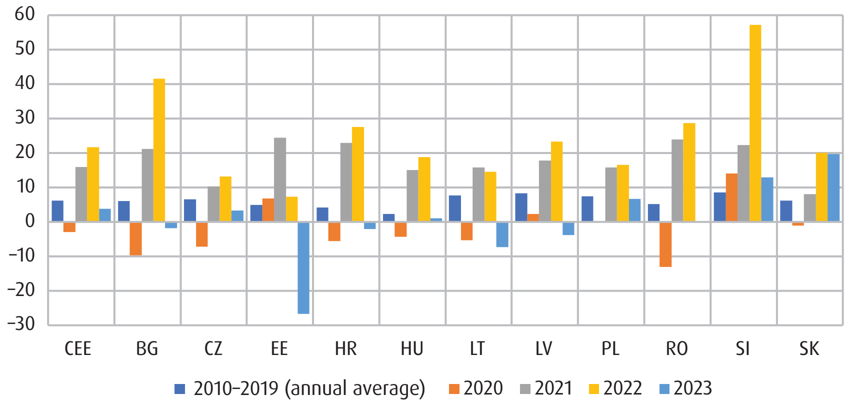
Source: Authors' own compilation based on European Commission [2024] data.

Changes in trade in goods of CEE countries with non-EU countries

Trade dynamics

Throughout the analysed period 2010–2023, the average annual growth rate of CEE countries' exports to non-EU countries was 8.4%, i.e. it was almost 70% higher than the average growth rate of external exports of the entire EU. Between 2010 and 2019, Slovenia, Lithuania, Latvia and Poland were relatively the largest extra-EU exporters, while Hungary was the worst performer (Figure 6). In 2020, exports decreased by 3% (except for Slovenia, Estonia and Latvia), only to more than make up for the losses in the next two years (especially in Slovenia). The following year saw a modest improvement in exports in most CEE countries, except for Estonia.

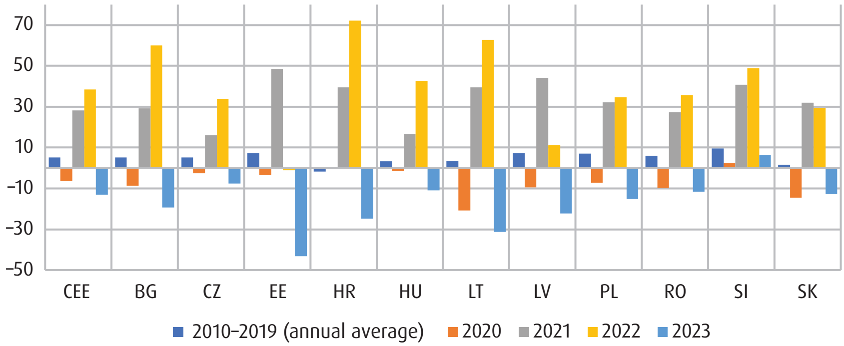
Figure 6. Average annual rate of change in CEE countries' exports in 2010–2023 (%)



Source: Authors' own compilation based on Eurostat-Comext data.

External imports of almost all CEE countries throughout the period 2010–2023 were characterised by a slightly lower growth rate than exports, reaching an annual average growth rate of 7% (Figure 7). In the pandemic year 2020, imports of CEE countries from non-EU countries decreased by 6% compared to the previous year, especially in Lithuania. The next two years were a period of very dynamic growth in imports, with increases of over 40% (in 2021) in Estonia, Latvia, Croatia, Lithuania and Slovenia and over 50% (in 2022) in Croatia, Bulgaria, Lithuania and Slovenia. In 2023, on the other hand, there was a collapse in imports, which decreased by an average of 13% across all CEE countries. The opposite situation was recorded in Slovenia, where imports increased once again.

Figure 7. Average annual rate of change in imports in CEE countries in 2010–2023 (%)

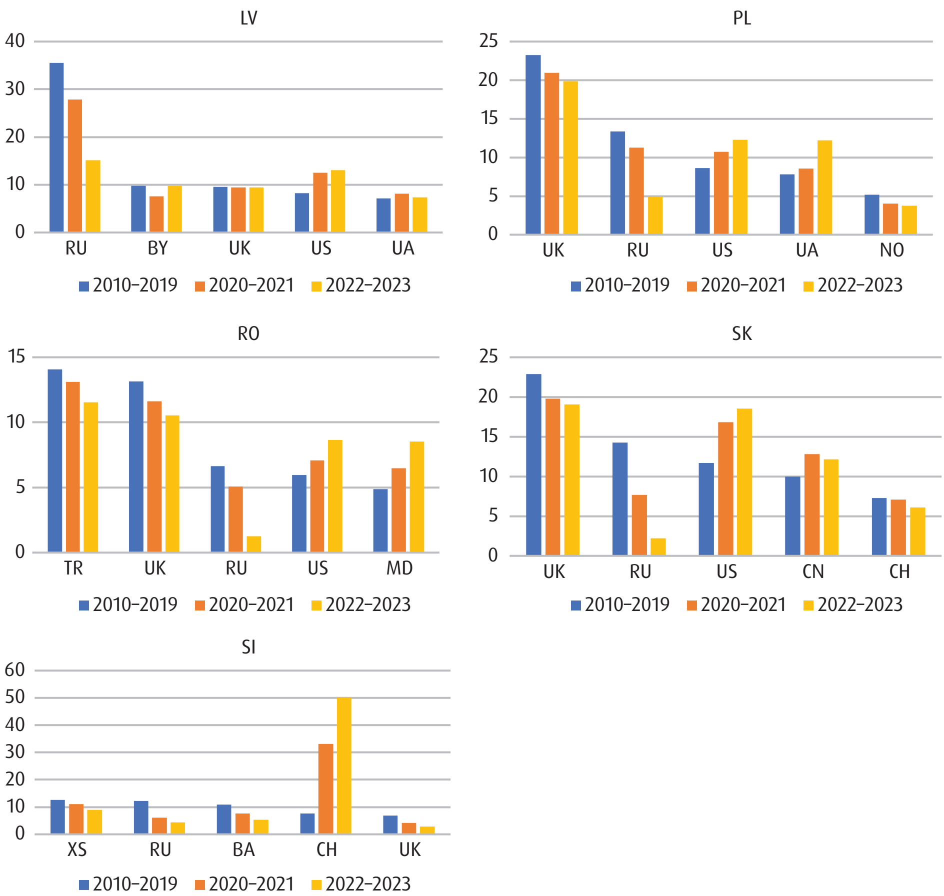


Source Authors' own compilation based on Eurostat-Comext data.

Geographical structure

The five main recipients of goods from CEE countries in 2010–2019 were the United Kingdom (UK), Russia, the USA, Turkey and Ukraine. Their total share amounted to over 52% of the total exports of CEE countries, which indicates a strong concentration of exports. The share of three of these countries (the UK, Turkey and especially Russia) fell in the following years, while in the case of the US and Ukraine it increased. These five countries were usually listed as the largest partners of each CEE country, albeit in different order (Figure 8). In all three analysed sub-periods, the largest share in CEE countries' exports was maintained, despite Brexit, by the UK, especially in the case of Czechia, Poland, Slovakia and Hungary. Until 2020, Russia was the main partner for the Baltic states (about a third of exports). Over the next four years, the country's share fell by about half, but Russia still remained the largest recipient of products from Lithuania and Latvia, and the second largest recipient of products from Estonia, though with a much smaller share than in the pre-pandemic period. For many years, Russia ranked second or third in exports of Czechia, Poland, Slovakia, Slovenia and Hungary with a share of several percent, but in the last two years its position significantly weakened. On the other hand, in most CEE countries (mainly in Poland and Czechia, as well as in Slovakia, Hungary, Lithuania and Latvia), the US share increased in the last few years compared to the 2010–2019 average. As far as Turkey is concerned, it was a relatively large recipient for several countries in the southern part of CEE (mainly Bulgaria and Romania). Ukraine's high position in total exports from CEE was influenced by its relatively large and rapidly growing share in exports from Poland, Romania and Slovakia, as well as its high stable share in exports from Hungary and other CEE countries, especially after Russia's aggression.

Figure 8. Five main export partners of CEE countries compared to the CEE-11 group and the EU in 2010–2023 (%)

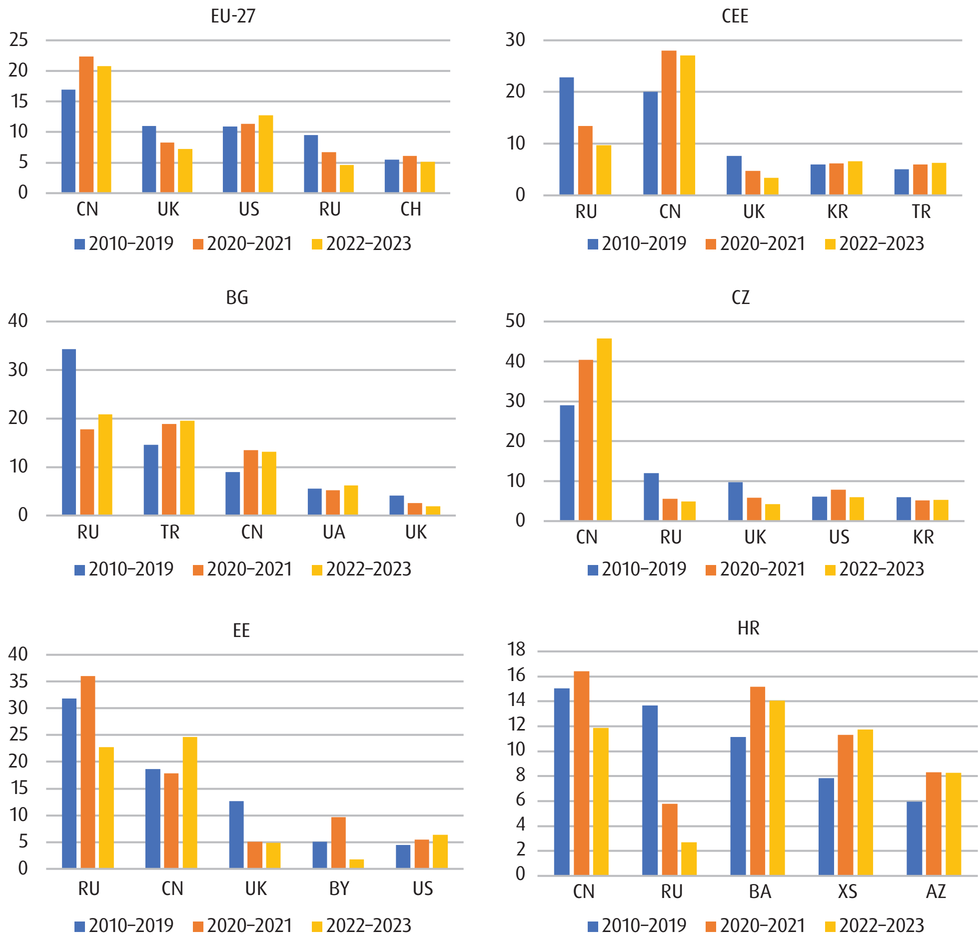


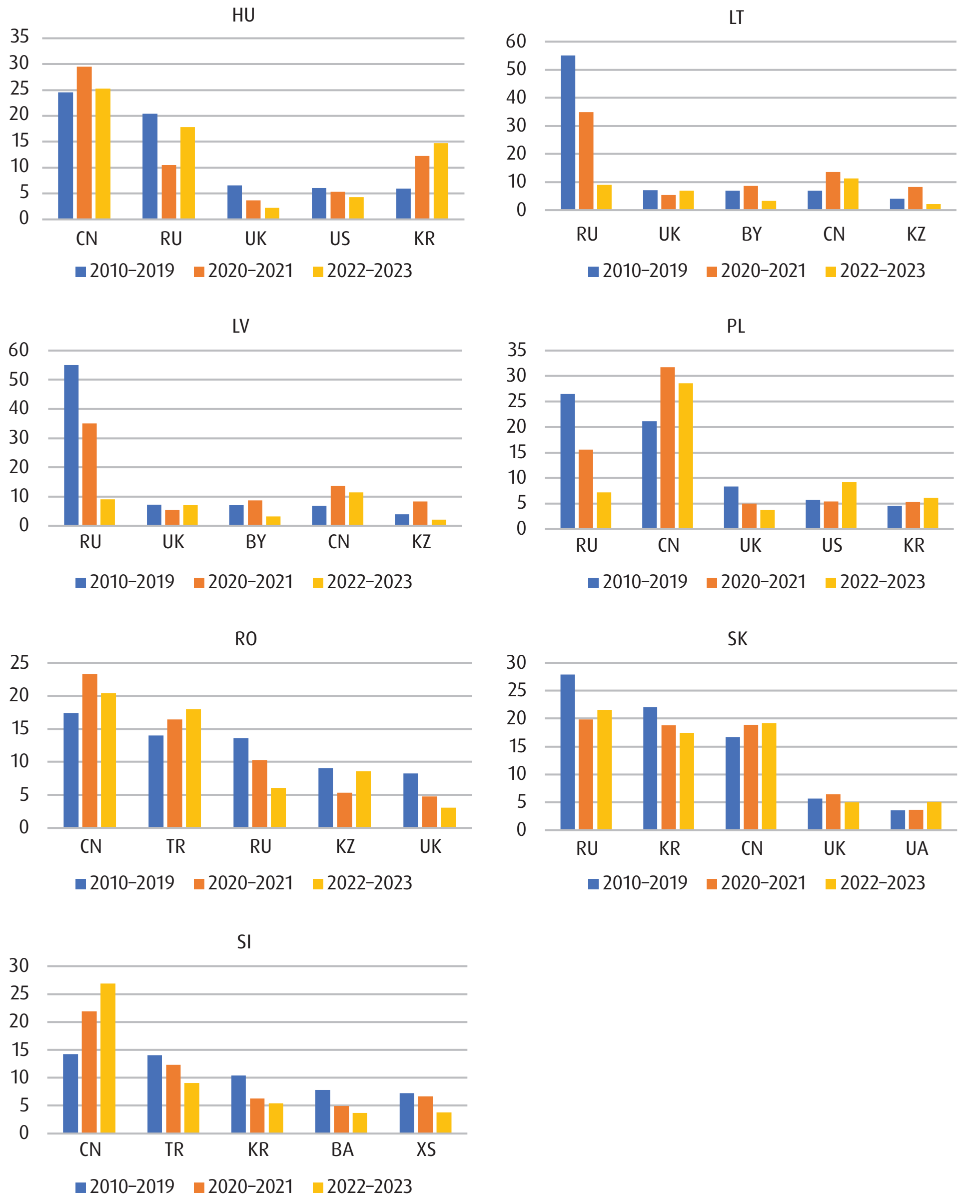
Notes: BA – Bosnia and Herzegovina, BY – Belarus, CH – Switzerland, CN – China, MD–Moldova, NN – not-named countries, NO – Norway, RU – Russia, UK – United Kingdom, US – USA, TR – Turkey, XS – Serbia, UA – Ukraine.

Source: Authors' own compilation based on Eurostat-Comext data.

For many years, the main suppliers to CEE countries were Russia, China, UK, South Korea, Turkey (in that order). In this case, trade concentration was higher than in exports, accounting for an average of 62% of imports between 2010 and 2023 (Figure 9). Between 2010 and 2019, Russia was the first or second supplier in all the countries analysed, with the exception of Slovenia and Romania. Its share decreased slightly after the annexation of Crimea in 2014, only to fall dramatically in the first two years of the war in Ukraine (e.g. in Lithuania, Croatia and Poland). At the same time, Russia maintained its high position as a sales market for Bulgaria, Estonia and Latvia. The above declines in its share in most countries were compensated by an increase in China's share – from 20% of CEE countries' imports in 2010–2019 to 27% in 2022–2023. As for the UK, during both the pandemic and the conflict in Ukraine, the country's position significantly weakened (by more than half compared to 2010–2019), to 2–4%. On the other hand, the importance of the US as a supplier was lower in all CEE countries than as a recipient, but it also strengthened almost every time when compared to the reference period, reaching almost 7% in 2020–2023. South Korea held a relatively stable position in this ranking (an average of 6–7% in CEE countries throughout the analysed period), which reflected the country's strong position in imports mainly of two partners, i.e. Slovakia and Hungary.

Figure 9. Five main import partners of CEE countries compared to the CEE-11 group and the EU in 2010–2023 (%)





Notes: AZ – Azerbaijan, BA – Bosnia and Herzegovina, BY – Belarus, CA – Canada, CH – Switzerland, CN – China, KR – South Korea, KZ – Kazakhstan, MD–Moldova, NO – Norway, RU – Russia, UK – United Kingdom, XS – Serbia, TR – Turkey, US – USA.

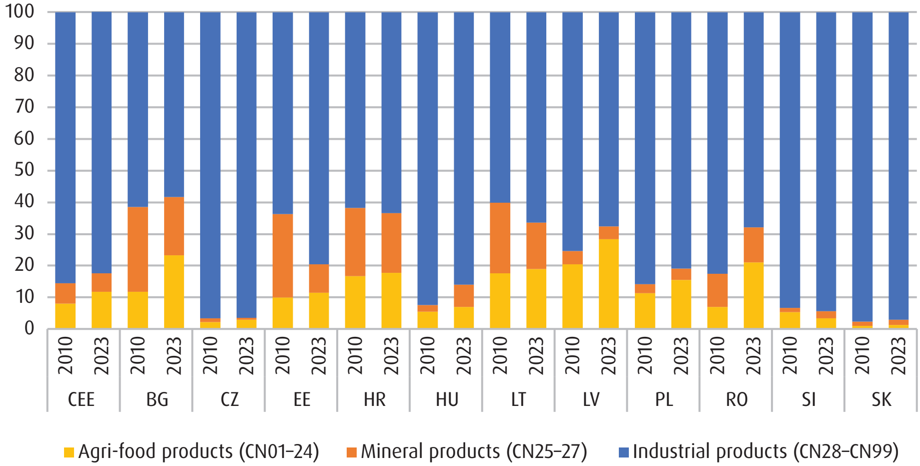
Source: Authors' own compilation based on Eurostat-Comext data.

It is worth noting that the list of the main partners of CEE countries does not coincide with the corresponding list for the entire EU. The main recipients of goods in the case of the EU in 2023 were the US (20%), the UK (13%) and China (9%). The same partners also dominated imports, but in reverse order: China (21%), the US (14%) and the UK (7%).

Trade commodity structure

Exports of all CEE countries were dominated by industrial products, albeit to a different extent. In the years 2010–2023, these products held by far the highest, stable position in exports from Czechia, Slovakia and Slovenia – about 95% (Figure 10).

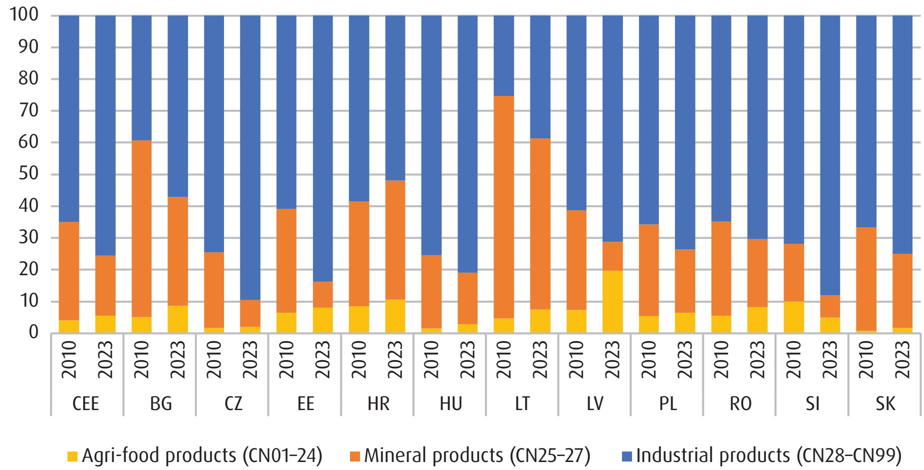
Figure 10. Changes in commodity structure of CEE countries' exports in 2010 and 2023 (%)



Source: Authors' own compilation based on Eurostat-Comext data.

On the opposite end, there were Latvia, Lithuania, Estonia, Bulgaria, Croatia, where the share of these products in 2023 ranged around 60% with an upward trend from 2010 onwards (except for Romania). In the case of mineral resources, the dependence of CEE countries on foreign markets was fundamentally different. Thus, minimal exports of these products throughout the analysed period were recorded in Czechia, Slovakia and Slovenia, and slightly higher in Poland, Latvia and Hungary. Mineral resources represented the largest share (around 20%) almost throughout the period 2010–2023 in Bulgaria and Croatia, and at the beginning of the period also in Estonia and Lithuania. The result of the changes in these two commodity groups were shifts in the share of agri-food products. Rates below 10% were recorded in Slovakia, Slovenia, Czechia and Hungary, and the highest – almost 30% – in Latvia. The average share of industrial products, mineral resources and agri-food products in exports from CEE countries was quite stable at 85–84%, 7–5% and 8–11%, respectively. The commodity structure of exports of the entire EU was also stable, and the respective shares were similar to the above. Due to such a high stability of export shares of the three groups of goods mentioned here, Figure 10 shows the corresponding indicators only for the first and last years of the analysed period, i.e. 2010 and 2023.

Figure 11. Changes in the commodity structure of CEE imports in 2010 and 2023 (%)



Source: Authors' own compilation based on Eurostat-Comext data.

In CEE imports, the role of industrial products was slightly more modest than in exports, while that of mineral resources was much greater, and the share of agri-food products was lower than in exports (Figure 11). The position of the first of these groups in imports to CEE countries strengthened in almost the entire region and is currently highest in Czechia and Slovenia, where their share reaches almost 90%. The lowest share is reported for Lithuania due to the country's very strong dependence on imports of mineral resources. Despite a temporary increase in the share of mineral commodities in 2021–2022, when their prices shot up, a clear trend towards a decline in their share in exports prevailed throughout the analysed period. Mineral resource imports maintained record highs over the period 2010–2023 in both Lithuania and Bulgaria. Steep declines (about two- and three-fold) in the share of resources over the entire analysed period were recorded in imports by Czechia, Estonia, Latvia and Slovenia, yet from lower levels than in Lithuania and Bulgaria. The import share of agri-food products in most countries was below 10%, and a minimal value was reported for imports to Slovakia, Czechia and Hungary. The average shares of the three types of products mentioned here in CEE imports were as follows: industrial products –

about 75%, mineral products – about 5%, agri-food products – about 20%. As in the case of exports, the structure of imports was similar to the proportions characteristic of the entire EU, and the changes spread relatively evenly over time. The exceptions were, first, a significant decline in the share of mineral resources in 2020 (reaching several percentage points) due to a slump in economic activity, and then an even greater strengthening of the position of resources in imports (especially in 2022), which mainly reflected an increase in their prices rather than an increase in volume.

Trade balance

A characteristic feature of the external trade of most CEE countries in the analysed period was a negative, although usually increasing, trade balance. The exceptions were Estonia, Latvia and, for most of the time, Lithuania, which showed a surplus of exports over imports in the years 2010–2023. In the first year of the pandemic (2020), the balance of trade in most countries (except for Croatia, Czechia, Hungary and Romania) improved: the deficit decreased (in the case of Poland and Slovenia) and the surplus increased (Estonia, Lithuania, Latvia) or appeared (Slovakia). These changes occurred in the wake of stagnant imports and an increase in exports. On the other hand, the effects of both the weakening of demand amid lockdowns and the reduction in production of selected goods, as well as the disruption of many global supply chains, became apparent in 2021, when imports grew much stronger than exports, and the trade balances of all CEE countries deteriorated. In 2022, there was another massive deterioration in the trade performance of almost all CEE countries, often with deficits almost doubling (mainly in response to a huge increase in prices for many goods). A year later, the level of these deficits decreased to some extent.

In geographical terms, it seems particularly interesting in the analysis of changes in the balance of trade that despite Brexit, all CEE countries (including mainly Poland and Romania) recorded a high trade surplus with the UK in recent years. At the same time, increasing deficits in trade with China were observed throughout the analysed period.

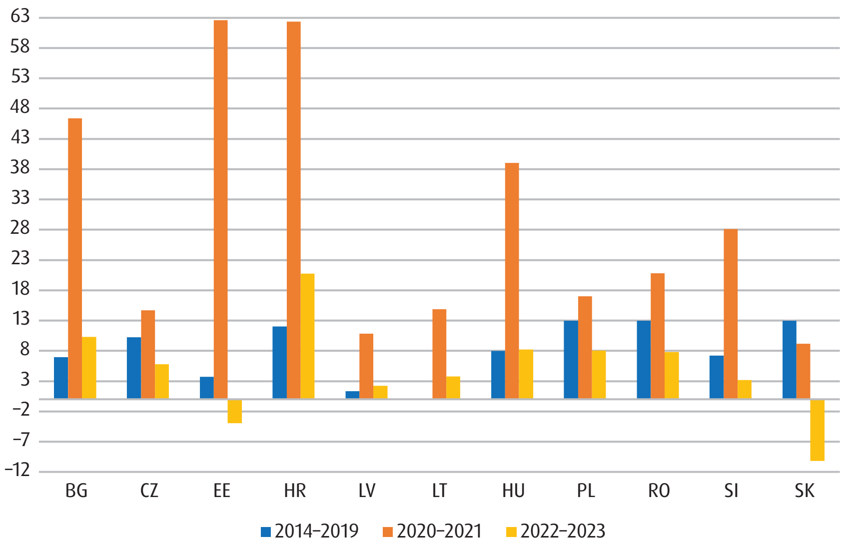
In terms of commodities, all CEE countries recorded a predominance of imports over exports in the trade in mineral resources (especially fuels) due to low resources of their own. In agri-food trade, several countries achieved a strong and sustainable competitive position, which was reflected in the continued positive balance of trade. Estonia, Latvia and Slovakia, on the other hand, were characterised by permanent surpluses in trade in industrial products.

Evolution of CEE countries' trade in services with non-EU countries

Trade dynamics

In the analysed period, on the export side, the highest average annual growth rate was recorded in 2010–2019 by Slovakia (at 14%), followed by Romania (13%) and Poland (13%). The lowest growth rates were recorded for Estonia and Latvia (Figure 12). In 2020–2021, Estonia and Croatia turned out to be the leaders in terms of sales of services (over 60%). Bulgaria also stood out from other countries in the region during the period (with a growth rate of 46%), while Latvia and Slovakia fared worst in the ranking. In 2022–2023, export growth in all CEE countries turned out to be weaker than in previous years – the highest values were recorded for Croatia (21%) and Bulgaria (10%).

Figure 12. Dynamics of CEE countries' exports of services to non-EU countries (CAGR, %)



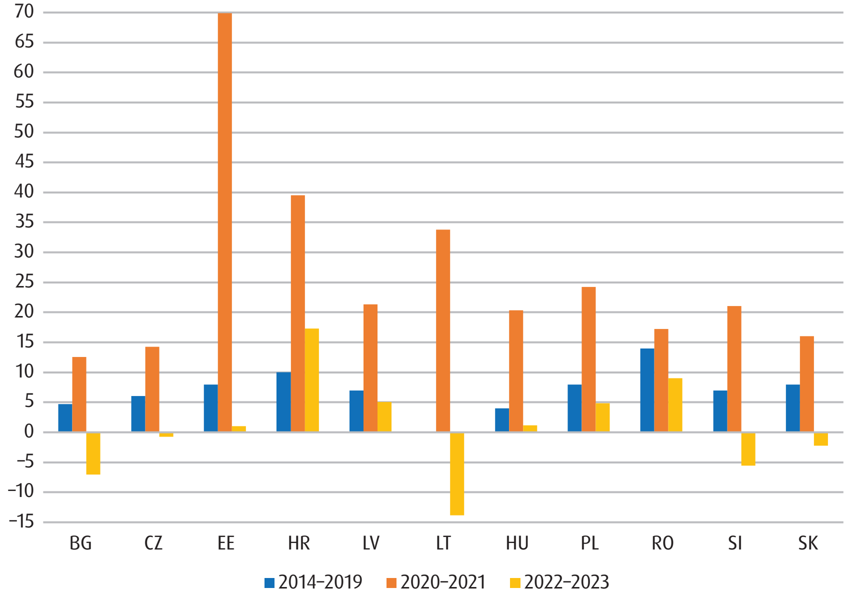
Notes: No data available for Lithuania for 2015 and 2016.

Source: Authors' own compilation based on Eurostat [2025d] data.

Between 2014 and 2019, the dynamics of imports of services in the region showed an average increase, with the highest growth rates seen in Romania and Croatia. The average annual increase in imports was high in Latvia, as well as in Poland and Slovakia. In 2020–2021, the growth rate of imports turned out to be higher than in the previous period. The highest increase was recorded in Estonia, where it amounted to as much as

70%, as well as in Croatia (40%) and Lithuania (34%). In contrast to 2020–2021, in the period 2022–2023 the growth rate of imports decreased (e.g. in Poland, it remained at around 5%, although previously it was over 24%), and in the case of some countries (Bulgaria, Czechia, Lithuania, Slovenia and Slovakia) it even turned out to be negative.

Figure 13. Dynamics of imports of CEE countries' services to non-EU countries (CAGR, %)



Notes: No data available for Lithuania for 2015 and 2016.
Source: Authors' own compilation based on Eurostat [2025d] data.

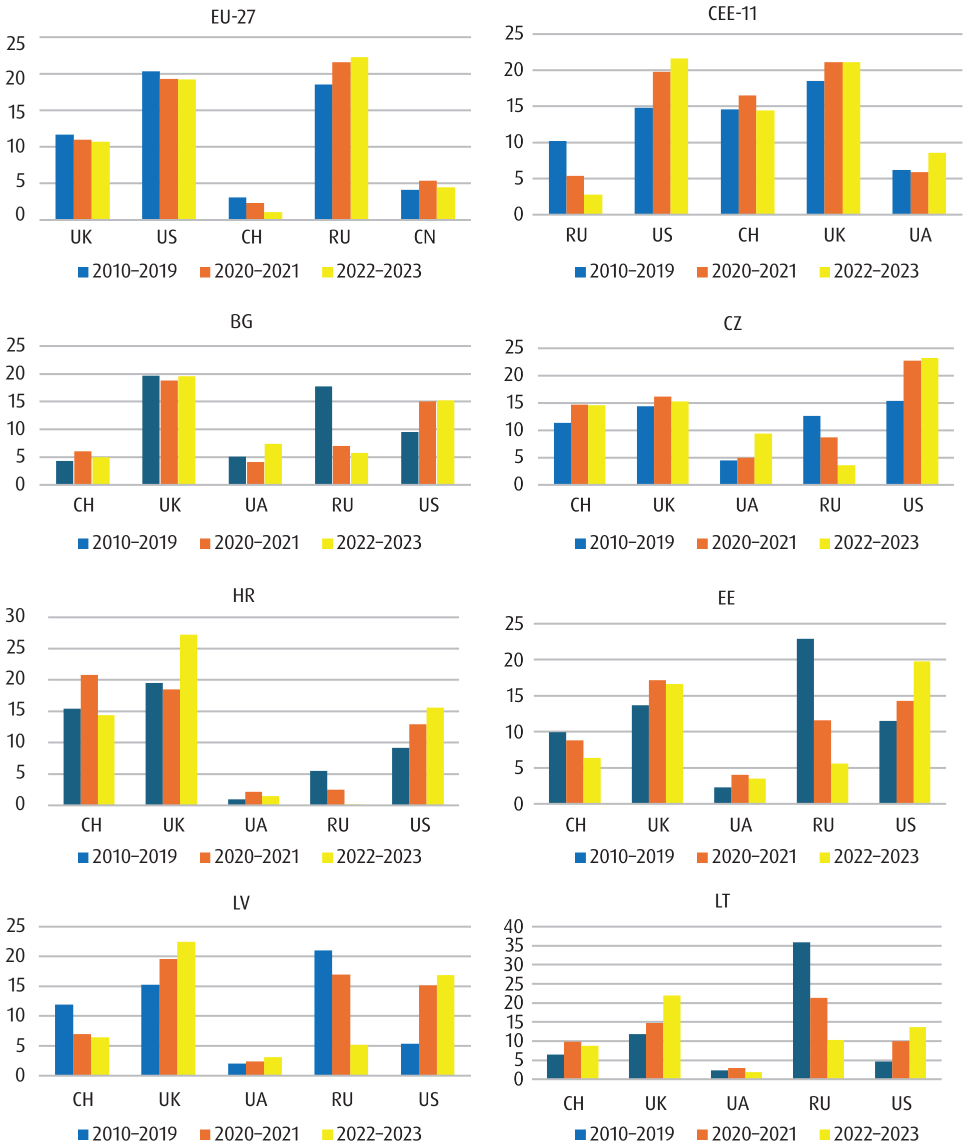
Geographical structure

The five main recipients of services from the CEE region as a whole in 2010–2019 were Russia, the US, Switzerland, the UK and Ukraine (Figure 14). In the next two years, Russia's share decreased, while the importance of the US and the UK grew. In 2022–2023, Russia recorded further declines, while the US and Ukraine continued to follow an upward trend, with the share of Switzerland and the UK remaining relatively stable.

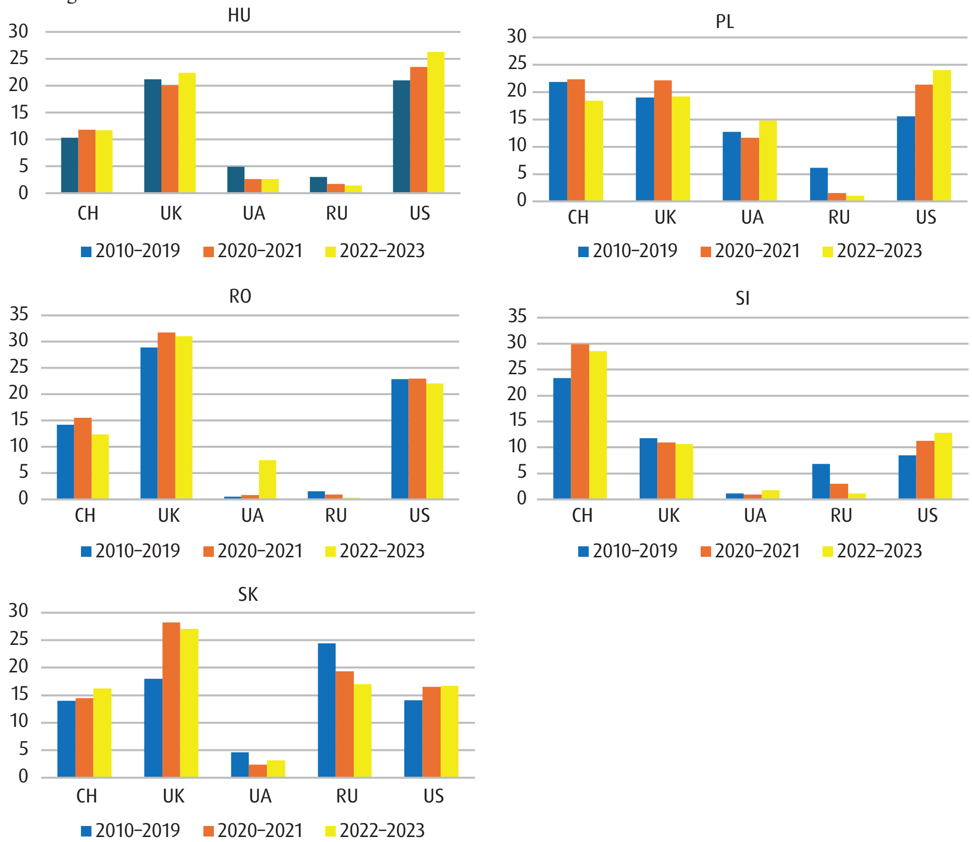
In terms of dynamics, Poland significantly reduced exports to Russia (from 6.1% in 2010–2019 to 1.0% in 2022–2023), while increasing exports to the US and Ukraine, as well as to Hungary, Czechia and Lithuania.

The geographical structure of exports of services from the CEE region for the period 2010–2019 did not differ in principle from the EU model: only China was in the group of the five most important recipients of services from the EU, instead of Ukraine. It can also be noted that, unlike CEE, EU exports to Russia exhibited an upward trend.

Figure 14. Five main export partners of the CEE-11 group and their importance in individual exports from the countries of the region in 2010–2023 (%)



cont. Figure 14



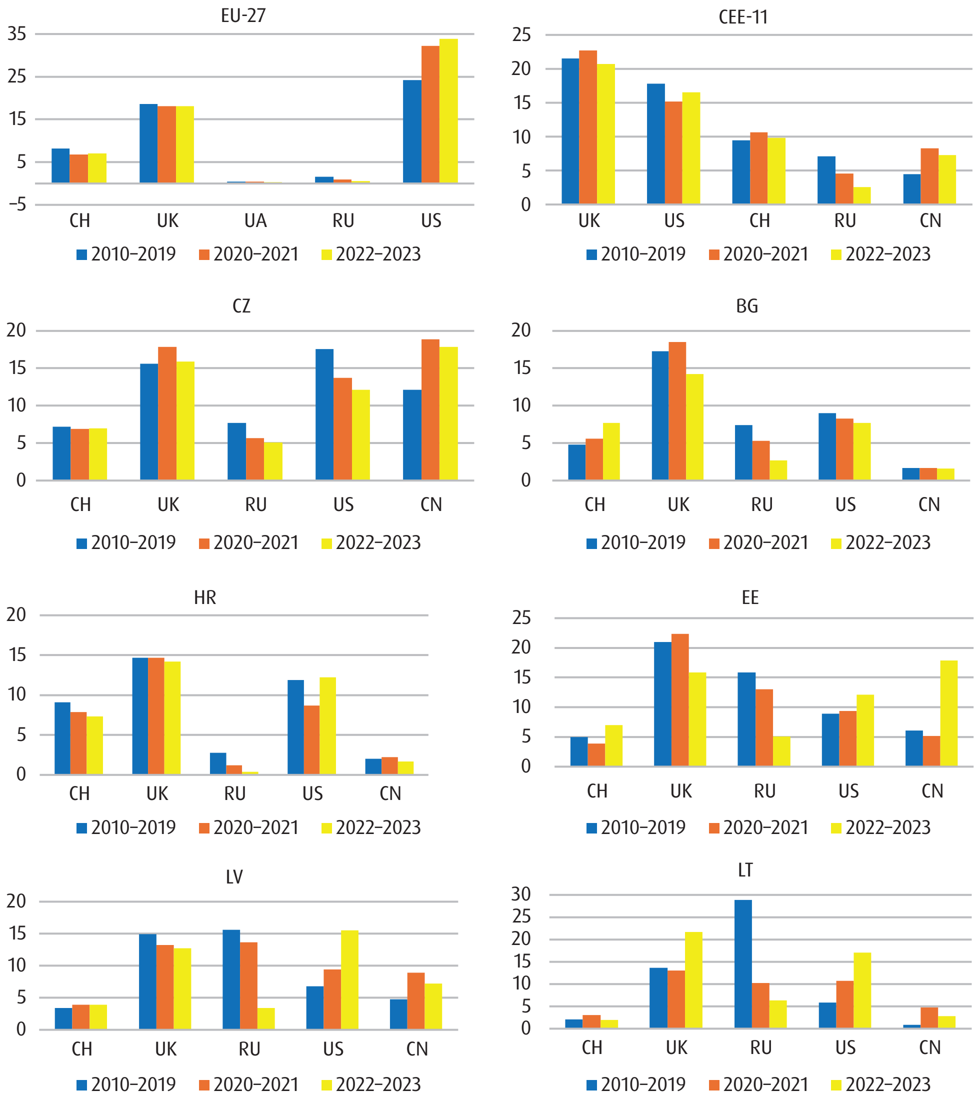
Source: Authors' own compilation based on Eurostat [2025d] data.

In terms of imports of services, in the period 2010–2019, the main partners of CEE countries were the UK, the US, Switzerland, Russia and China (Figure 15). In 2020–2021, the UK remained the leader, with a significant decline in imports from Russia in favour of growing imports from China. During these two years, the US's position as a service provider for CEE consumers also deteriorated. In 2022–2023, the UK's position did not change, but a further decline in Russia's share could be observed. During that period, China's position also weakened slightly (by 1 pp), and the role of the US increased. The most important market from which CEE countries purchased services was the UK (20.7%).

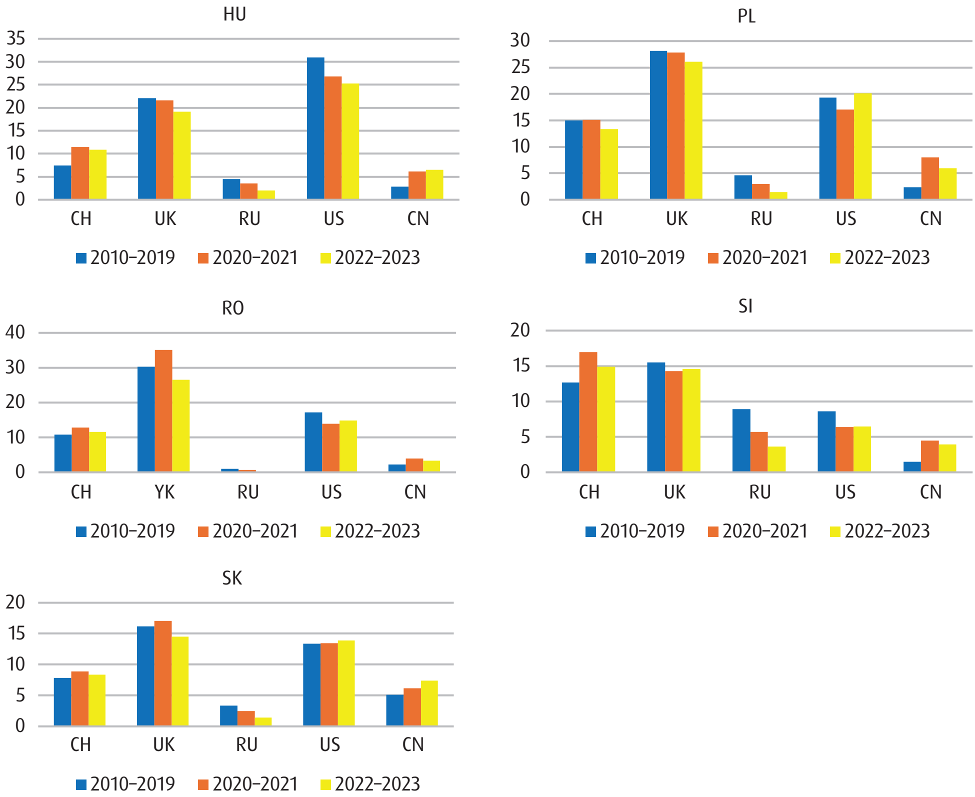
Poland imported the most services from the UK and the US, while imports from Russia were decreasing in favour of China. For Hungary, the US was the main partner in imports, and the importance of China also rose at the expense of Russia. In Lithuania's imports, Russia's position decreased dramatically, and the role of the US increased, which suggests a significant reorientation of the direction of import.

Unlike CEE, imports of services to the EU-27 from Russia in 2010–2019 and 2020–2021 were marginal (1.6%), and fell to 0.6% in 2022–2023, indicating that the group had almost completely severed its ties with Russia in services. In 2022–2023, the US significantly increased its share of EU imports (to 33.9%), which should be seen as an upturn in transatlantic cooperation.

Figure 15. Five main partners in the import of services to CEE countries vis-à-vis the CEE-11 group and the EU in 2010–2023 (%)



cont. Figure 15



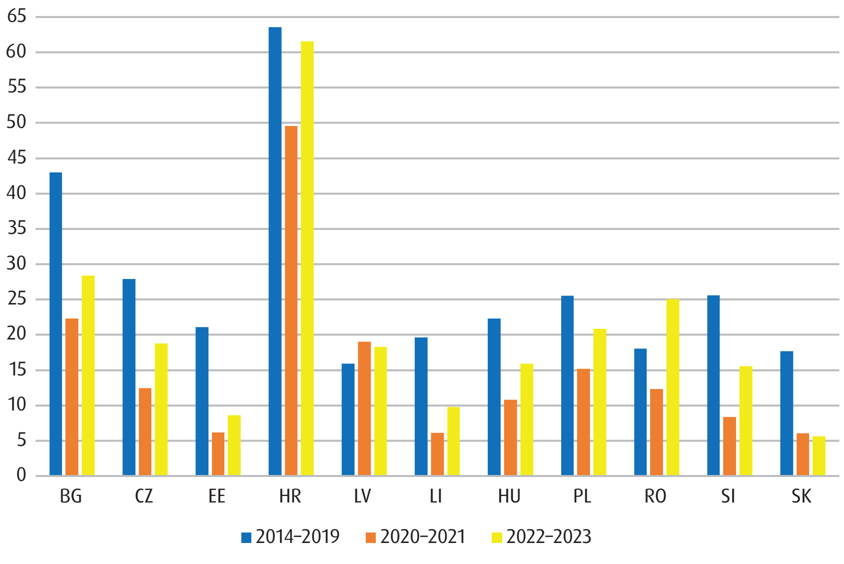
Source: Authors' own compilation based on Eurostat [2025d] data.

Sectoral breakdown of trade in services

The main industries in the trade of services in the CEE region with non-EU partners were transport services, travel, ICT and business services. This was a common feature of this region, which is not to say that the structure of exports and imports of all 11 countries was identical over the analysed period.

Travel, which includes both revenues from the influx of tourists and fees paid by foreign patients who choose to come to the country for medical treatment, and expenditure of foreign students, proved to be the main export product not only in 2014–2019, but also in subsequent periods only for Bulgaria and Croatia (Figure 16). The share of travel in Croatia's exports before 2020 accounted for more than three-fifths of all revenue, then declined during the pandemic, and over the following two years this share stabilised at the same level as in the years before the pandemic. In the case of Bulgaria, travel generated only one-fifth of all revenue from trade in services in 2020–2021, which is less than before 2020. Although their share increased over the following two years, its value was still lower than before the pandemic. As for the other countries, the overall position of tourism in CEE countries' exports deteriorated compared to the pre-2020 period. The exceptions were Romania and Latvia, where in 2022–2023 travel accounted for 25% and 18% of revenue from trade in services, respectively, while in 2014–2019 their share was 18% and 16%. Some of the steepest declines in the position of this industry during the pandemic were recorded in trade in Bulgaria, Slovenia, Czechia and Estonia (at 21–15 pp). In the subsequent post-pandemic period, there was a rebound in all countries, except for Latvia. In the case of Poland, tourist services remained the leader between 2014 and 2019 in terms of revenues. In 2020–2021, the position of the industry deteriorated, but in the next two-year period, growth was recorded, with travel ranking second in the structure of Polish exports, right after business services. Similar changes in the rate of growth in the share of travel were recorder only in Slovenia, Czechia and Hungary.

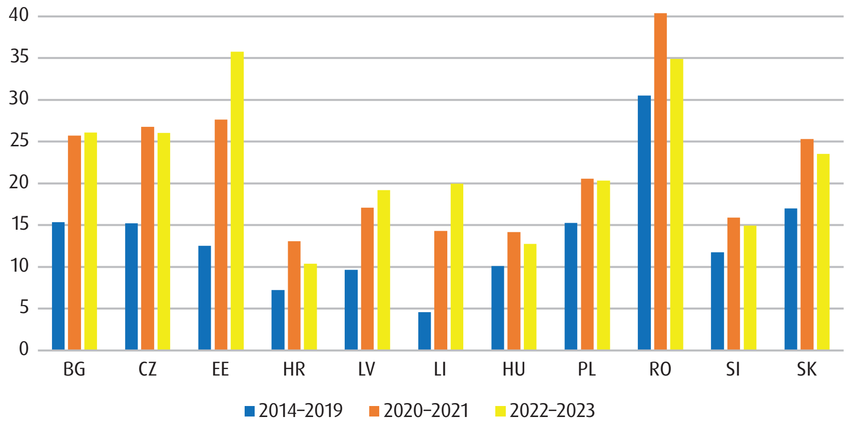
Figure 16. Share of travel in exports of services in CEE countries (%)



Source: Authors' own compilation based on Eurostat [2025d] data.

As in the case of tourism, the role of the ICT industry until the end of 2018 as a source of revenue in CEE countries was the smallest compared to the other analysed categories (Figure 17). In the case of as many as nine countries, it ranked lowest (fourth) in that initial period. Only in Bulgaria's exports was the share of ICT services higher than in the category "other business services". Romania stood out in the region, where revenue generated in these years from exports of ICT services turned out to be the highest compared to other service sectors. However, the role of ICT services in CEE countries changed significantly between 2020 and 2023. Compared to the 2014–2019 period, the importance of this industry increased significantly in 2020–2021 in all the countries, and in the following two years a clear upward trend continued only in the Baltic States. The importance of ICT increased exceptionally dynamically in exports of services in Lithuania (from 5% in 2014–2019 to 20% in 2022–2023) and Bulgaria (from 15% in 2014–2019 to 26% in 2022–2023). The countries that turned out to be the most specialised in providing these services were Estonia and Romania. In 2022–2023, ICT exports accounted for almost 36% of Estonia's and 35% of Romania's exports of services. In Poland's trade, ICT generated an average of 15% of all revenue annually before 2020, and in 2020–2021 this value increased to 20% and slightly decreased after 2021. As for the export structure of other Visegrad Group members, it can be noted that in 2022–2023, compared to the pandemic period, the position of these services weakened, although in the case of Czechia, the decrease was no more than 1 pp.

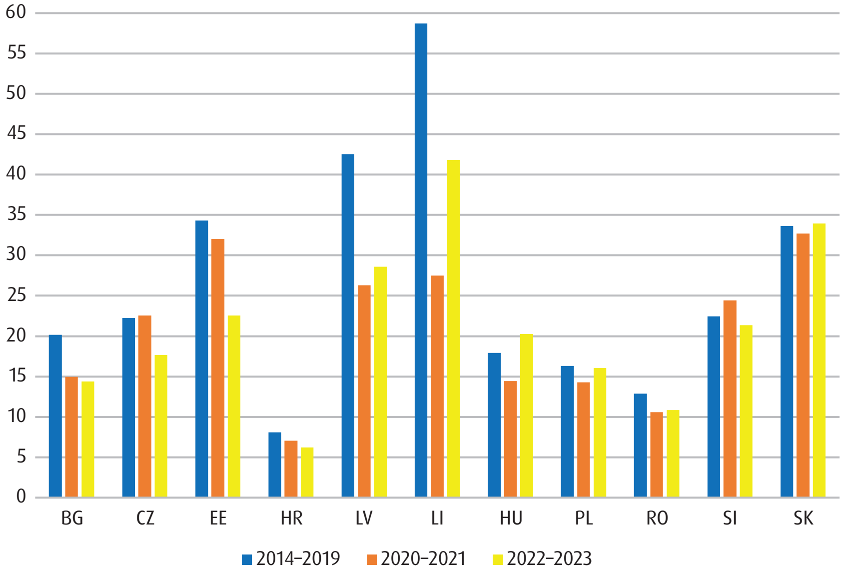
Figure 17. Share of ICT in exports of services in CEE countries (%)



Source: Authors' own compilation based on Eurostat [2025d] data.

In the years preceding the coronavirus pandemic, transport ranked first in terms of the share of services exported by the Baltic States and Slovakia and was of the foremost importance for Lithuania (Figure 18). Despite maintaining the status of a key export product, the position of transport in Lithuania's trade deteriorated over the following years. Its share decreased from 59% (2014–2019) to 28% (2020–2021), and the subsequent increase to 42% in the next two-year period was not enough to return to the previous level. Negative growth was also witnessed in Latvia's trade. The share of transport in Latvian exports decreased dramatically from 43% (2014–2019) to 27% (2020–2021), and the decline was not offset by growth in the following two years (there was a slight rebound, at a maximum of 29%). In the case of Estonia, transport eventually lost its dominant export role after 2019 in favour of ICT services. Only in Hungary's trade did the share of transport at the end of the analysed period increase compared to 2014–2019, after a decline during the pandemic. Transport was the least important as a source of revenue for Croatia and Romania. The position of this sector turned out to be relatively stable in Polish trade. Revenue from the sale of these services amounted to an annual average of 15–16% in each of the three analysed sub-periods. Slovakia's trade exhibited a similar trend (the share of transport ranged between 33% and 34%). Exports from the other two Visegrad Group members were more dynamic, with their share of transport increasing (Hungary) or decreasing (Czechia) compared to 2014–2019.

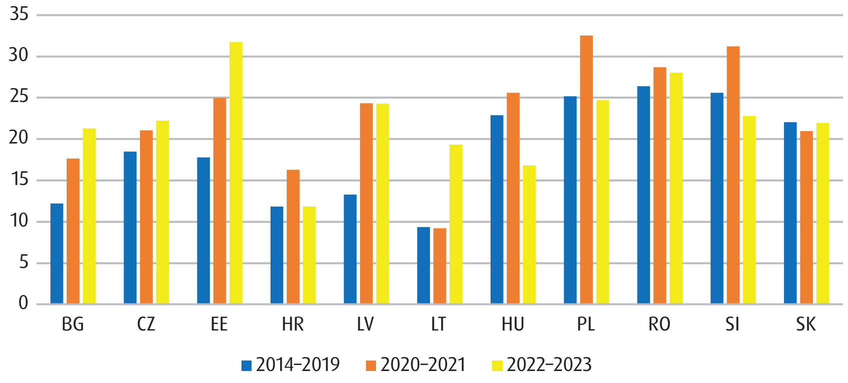
Figure 18. Share of transport services in CEE exports (%)



Source: Authors' own compilation based on Eurostat [2025d] data.

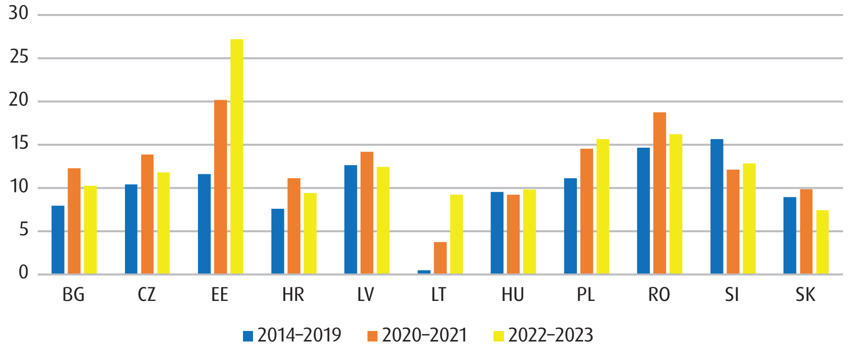
The category "other business services" includes a highly diverse group of activities, which include, on the one hand, research and development services, consulting and market research, and on the other hand – professional services, real estate brokerage, waste management and vehicle leasing. This industry started to gain significant importance in many countries of the region in 2014 (Figure 19). The position of business services proved to be stable in the export of services from Slovakia and Romania and Slovenia. Compared to the period 2014–2019, the importance of business services during the pandemic decreased slightly only in Slovakia, remained at a similar level in Lithuania, whereas it increased in exports from other countries. In 2022–2023, a downward trend was recorded in Croatia, Hungary, Poland, Romania and Slovenia. The position of this industry strengthened in exports, primarily in Lithuania and Estonia. Estonia recorded the largest fluctuations in the share of business services.

Figure 19. Share of other business services in exports of services in CEE countries (%)



Source: Authors' own compilation based on Eurostat [2025d] data.

Figure 20. Share of ICT services in imports of services in CEE countries (%)

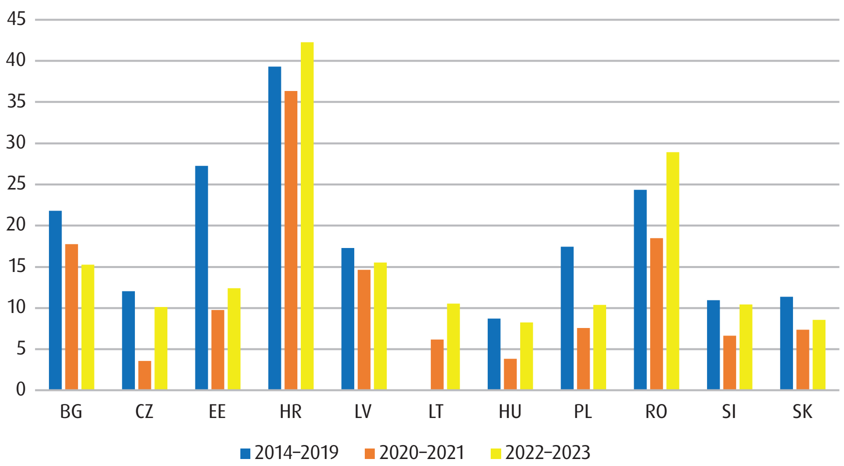


Source: Authors' own compilation based on Eurostat [2025d] data.

Significant changes were also recorded in the industry structure of imports of services in CEE countries. With the exception of Slovenia and Hungary, the other countries saw a strengthening of the role of ICT in the period 2020–2021 compared to 2014–2019 (Figure 20). The largest increase was recorded in Estonia (from 11.6% to 20.2%). Spending on ICT purchases also increased in Bulgaria (from 8.0% to 12.3%), Poland (from 11.1% to 14.6%) and Romania (from 14.7% to 18.8%). In turn, in 2022–2023, the share of this industry in service imports decreased in most countries in the region. The most noticeable decrease was recorded in Romania (from 18.8% to 16.2%), followed by Slovakia, Bulgaria, Czechia, Croatia and Latvia. Against the background of the region, Estonia turned out to be the leader in the purchase of ICT services abroad, where the share of this industry increased from 11.6% in 2014–2019 to 27.2% in 2022–2023. In contrast, imports to Hungary and Slovenia showed a lack of significant changes in this respect.

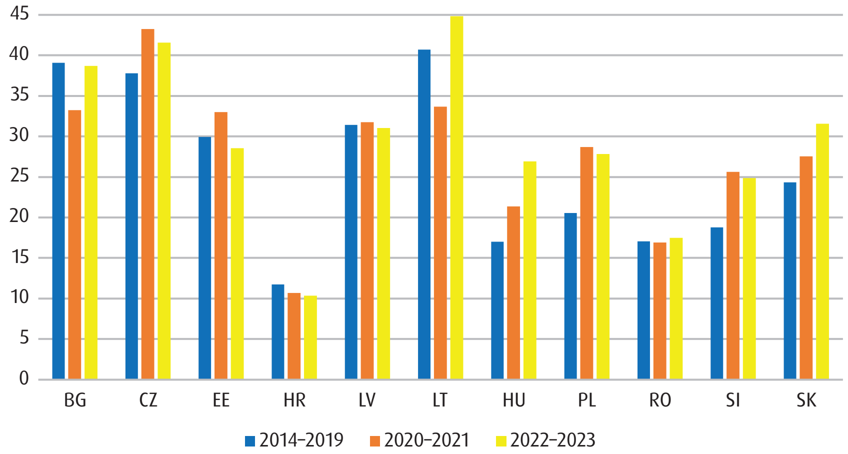
Unlike ICT, in most countries in the region, the share of travel in service imports decreased markedly in 2020–2021 compared to 2014–2019. The largest decreases were recorded in Estonia, Czechia and Poland (Figure 21). In 2022–2023, with the exception of Bulgaria, the share of travel in service imports increased compared to the pandemic years but did not yet return to pre-pandemic levels. In Czechia, Estonia, Lithuania and Poland, spending on tourism turned out to be significantly higher compared to other types of services. Croatia stood out from the region, recording only a slight decline in 2020–2021, and in 2022–2023 it even exceeded the pre-pandemic level (42.3%). In the latter period, an increase in Romanian imports was also recorded – from 18.5% to 28.9%.

Figure 21. Share of travel in imports of services in CEE countries (%)



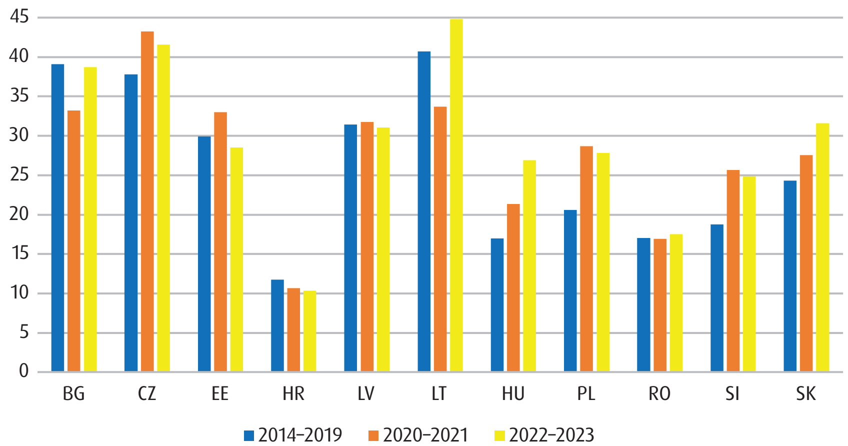
Source: Authors' own compilation based on Eurostat [2025d] data.

Figure 22. Share of business services in imports of services in CEE countries (%)



Source: Authors' own compilation based on Eurostat [2025d] data.

Figure 23. Share of transport services in imports of services in CEE countries (%)



Source: Authors' own compilation based on Eurostat [2025d] data.

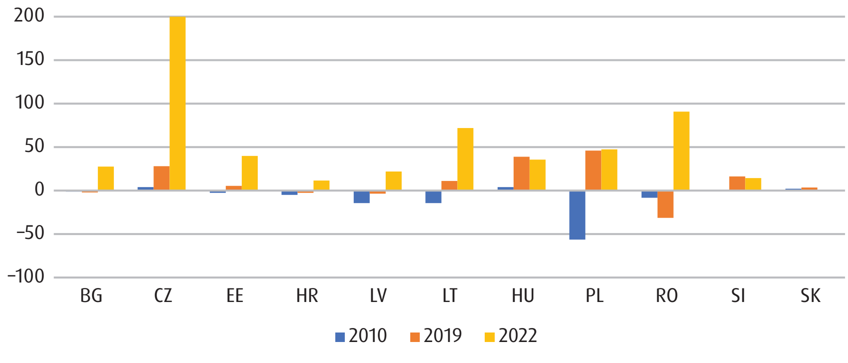
As with ICT, spending on the purchase of business services abroad increased in 2020–2021 compared to the previous period in many countries in the region, with Estonia, Lithuania, Latvia and Romania experiencing the largest changes (Figure 22). Spending on the purchase of these services remained at basically the same level in Poland and in other members of the Visegrad Group. In 2022–2023, the dynamics of imports of business services displayed greater diversity. The volume of business services purchased abroad increased in the case of Latvia and Lithuania, while the share of this industry remained stable in imports to Bulgaria, Czechia and Poland. By contrast, in Hungary, Estonia, Romania, Slovenia and Slovakia, expenditure decreased compared to the period 2020–2021.

As regards transport, the industry consolidated its position in the import structure of Czechia, Hungary, Poland, Estonia, Slovakia and Slovenia in 2020–2021 compared to the previous period (Figure 23). On the other hand, Lithuania, Bulgaria and Croatia experienced decreases. In 2022–2023, the largest increase in the share of transport services in imports was recorded in Lithuania, as well as in Slovakia, Hungary and Bulgaria, while the opposite trend was witnessed in trade by Czechia, Estonia, Latvia, Croatia and Slovenia.

CEE countries and migration from outside the EU

Between 2010 and 2023, there was a significant increase in the attractiveness of CEE countries for immigrants (Figure 24). While in 2010 most CEE countries were net emigration countries, at the end of 2019 a clear change in this trend could be observed – only four CEE countries, i.e. Romania, Bulgaria, Latvia and Croatia, remained net emigration countries in that year. In turn, in 2022, after the Russian invasion of Ukraine, the migration balance was positive in all the CEE countries analysed. It is worth noting that Romania also recorded a positive net migration balance at that time, which remained a net emigration country until the end of 2022.

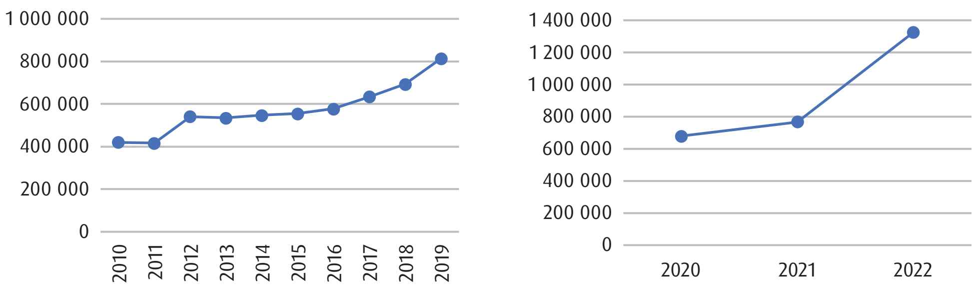
Figure 24. Net migration in CEE countries in 2010, 2019, 2022



Source: Authors' own compilation based on Eurostat [2025b] data.

Between 2020 and 2022, the percentage increase in total immigration to CEE countries was 95%, which means that the number of immigrants almost doubled over these three years. It is worth noting that in relative terms, it took ten years (2010–2019; Figure 25) to achieve the same growth (93%)[1].

Figure 25. Increase in the number of migrants in CEE countries in 2010–2019 and 2020–2022



Source: Authors' own compilation based on Eurostat [2025a] data.

As early as 2010–2019, CEE experienced a significant (higher than the EU average) increase in GDP per capita. In combination with an analysis of the unemployment rate, which shows a decrease in the average unemployment rate in CEE countries to a level lower than the EU average,[2] the migration trends of these countries can also be relatively easily explained on economic grounds, as both of these indicators are usually considered to be relevant in the context of labour migration.

For the economies analysed, the largest immigrant populations residing there at the end of both 2019 and 2023 came from outside the CEE region. The only exception was Slovakia, where Czechs were the largest immigrant population, but this was historically based on the division of Czechoslovakia in 1993. Interestingly, while in 2019 Ukrainians were the largest immigrant population in 6 of the 11 countries analysed, at the end of 2023 this situation was seen in only five countries (Table 1).

After the start of Russia's full-scale invasion of Ukraine, CEE countries had to face an unprecedented influx of refugees. It is estimated that in the first half of the year following the invasion of Ukraine in February 2022, the Ukrainian border was crossed about 12 million times (from Ukraine to neighbouring countries), the vast majority of which (about 60%) was through border crossings with Poland (Figure 26).

1 In this context, the significant difference between 2019 and 2020 needs to be clarified. It is due to the COVID-19 pandemic and the restrictions on international mobility occurring during that period.

2 In this context, it is worth noting the case of Croatia, where the unemployment rate began to fall only after its accession to the EU, i.e. after 2013.

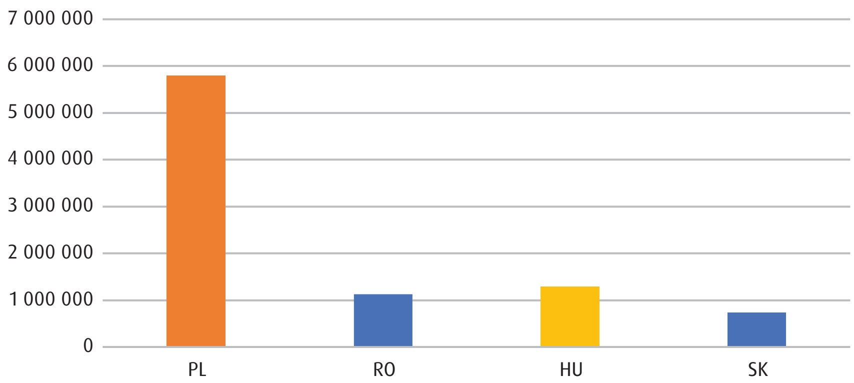
Table 1. Countries of origin of the largest diaspora in relation to the total population of foreigners with the right to reside in respective CEE countries in 2019 and 2023 (%)

Country	Largest populations of foreigners in relation to total foreigners in 2019		Largest populations of foreigners in relation to total foreigners in 2023	
Bulgaria	Ukraine	38	Russia	24
Croatia	Bosnia and Herzegovina	40	Bosnia and Herzegovina	22
Czechia	Ukraine	50	Ukraina	55
Estonia	Russia	90	Russia	34
Lithuania	Russia	60	Ukraina	51
Latvia	Russia	80	Non-citizens*	67
Poland	Ukraine	68	Ukraine	78
Romania	Ukraine	30	Ukraine	24
Slovakia	Ukraine	45	Czechia	17
Slovenia	Bosnia and Herzegovina	40	Bosnia and Herzegovina	46
Hungary	Ukraine	30	Ukraine	16

* The situation in Latvia, where non-citizens were the largest population of foreigners, requires additional clarification. This is due to the fact that after regaining independence in 1991, the Latvian authorities did not automatically grant citizenship to all residents from neighbouring countries, and some did not apply for citizenship or did not obtain it.

Source: Authors' own compilation based on UN [2025] and Eurostat [2025c] data.

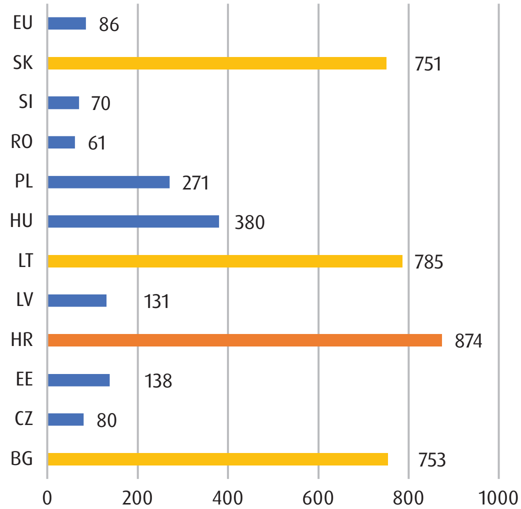
Figure 26. Departures from Ukraine across borders with EU countries, February–August 2022 (number of border crossings)



Source: UNHCR [2022].

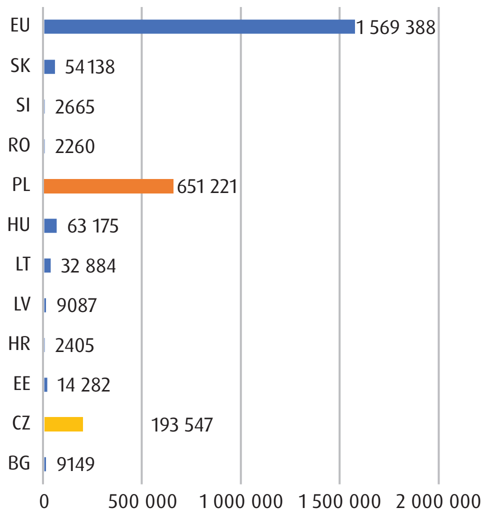
However, it should be borne in mind that the intensification of migration from Ukraine to CEE countries had already taken place earlier, after Russia's invasion of Crimea in 2014. Most CEE countries recorded an increase in their Ukrainian population in relative terms during that period, well above the average percentage increase for the EU as a whole (Figure 27).

Figure 27. Percentage increase in Ukrainian population in CEE countries between the invasion of Crimea and the start of full-scale conflict (%)



Source: Authors' own compilation based on Eurostat [2022] data.

Figure 28. Number of Ukrainian citizens with residency rights in respective CEE countries before Russia's full-scale invasion of Ukraine

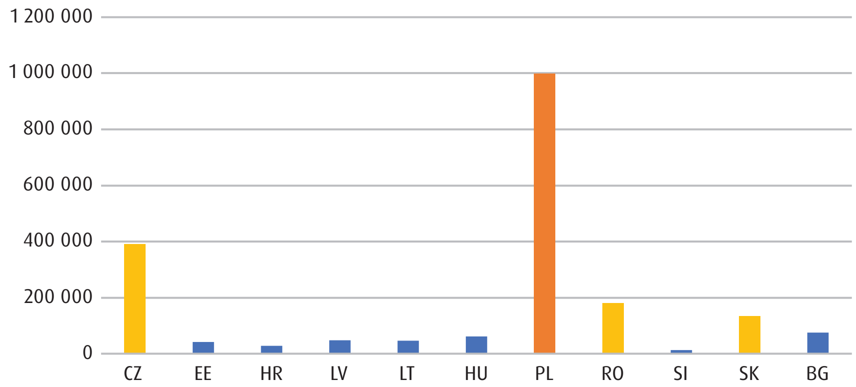


Source: Authors' own compilation based on Eurostat [2022] data.

The leader in terms of nominal growth in the number of immigrants from Ukraine in that period was Poland, where in the year preceding the full-scale invasion there were over 650,000 Ukrainians residing (Figure 28).

According to UNHCR data, at the end of 2024, nearly seven million Ukrainians who fled the war applied for protection outside their homeland. Among CEE countries, most of them were staying in Poland (nearly one million) and Czechia (390,000), and in principle all of the CEE countries played an important role as destination countries for forced emigration from Ukraine (Figure 29).

Figure 29. Population of forced migrants from Ukraine in CEE countries at the end of 2024



Notes: The above data refer only to people arriving in the above-mentioned countries after 24 February 2022; therefore, they should not be compared with the data in Figure 28, which shows the population of Ukrainians living in the respective CEE countries before the war.

Source: UNHCR [2024].

Compared to the situation at the end of 2021, Romania recorded by far the largest increase in immigration from Ukraine as a result of the war (over 179,000 compared to less than 25,000 before the war). Hungary was the only country where fewer migrants from Ukraine arrived as a result of the war than there were before 2022.

The increase in the population of foreigners in CEE countries has been continuous since the end of COVID-19 pandemic and involves not only migrants from Ukraine, although they are undoubtedly the largest component of this growth. Relatively large groups of immigrants in CEE countries (in particular in the Baltic republics) were Russians (although it should be emphasised that after 2022 their share in the migrant population decreased significantly), as well as Belarusians. Also noteworthy is the growing immigration from Asia – in addition to the Vietnamese, this includes citizens of India or China.

Interpretation of statistical survey results

The changes in the geopolitical situation in the world witnessed in recent years have left their mark on both the policy of supporting domestic entrepreneurs from CEE countries and their trade in goods and services with non-EU countries, as well as migration flows. The beginnings of significant changes could be seen as early as 2014–2015, but these phenomena intensified in connection with Brexit, the COVID-19 pandemic and the war in Ukraine. All these events had a major impact on the perception of interventionist policies and open trade and migration policies of the entire EU, including CEE countries.

As regards interventionism in CEE, in the first year of the COVID-19 pandemic, the countries in the region reacted more strongly to the problems of domestic companies compared to other EU countries, but in the second half of the period they were unable to maintain a high level of funding due to strained budgets. As a result, the intensity of aid provided in connection with the coronavirus pandemic and the subsequent war in Ukraine was recorded in CEE countries at that time well below the EU-27 average. As far as the supported objectives are concerned, it can be said that traditional state aid intended for businesses (both manufacturers and service providers) did not change during the COVID-19 pandemic crisis and the war in Ukraine. The structure of the objectives of state aid granted in CEE countries was affected more by the phasing out of activities under the second financial perspective from 2014–2020 than by the crisis years 2020–2022. Firstly, CEE countries began to gradually move away from simple investment aid in favour of policies that are slightly more in line with the EU's goals, including those related to the digital and energy transitions. Secondly, the higher share of environmental and energy aid in CEE countries compared to the pre-crisis period was not necessarily linked to the COVID-19 pandemic or the war in Ukraine but resulted from investment needs identified much earlier. Thirdly, there was still a lack of stable state financing for entrepreneurs' activities, including in the RDI area which is key to innovation. Finally, the crisis years coincided with the final stage of the previous financial perspective providing this type of support.

The volatile dynamics of trade in goods in CEE countries in 2010–2023 reflected both severe turbulence in the global economy and the varying scale of price fluctuations in the main commodity groups. The growth rate of CEE countries' exports, which was faster (with the exception of Estonia) than the EU average throughout the period, was due to the relatively high competitiveness of the former, based on their price advantages and the attraction of significant foreign investors. The latter, in turn, contributed to the inclusion of Central European companies in global supply chains, especially in the automotive industry. What significantly contributed to improving the international competitive position of CEE countries was their earlier accession to the EU and the related adaptation of technical, sanitary, veterinary requirements, etc., increasing the attractiveness of products from these countries in all foreign markets. Thanks to these and other factors specific to the respective CEE countries, their exports did not suffer significantly during the pandemic years.

Much greater growth fluctuations in imports than exports in CEE countries, especially from 2020 onwards, were mainly due to external factors. In 2020, these were lockdowns related to the COVID-19 pandemic, which inhibited the growth of demand, including for imported goods. The steep increases in imports in the next two years (especially in 2022) were in turn related to both huge imports of medicines and sanitary materials needed to control the coronavirus, as well as to the rising prices of energy resources since mid-2021. These prices rose sharply as a result of the policy adopted by Russia in the second half of 2021, under which gas supplies to some EU countries were unilaterally suspended (including Poland, Bulgaria and Latvia in retaliation for refusing to pay for gas in Russian roubles). Energy commodity prices doubled in 2021, rising by 25% for other commodities and by 52% on average in global trade as a whole. Strong price pressures were augmented in the following year as a result of Russia's invasion of Ukraine in February 2022. Shortly after that invasion, Western countries introduced economic sanctions against Russia, which spurred price increases. The sanctions were aimed at improving energy security, as well as dramatically reducing Russia's revenue from the exports of these products, which are used to strengthen the country's war potential. The sanctions include a ban on imports of basic resources, i.e. coal, oil, natural gas and LPG from Russia (with certain transitional periods, e.g. for landlocked countries and those experiencing difficulties in switching to imports from other suppliers), and on exports of sensitive industrial products, including those used to strengthen military potential. The record-breaking heat wave in the summer of 2022, which increased the demand for energy for cooling equipment, became a factor strongly affecting an increase in energy prices. On the other hand, the sharp slowdown in import growth in 2023 resulted from a decrease in the global price levels, previously pushed up by supply constraints on many products, as well as from a decline in demand amid economic weakness in the EU.

The above-mentioned factors also allow major changes in the geographical and commodity structure of trade in CEE countries to be explained a large extent. In particular, the sharp decline in Russia's share in foreign trade was mainly due to the sanctions introduced by the EU on the sale of certain products to Russia and on the supply of Russian energy resources, which were an important part of CEE countries' imports in previous years. In turn, the marked increase in the importance of Ukraine's position in exports from most CEE countries was mainly due to increased exports of ammunition and armaments, as well as some other industrial products (e.g. drones), for which Ukraine's demand increased steeply due to the ongoing hostilities. The tightening of relations between some CEE countries and the US is also attributable to the effects of Russia's attack on Ukraine. China's high competitive advantage, as well as its strong involvement in global supply chains for many goods, are the main factors behind the country's export expansion continuing in CEE markets for many years. The pandemic reinforced this trend due to China's rapid increase in the supply of medicines and sanitary materials, for which there was a huge demand in the analysed countries.

At the same time, the pandemic and the war in Ukraine showed that high dependence on imports from one country (e.g. integrated circuits from China or energy resources from Russia) poses a huge risk to the importing country in the event of unfavourable economic or political circumstances (as well as dependence on one market). Examples of the adverse consequences of such a relationship were visible at the beginning of the pandemic, when due to the closure of the Chinese economy and the disruption of global value chains, many goods did not reach customers on time and caused interruptions in the production of finished products. As a result of the sanctions imposed, imports of goods from Russia subject to the bans were dramatically reduced or completely eliminated and replaced by gas and oil supplies from Norway, Saudi Arabia, Iraq, Nigeria, the US, and in the case of coal – from Australia, Colombia, Kazakhstan and India. However, attention should be paid to the practice of circumventing these sanctions. Firstly, hundreds of tankers (the Russian "shadow fleet") were involved in the illegal transport of Russian energy resources, circumventing EU sanctions. The resulting threat to environmental security in the Baltic Sea basin was an additional adverse effect of this phenomenon. Secondly, no sanctions were imposed on LNG, which saw a significant increase in supply to EU countries. Thirdly, exports of banned goods to Russia were diverted to third countries, including Turkey and the former Soviet republics (notably Armenia, Kazakhstan and Kyrgyzstan). These countries became the main transshipment hubs for many American and European sanctioned products (computer chips, lasers, and other dual-use products) [Darvas, Moffat, McCaffrey, 2024]. In addition, some non-sanctioned items are still exported to Russia. This applies mainly to chemical products (including medicines) and agricultural products.

As for trade in services, CEE countries experienced different dynamics of revenue and expenditure in the analysed period. These discrepancies resulted from the impact of economic, structural and geopolitical factors. On the other hand, the geographical structure of exports and imports in the CEE region turned out to be very similar. CEE countries exported the most services to the US, the UK, Switzerland, Ukraine and

Russia. In contrast to exports, only Ukraine was missing from the list of the five largest importers of services to CEE, and China appeared among the leaders from the very beginning. Probably due to the new geopolitical situation after 2022, Russia's position as a partner of the CEE region clearly declined. On the other hand, the importance of Ukraine as a buyer of services and China as a supplier of services strengthened. However, the geographical structure of exports and imports of individual countries in the CEE region was not identical. The causes may include geographical location, cultural conditions, complementarity of economies, export specialisation or consumer preferences. As far as the sectoral breakdown is concerned, both exports and imports in basically all countries of the region were dominated by four industries: transport, travel, business services and ICT. Between 2014 and 2023, their position changed, with the coronavirus pandemic seeming to have been the main factor. Movement restrictions had a negative impact on the amount of revenue derived from tourism and partly also on passenger transport. Overall, an upward trend was witnessed in business services and ICT, which may be indicative of the ongoing process of modernisation of economies.

In the analysed period, unprecedented developments in international migration could also be observed in CEE countries. The first was the COVID-19 pandemic, which was spreading in Europe from the beginning of 2020. It was a unique period in that the restrictions imposed by individual countries on international mobility made it practically impossible to cross national borders freely. In the context of the economy, it is important to mention the threat that this decision could pose to European agriculture. At the time, different EU countries experienced potential shortages of temporary workers in the agricultural sector, measured in tens (and sometimes hundreds, as in the case of Italy or France) of thousands of people. For this reason, the member states' governments concluded relevant bilateral agreements with the governments of the countries of origin of temporary workers, as a result of which there was ultimately no significant decrease in agricultural production in the EU [Schwabe, 2021].

However, the most serious challenge for CEE countries after 2019 was the Russian invasion of Ukraine in February 2022 and the unprecedented wave of forced migration from the country. At the time of the invasion, the countries of the region were faced with a situation unprecedented in their post-war history of a large-scale influx of forced immigrants, which they managed to cope with not only thanks to the measures taken by their governments, but also, and perhaps above all, thanks to the huge involvement of societies (in Poland, nearly 80% of citizens declared some form of assistance to Ukrainians in the period immediately following the invasion), multitudes of committed non-governmental organisations and volunteers, as well as the activities of local governments [Baszczak, Kiełczewska, Kukołowicz, Wincewicz, Zyzik, 2022]. The most important decision of the EU during that period was the first ever activation of the decision-making procedure under the Temporary Protection Directive (TPD) – thanks to this, Ukrainian citizens were able to use public services on general terms and gained access to labour markets in the member states [European Union, 2001].

An analysis of the data shows that all CEE countries played an important role as destination countries in the context of forced migration from Ukraine. Importantly, a gradual intensification of migration from Ukraine to CEE countries could be observed earlier, i.e. from Russia's invasion of Crimea in 2014. The attractiveness of CEE countries for migrants from Ukraine resulted both from their favourable location which facilitated periodic returns to Ukraine and from their cultural proximity.

While before the COVID-19 pandemic Ukrainians constituted the largest population of migrants in the six CEE countries, four years later, i.e. in 2023, they formed the largest group of immigrants in only five of the analysed countries. This may have been due to the fact that, as a result of gaining access to the labour markets and, importantly, the range of social benefits available throughout the EU, CEE countries had lost some of their attractiveness for Ukrainian citizens. Some Ukrainians chose other EU countries (in particular Germany) as their destination due to better career prospects and a more generous social benefits system than in CEE, as well as outside the EU (e.g. Canada).

Overall, a clear increase in the attractiveness of CEE countries as a destination for immigration could be seen throughout the analysed period. Although in 2010 most of them experienced negative net migration, this trend began to gradually change over time. In 2022, after the start of the Russian invasion of Ukraine, all CEE countries analysed recorded a positive migration balance. The reason for this, in addition to the hostilities of the Russian Federation in the territory of Ukraine, is the good economic situation of these countries, which translated into relatively low unemployment, and thus provided an additional incentive for immigration – also from countries not affected by armed conflicts, including Asian countries.

Conclusions and recommendations

CEE countries have been affected by and, consequently, responded to the changes in global geopolitics in different ways. Both external and internal challenges have forced them to adapt their interventionist policies. In addition, the situation in trade, primarily in goods and services, has changed quite dramatically in connection with Brexit, the COVID-19 pandemic and the war in Ukraine, and ultimately migration from the East has definitely redefined the economic policy of CEE countries and the entire EU. This means that after more than 20 years of relatively stable development and economic growth within the EU, CEE countries should immediately begin to identify their own national interests and, keeping in mind the exclusive competence of the EU in certain areas, pursue them with the use of available tools in line with EU rules and policies.

In the context of interventionist policies, it should be emphasised that, on the one hand, interventionist policies can be acted upon so as to achieve internal priorities and, on the other hand, to provide a shield protecting them from adverse external developments, including non-competitive behaviour by third-country partners. It usually leads to the distortion of competition in the domestic market and, with most barriers to trade between EU member states eliminated, also in the European single market. In response to the COVID-19 crisis, CEE countries took much faster and more intensive measures (in the form of increased state aid for domestic entrepreneurs) than other EU countries, which – due to limited financial resources – ruled out the possibility of long-term support for entrepreneurs affected by the pandemic and the energy crisis. At the same time, the convergence of objectives supported by CEE countries is usually quite distant from the EU average, although it remains strongly correlated with the objectives of cohesion policy under successive multiannual financial perspectives of the EU. It is therefore necessary to implement targeted and stable sectoral and horizontal policies with adequate funding at national level in the form of well-thought-out aid programmes by subordinating them to national objectives linked to the achievement of specific EU objectives, including environmental protection and energy efficiency, as well as research, development and innovation.

As far as trade in goods is concerned, despite the successes achieved so far and the high resilience of most CEE countries to shocks, the near future does not inspire optimism. The (usually) positive trends in the development of trade in CEE countries have so far been largely based on the price advantage of products (thanks to relatively low labour costs and Western technologies). However, the first of these factors began to run out quickly. At the same time, new challenges have emerged that require increased expenditure by companies (e.g. on digitalisation, on reducing greenhouse gas emissions, etc.). Trade conflicts and protectionist tendencies have been exacerbated by the COVID-19 pandemic and China's expansionary trade policy, followed by President Donald Trump's imposition of high tariffs on many goods and retaliatory measures taken by trading partners. In these conditions, it will be more difficult for all players to compete in global markets. The future trade position of CEE countries will also depend to a large extent on their internal economic policy. The prerequisite for maintaining and further improving the position of producers and exporters in foreign markets is in particular a significant increase in the ability of companies to design and implement innovations, which are the basis for new comparative advantages. What can be considered a positive aspect of the new situation in imports of resources is the current increased diversification of energy supply sources in the EU countries and accelerated efforts to expand renewables, which has a positive impact on the climate and the environment.

The analysis shows that the countries of the region have begun to specialise in the provision of highly knowledge-intensive services, such as ICT and business services, which is part of the global trend in modern developed economies. This is a good harbinger for a further development of these categories of services, as the demand for them is growing relatively quickly. These areas are witnessing non-price rather than price-based competition. Due to the changes that are taking place today, the key sources of service companies' comparative advantage include human capital and investing in customer quality and loyalty. The countries of the region have an opportunity to strengthen their competitive position in the global services market if they take this factor into account and properly adapt to the changes taking place in the architecture of new international economic relations. A particularly difficult challenge is to predict the appearance of "black swans" – events that are unexpected and rare but have a huge impact on the functioning of the services market and international trade in services.

In the context of migration flows, CEE countries have undergone a transformation from being emigration countries to becoming net immigration countries after their accession to the EU, and the key factor accelerating this process was mass migration from Ukraine following the 2022 Russian aggression. If the economic situation in CEE countries continues to be relatively good and the geopolitical situation in Ukraine does not stabilise in terms of prospects for long-term peace, CEE countries will remain an attractive destination for immigrants. Therefore, cooperation at the EU level on migration issues seems to be very important, as well as the development of methods and effective implementation of programmes aimed at increasing the integration (both professional and social) of immigrants residing in the CEE region. Otherwise, there is a concern that they will gradually start to move to Western European countries, where they will find better career prospects, free language courses and vocational training, as well as additional social benefits, much more generous than in CEE countries. This, in turn, may have negative consequences for labour markets in CEE countries, and contribute to an inflationary impulse.

References

Ambroziak, A.A. (2024). State Aid in Poland After Accession to the European Union – Twenty Years of Financial Interventions in the Market Economy. In: *Poland in the European Union. Report 2024. 20 Years of Membership: Experiences and Foresights* (pp. 163–194), A.A. Ambroziak (Ed.). Warsaw. SGH Publishing House.

Ambroziak, A.A., Grzegorzewska, B. (2025). Ewolucja pomocy publicznej na cele związane z energią w Polsce po akcesji do UE. In: *Międzynarodowe stosunki ekonomiczne w warunkach niestabilności – zagadnienia wybrane* (pp. 91–104), K. Czech, J. Kos-Łabędowicz (Eds.). Katowice: Uniwersytet Ekonomiczny w Katowicach.

Baszczak, Ł., Kiełczewska, A., Kukołowicz, P., Wincewicz, A., Zyzik, R. (2022). *How Polish Society Has Been Helping Refugees from Ukraine*. Warsaw: PIE.

Darvas, Z., Moffat, L.L., McCaffrey, C. (2024). *Emerging Countries Have Replaced Most of Russia's Lost Trade with Advanced Economies*, https://www.bruegel.org/analysis/emerging-countries-have-replaced-most-russias-lost-trade-advanced-economies (accessed: 1.04.2025).

Drbohlav, D. (2006). Immigration and the Czech Republic (with Special Respect to the Foreign Labour Force), *International Migration Review*, 37(1), pp. 194–224.

Engbersen, G. (2012). Migration Transitions in an Era of Liquid Migration. W: *European Immigrations: Trends, Structures and Policy Implications* (pp. 91–105), M. Okólski (Ed.). Amsterdam University Press.

European Commission (2024). *State Aid Scoreboard*, https://competition-policy.ec.europa.eu/stateaid/scoreboard_en (accessed: 30.07.2024).

European Union (2001). Council Directive 2001/55/EC of 20 July 2001 on minimum standards for giving temporary protection in the event of a mass influx of displaced persons and on measures promoting a balance of efforts between Member States in receiving such persons and bearing the consequences thereof (OJ L 212, 7.08.2001, pp. 12–23), https://eur-lex.europa.eu/legal-content/PL/TXT/HTML/?uri=OJ:L:2001:212:FULL (accessed: 1.04.2025).

Eurostat (2022). *Ukrainian Citizens in the EU*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ukrainian_citizens_in_the_EU (accessed: 1.04.2025).

Eurostat (2025a). *Foreign-Born Population*, https://ec.europa.eu/eurostat/databrowser/view/tps00178/default/table?lang=en&category=t_demo.t_demo_pop (accessed: 1.04.2025).

Eurostat (2025b). *Net Migration by Age and Sex*, https://ec.europa.eu/eurostat/databrowser/product/page/migr_netmigr$defaultview (accessed: 1.04.2025).

Eurostat (2025c). *EU Population Diversity by Citizenship and Country of Birth*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_population_diversity_by_citizenship_and_country_of_birth (accessed: 1.04.2025).

Eurostat (2025d). *Database – International Trade in Services*, https://ec.europa.eu/eurostat/web/international-trade-in-services/database (accessed: 1.04.2025).

Schwabe, M. (2021). Effect of COVID-19 Crisis on Labour Migration: The Polish Case. In: *Poland in the European Union. Report 2021* (pp. 57–71), A.A. Ambroziak (Ed.). Warsaw: SGH Publishing House. DOI: 10.33119/978-83-8030-468-0_2021_57_71.

UN (2025). *International Migrant Stock*, https://www.un.org/development/desa/pd/content/international-migrant-stock (accessed: 1.04.2025).

UNHCR (2022). *Ukraine Situation Flash Update #28*, https://data.unhcr.org/en/documents/download/ (accessed: 1.04.2025).

UNHCR (2024). *Ukraine Refugee Situation*, https://data.unhcr.org/en/situations/ukraine (accessed: 1.04.2025).

FISCAL POLICY CHALLENGES FOR CENTRAL AND EASTERN EUROPEAN COUNTRIES IN THE ERA OF ARMED CONFLICTS

Michał Bitner
Wojciech Decewicz
Paweł Felis
Marcin Jamroży
Elżbieta Malinowska-Misiąg
Grzegorz Otczyk
Piotr Russel
Adam Wyszkowski

DOI: 10.33119/978-83-8030-742-1.287_319

Abstract

The subject of the study is a quantitative and qualitative comparative analysis of defence strategies in the countries of Central and Eastern Europe (CEE) in the period 2014–2023 as well as the level and structure of defence spending and its financing methods. The study also deals with tax instruments to support defence policy, pointing to the necessity of embedding their structure in compensatory taxation. In the empirical part, it compares the national defence spending in the CEE countries and examines the impact of financing the Polish Armed Forces on public finance in Poland. In the final part, recommendations are formulated concerning legal empowerment of defence strategies, focusing on the development and modernisation of the armed forces, their financing in the long term, support for innovation and competition in accordance with the rules of state aid, search for new sources to finance levy on defence spending and financing it by reducing spending on other purposes which do not contribute to development.

Authors

Michał Bitner – PhD, lecturer, Faculty of Law and Administration, University of Warsaw. Used to work at the Municipal Development Agency (where he headed the Municipal Bond Centre), CIDA, UNDP, and the Association of Polish Cities. Author of several dozen scientific publications. Specialises in public finance regulations, methods of financing infrastructure, public debt management and financial assembly of investment projects.

Wojciech Decewicz – graduate student, SGH Warsaw School of Economics, tax relief consultant. Winner of the Institute of Public Finance award for the best thesis entitled *The impact of increasing the financing of the Armed Forces on public finance in Poland in 2021–2026*.

Paweł Felis – Professor at SGH, Institute of Finance, SGH Warsaw School of Economics. Expert in finance and taxes. Specialises in the design and implementation of economic research. Author or co-author of over 150 scientific and popularising publications as well as many opinions and expert opinions for the Chancellery of the Sejm. Member of the Scientific Council of the Discipline of Economics and Finance, SGH Warsaw School of Economics.

Marcin Jamroży – PhD in economics and law, Director of the Institute of Finance, SGH Warsaw School of Economics. Head of Postgraduate Studies in International Taxation and Postgraduate Studies in Transfer Pricing and Tax Management. Tax and legal advisor.

Elżbieta Malinowska-Misiąg – PhD, Assistant Professor, Department of Financial System, SGH Warsaw School of Economics. Author or co-author of several dozen books and articles and numerous reports and expert opinions in the field of public finance, including fiscal transparency and institutional aspects of the public finance sector.

Grzegorz Otczyk – graduate of the Centre for Local Government and Local Development Studies, University of Warsaw and the Faculty of Cybernetics, Military University of Technology. Former doctoral student at the Collegium of Management and Finance, SGH Warsaw School of Economics. Employed in the Ministry of Finance dealing with transfer pricing since 2020. Author or co-author of publications in the field of public finance.

Piotr Russel – PhD, Assistant Professor, Institute of Finance, SGH Warsaw School of Economics. Expert in the fields of corporate finance, public finance and pension systems. Participant of over twenty scientific projects, author and co-author of over eighty scientific and popularising publications. Specialist in the Bureau of Expertise Reports and Regulatory Impact Assessment of the Chancellery of the Sejm.

Adam Wyszkowski – Professor at the University of Bialystok. Lecturer, expert in public finance and taxes. Specialises in the analysis of the effectiveness of tax preference. Author and co-author of over 100 scientific and popularising publications as well as many different opinions and expert opinions. Member of the Discipline Council of Economics and Finance, University of Bialystok.

The international situation, geopolitical tensions and, primarily, the redefinition of the concept of war as a result of technological progress have necessitated the revision of defence policy, including the size and type of armament. The 2014 Wales Summit adopted the Defence Investment Pledge, which included a commitment to spend 2% of GDP annually on defence and 20% of this spending on new military equipment. The defence strategies and principles of modernisation of the armed forces are being redeveloped. No matter what the direction of the introduced and proposed changes, they result in increased defence spending. It must lead either to a reduction in spending in other areas or to a significantly increased deficit and public debt of the general government.

The increase in defence spending raises numerous challenges to the performance of public finances in the countries of Central and Eastern Europe (CEE), and in particular their stability in the medium and long term. The identification and assessment of these phenomena require:

- **firstly**, description of the status quo of defence spending, including the characteristics of its impact on each item in public accounts;
- **secondly**, indication of potential forms of modification of the fiscal rules adopted by each country in accordance with the applicable EU law and the related identification of potential instruments for financing defence spending;
- **thirdly**, analysis of how to improve the defence spending financing with public levies by introducing appropriately structured investment reliefs to stimulate defence spending.

The study is aimed at answering the following research questions:

- How has the importance of defence spending in the general government spending system in the selected CEE countries changed over the past few years?
- What impact does this spending have on public finance in the CEE countries, in particular in Poland?
- Has the increase in defence spending entailed changes in the way it is financed??
- Is it possible to introduce investment tax reliefs constructed in such a way as to stimulate spending (outlay) on security and defence?

The study is theoretical and empirical. The sources of data include Eurostat, OECD and CEE countries, and in the case of Poland – also detailed reports of budget units on the implementation of financial plans. The empirical part presents a summary concerning the structure of public spending on national defence. It forms the basis for a comparative analysis, which was carried out in cross-sectional and temporal dimensions using the panel-based data. The adoption of a longer time horizon enabled the observation of changes in financing caused by the outbreak of war in Ukraine. The comparison of the structure of spending in the cross-sectional dimension contributed to the preparation of rankings of countries which are leaders in this area – accounting for the number of inhabitants as well as the volume of GDP. In order to obtain a full picture of the analysed phenomenon, the analysis was supplemented with classic methods in descriptive statistics: group comparison and data clustering. This approach allowed the identification of groups of countries whose fiscal policies in the area of defence are most similar.

Directions of changes in defence policy in the CEE countries

Russia's invasion of Ukraine, and in particular a full-scale war that broke out in February 2022, forced NATO allies to analyse their armed forces capabilities to meet the alliance commitments, if need be. In many cases, it is necessary to change the long-term approach to defence, strategic objectives and the way they are financed. A summary of the most important documents and strategic objectives of the CEE countries in the field of defence are presented in Table 1.

The directions of changes in the defence policy of each CEE country are discussed below, accounting for the method of financing spending incurred under this policy.

Table 1. Main defence strategies and plans of the CEE countries

Bulgaria	Bulgaria's national defence strategy for 2025–2029 is based on three pillars: 1) modernisation of armed forces; 2) increase in the country's defence potential through the development of infrastructure and operational capabilities; 3) cybersecurity
Croatia	In 2017, the Croatian parliament adopted a national security strategy. It is planned to modernise obsolete systems and platforms in all the military segments. In 2025–2027, besides the modernisation of military equipment, measures are also planned to improve the living and working conditions of Croatian soldiers
Czechia	The current defence strategy of Czechia was adopted by the government in October 2023. It assumed that the country must be prepared for a long-term defensive war against an enemy equipped with nuclear weapons. It also stressed the need for Czechia's active participation in NATO and adequate financial security in the form of annual defence spending of at least 2% of GDP
Estonia	The basic documents related to national defence in this country are Estonia's concept of national security and plans with different time horizons. The 10-year perspective is covered by the National Defence Development Plan – the latest one (for 2022–2031) focuses on strengthening the army by increasing the size of the reserve and reorganising the military territorial defence as well as developing infrastructure and purchasing various types of vehicles and communication equipment. The Military Defence Action Plan is a four-year plan, which sets out the funds for the implementation of the National Defence Development Plan; and the plan with the shortest time horizon is the Emergency Defence Plan (Operational Defence Plan)
Lithuania	The main instruments aimed at strengthening Lithuania's national security include the programme for the development of the country's defence system and infrastructure necessary for defence, the preparation and armament of the armed forces and their active reserves, the development of the state border protection system, the development of the airspace control system, the development of military education and the science of war, as well as the training and preparation of citizens for civil defence
Latvia	The basic plans for Latvia's national security include the National Security Concept, State Defence Concept, National Security Plan, State Defence Plan, State Defence Operational Plan. In July 2024, the Council of Ministers of Latvia approved the Armed Forces Development Plan 2025–2036 (classified document, only general assumptions have been published). The development of defence potential, infrastructure and human resources was considered a priority
Poland	The Polish Armed Forces Development Programme was introduced by the order of the Minister of National Defence. The main objectives of the programme for 2017–2026 include strengthening the combat potential and improving operational capabilities, with priority given to the north-eastern flank

Romania	The strategy, which aims at increased defence capabilities through large-scale military investments in an unprecedented way, was formulated in the procurement programmes under the general name Armata 2040. The concept of the programmes was developed in 2020 and modified two years later. The programmes cover four areas: 1) defence budget; 2) equipment (replacement of post-Soviet equipment with armaments corresponding to NATO standards); 3) the arms industry (the development of the state-owned company ROMARM, the main domestic supplier of military equipment) and 4) personnel (plan to increase the number of armed forces from about 80,000 to 100,000 soldiers and improving their living conditions in the barracks, the construction of the largest military base in Europe was announced)
Slovakia	The current security and defence strategy of Slovakia was adopted in January 2021. It emphasises that 1) Russia is a challenge to Euro-Atlantic security; 2) Slovakia's security policy should be conducted within the framework of multilateral cooperation with the EU and NATO countries; 3) an important tool of deterrence is the nuclear arsenal of NATO allies; 4) in order to strengthen Slovakia's credibility as a NATO member in relation to the commitments made at the 2014 Newport Summit, the government in Bratislava aimed to set defence spending at 2% of GDP by 2024
Slovenia	The 2020 document The Defence White Paper of the Republic of Slovenia sets out a vision for the long-term development, operation of Slovenia's defence system and the achievement of key defence objectives by 2035. The necessary activities include modernisation of the Slovenian Armed Forces, construction and modernisation of critical infrastructure and training areas and the strengthening of technologically advanced military capabilities. Slovenia has also adopted other documents in the field of strategic or long-term planning, including a resolution on the general long-term programme for the development and equipment of the Slovenian Armed Forces until 2040.
Hungary	The strategic basis for shaping Hungary's defence spending is the National Programme for the Development of Defence Capabilities and Armed Forces "Zrínyi 2026' (in 2021, its time horizon was extended to 2030). The financial concept of the programme envisages allocation of around 30% of the budget for personnel spending (including incentives to increase interest in military service), 40% for the purchase of new equipment and 30% for the acquisition of new or expansion of existing capabilities (the development of the Hungarian arms industry)

Source: Authors' own compilation based on the government websites, cited documents and press publications.

Bulgaria

The analysis carried out by the Bulgarian authorities after the Russian invasion of Ukraine highlighted the state of collapse in which the Bulgarian Armed Forces were. The most important problems included inoperable aircraft, obsolete armament of the army, lack of armoured personnel carriers, non-existent navy using obsolete ships or lack of people willing to serve in the armed forces [Domaradzki, 2022]. Therefore, a reform plan was developed to improve ineffective tender procedures related to the maintenance and modernisation of the armed forces. By 2024, defence spending was expected to reach 2% of GDP. In addition, the Armed Forces Modernisation Investment Fund was announced, and was finally established in 2024.

Bulgaria's defence plans and strategies focus on ensuring national security, in particular in relation to its NATO membership and in the face of geopolitical challenges emerging in the Balkan and CEE region. Bulgaria's defence strategy for 2025–2029 assumes that defence spending should be adequate to counteract threats and its level should be increased to 2.5% of GDP [The Republic of Bulgaria, 2025]. Maintaining this level in the coming years seems likely because the Bulgarian public finance sector has one of the lowest indebtedness levels – in 2023, it amounted to only 22.9% of GDP.

The main source of financing of defence spending in Bulgaria is the state budget. As part of international cooperation, it also receives financial and technical support from other NATO and EU member states. The compensation from Denmark for military aid provided to Ukraine is an example [Świerkowski, 2023]. In 2024, the Armed Forces Modernisation Investment Fund began to play a key role in financing, supplied with funds from the state budget, including those not used in a given year, but also other funds, e.g. from NATO and EU as well as income from the sales of surplus military equipment and revenues from the export of defence industry products [Dąbrowski, 2024].

Croatia

Croatia has participated in a number of programmes aimed at aligning its armed forces and command structures with NATO standards, such as the Membership Action Plan (MAP) and the International Military Education and Training (IMET) programme. This contributed to a fourfold increase in the number of officer trainings and double financial assistance between 2010 and 2022, the standardisation of Croatian military training in accordance with NATO requirements and a significant increase in the military operational capacity [Gombar, 2025].

The Croatian armed forces have more than 15,000 people, about half of whom serve in the army, 10% in the navy and 10% in the air force. This is in line with the Long-Term Development Plan 2015–2024, which also defines personnel as a key asset of the military and emphasises the importance of training and education [International Trade Administration, 2025].

In the last few years, there has been a tendency to increase military spending, but it has not resulted in reaching the level of 2% of GDP. It was not until the end of 2024 that the prime minister declared the increase in defence spending to 2% of GDP in 2025. Earlier (June 2024), the Minister of Defence stated that Croatia had committed to spending 2% of its GDP on defence by 2030, and the new circumstances meant that this deadline could be shortened by three years [Petrović, 2025]. However, it may turn out that spending of 2% of GDP will be insufficient. The new target may be as much as 5% of GDP.

As a rule, the entity responsible for the implementation of defence spending is the Ministry of Defence. However, raising spending above the minimum level of 2%

in relation to GDP may be difficult to achieve from budget funds alone, which is why the Croatian government is looking for other sources of financing. One of them is European funds within the European Defence Fund (EDF), another is the arms industry itself. Croatia is home to several advanced defence equipment manufacturers, including HS Produkt (a firearms manufacturer), Šestan-Busch (ballistic protective equipment) and DOK-ING (demining equipment).

Czechia

After the outbreak of war in Ukraine, Czechia increased its defence spending, accelerated the modernisation of its armed forces and strengthened cooperation with NATO and EU. However, their defence spending was still well below the reference level set by NATO. It was not until 2024 that just over 2% of GDP was allocated for this purpose [Zachová, 2025]. A significant sharp increase in spending was the result of the adoption of the law on financing the defence of Czechia by the Czech parliament in 2023. It aims to [Kucharski, 2023]:

- increase the defence budget to at least 2% of GDP as early as 2024,
- accelerate the modernisation of the armed forces, including the purchase of modern military equipment, such as F-35A multirole aircraft,
- create mechanisms to ensure the transparency of defence spending and control of its effectiveness.

The Czech Prime Minister announced that the country would seek to increase its defence spending to at least 3% of GDP within a few years [Bankier.pl, 2025]. It seems that the situation of public finance will enable an increase in budget spending in this area. Public debt is well below the limit set by the TFEU, but since 2020 the general government deficit has exceeded the ceiling of 3% of GDP.

Defence spending in Czechia is not directly linked to specific revenues such as special levies. Financing is mainly through the state budget. The authorities in Prague are also seeking to increase the scope of financing investments in security and defence from the EU Recovery Fund [Bankier.pl, 2025].

Estonia

After the decision made by the ruling political parties in 2012, Estonia's defence budget spending is expected to amount to 2% of GDP, which, according to the Estonian authorities, allows for stable financing and development of defence forces. After Russia's invasion of Ukraine, arrangements were adopted at the NATO summit in Madrid in June 2022 to strengthen the alliance eastern flank. It was decided to deploy additional military units in the Baltic states and Estonia became one of the key elements of the established defence plans [Republic of Estonia, 2024].

In February 2023, the Estonian parliament approved the country's national security concept. The increased military threat from the Russian Federation resulted in increased national defence spending, which was set at 3% of GDP over the next four years (without taking into account the additional costs connected with allied troops). However, in March 2025, the Estonian Prime Minister announced that the 2026 defence spending would amount to at least 5% of GDP [The Defence Post, 2025].

The Estonian Defence Investment Centre, which is a central public procurement agency subordinated to the Ministry of Defence, is responsible for the purchase of materials and services and the provision of infrastructure for national defence. Defence spending is financed primarily from the budget sources. To meet the increased demand for funds, the Ministry of Defence carried out reforms to improve the efficiency of spending [Republic of Estonia, 2021]. In 2024, the Estonian parliament also adopted a law on defence tax, which temporarily introduced this tax (until the end of 2028). Discussions are underway on the possibility of using part of the EU funds to finance defence spending [Voltri, 2025].

Lithuania

After gaining independence, Lithuania initially did not focus on defence-related issues. The situation changed only after the Russian aggressions against Ukraine in 2014 and 2022. At that time, the political parties in Lithuania reached an agreement on defence policy and decided to increase the defence budget. In order to increase Lithuania's defence potential, general conscription was reintroduced in 2015. An ambitious programme to supply the armed forces began, including mobile artillery systems, armoured fighting vehicles, a medium-range air defence system, tactical combat vehicles, helicopters (Black Hawk) and other tactical equipment. In 2022, the second phase of the modernisation of the armed forces was accelerated [Bankauskaitė, Šlekys, 2023, pp. 54–77].

In January 2025, the State Defence Council, which is made up of Lithuania's top politicians and military leaders, decided that defence spending will amount to 5–6% of GDP between 2026 and 2030. It is estimated that with unchanged defence spending, the Lithuanian military division would not reach full operational capability until 2036–2040. Initially, it was planned that this would be achieved by 2030. The increase in spending is to achieve the goal within the originally assumed deadline.

The Lithuanian national defence system is financed primarily from the state budget. It can also be funded by structural funds and other EU funds and repayable funds.

At the end of June 2024, laws were passed to enable financing increased defence spending. The corporate income tax rate and excise duty on tobacco, alcohol and fuel were increased. These funds – together with the so-called temporary solidarity contribution imposed on the interest income of banks – are to be added to the newly created State Defence Fund. Since 1 October 2024, Lithuanian citizens, companies and organisations have been able to donate to the country's defence needs by making online transfers or buying the so-called defence bonds [LRT, 2024]. The funds of the State Defence Fund are to be used for the creation of a division, a tank battalion, the acquisition of infantry fighting vehicles and the strengthening of air defence as well as for the purchase of mines or the installation of various types of barriers [LRT, 2024].

Latvia

After the Russian aggression against Ukraine in 2014, the intensity of military exercises in Latvia increased. The Ministry of Defence is systematically developing its training infrastructure. The increasing requirements for military infrastructure are related to the deployment of additional troops of allied countries in Latvia. It led to the adoption of a law in June 2023 to establish a new military training ground Selonia.

In January 2024, the defence ministers of Latvia, Lithuania and Estonia approved the Baltic Defence Line initiative, which aims to strengthen the defence of the eastern border of the Baltic states. The National Armed Forces of Latvia intend to establish support posts for the defence forces on the eastern border – defensive posts with reinforced military structures and fortifications, anti-tank trenches, ammunition and mine depots. There are also plans to reconstruct roads, build anti-tank trenches and install obstacles [Republic of Latvia, 2025a].

By 2026, the Latvian defence spending is expected to increase to 3.7% of GDP (compared to only 1.0% of GDP in 2015). This spending is financed primarily from the budgetary funds, but also with the participation of foreign financing. Latvia has applied for NATO co-financing for the construction of a new training ground [Republic of Latvia, 2025b] and is also benefiting from funding from the United States.

Poland

Poland is consistently implementing the process of modernisation of its armed forces; there are three stages to be distinguished in it. The first of them is the period from the political transformation to the beginning of conflict in Ukraine in 2014, when the size of the armed forces remaining after the period of the Polish People's Republic was reduced. The primary goal at that time was to acquire selected elements of modern equipment with limited financial capabilities of the state and to implement modern NATO procedures. At that time, Poland purchased used Leopard 2 tanks, F-16 aircraft, transport planes and Rosomak wheeled armoured personnel carriers. The directions of development of the armed forces set at that time were to respond to the need to carry out stabilisation missions within NATO.

In 2014, the process of preparation of the Polish Armed Forces for a possible conflict in Europe began. At that time, the process of expanding the size of armed forces from three to four divisions was initiated, the Territorial Defence Forces and the Cyberspace Defence Forces were established, and work on a modern air and missile defence system began. During this period, Krab self-propelled howitzers, Poprad and Patriot IBCS anti-aircraft systems, F-35 aircraft and Miecznik frigates were purchased.

The outbreak of war in Ukraine in February 2022 led to an unprecedented revision of plans for the expansion of the military. In response to the Russian invasion, the process of technical modernisation was significantly accelerated and the expansion of the structures of army to six divisions was planned, with the total size of the army coming up to 300,000 soldiers. Thanks to high defence spending, the scope and value of the acquired armament have been significantly modified since 2022. At the end of 2024, the Armament Agency implemented a total of 467 contracts amounting to about PLN 540 billion [Ministry of National Defence, 2025].

In 2001, guidelines for planning defence spending financed from the state budget in Poland was defined by the Act on Reconstruction, Technical Modernisation and Financing of the Polish Armed Forces. It includes the requirement to spend 20% of defence spending on property and 2.5% on research and development. The amendment to the Act of September 2017 enabled increased defence spending from 2% to 2.5% of GDP in the years 2018–2030. After the outbreak of war in Ukraine in 2022, the Homeland Defence Act was passed to bring groundbreaking changes in the structure of financing defence spending. Not only did the new regulations impose a higher minimum threshold of 3% of GDP for the purposes of planning defence spending within the state budget but also established the Armed Forces Support Fund (FWSZ),[1] which replaced the state special-purpose fund – the Armed Forces Modernisation Fund – effective in 2001–2022. The new fund was given the status of not really a state special-purpose fund, but a fund operating within Bank Gospodarstwa Krajowego, which can take loans and issue bonds for FWSZ. The amount of defence spending, despite the discrepancies between its declared and actual level,[2] makes Poland one of the leading NATO countries.

1 The Armed Forces Modernisation Fund remains outside the budget and is not included in the Eurostat statistics analysed further.

2 For example, in 2023, 4% of GDP was declared in public to be spent on defence compared to 3.3% of spending actually incurred for this purpose. This is due to a relatively low level of implementation of the FWSZ plan and the transfer of funds not used in a given financial year from part 29 of the state budget at the end

Romania

In Romania, the main "structural' problems related to financing defence spending include insufficient managerial efficiency of the Ministry of National Defence combined with bureaucratic constraints as well as corruption and desire to increase profits by manipulating the political and social environment. One of the initiatives to mitigate or even overcome these negative phenomena was the creation of the Romanian Agency for Technological and Industrial Cooperation in the field of Security and Defence (ARCTIS) in 2024. The main objectives of the Agency include the acceleration of tender based purchases, support for research and development activities and coordination of cooperation between defence policy stakeholders [Grein, 2024].

The level of financial resources allocated to defence-related purposes is determined by the National Political Agreement on Increasing Defence Financing. Defence spending became one of the spending priorities of the Romanian budget after 2014, i.e. after the annexation of Crimea by Russian troops. The systematic increase in military spending led to exceeding 2% of GDP, and after Russia's attack on Ukraine in February 2022, the Romanian Supreme Military Council (CSAT) set a more ambitious allocation target: 2.5% of GDP for the armed forces from 2023. Due to a high GDP growth dynamics, the new defence spending threshold has not been reached, despite an unprecedented increase in the defence budget in 2024.

According to Romania's strategy, it is the government task to ensure and allocate funds for defence. It should be remembered that the defence budget also includes civil defence, reserve and auxiliary forces, police (military and "civilian') and paramilitary units, subsidies in kind, pensions for military personnel and social security contributions provided by some government entities to other government entities. The level of defence spending is set as part of multiannual budgetary planning, which ensures predictability of funding. Defence financing is based on budget allocations and own revenues generated in the areas of competence of military institutions [Şuhan, 2019]. Transfers from NATO and international assistance under bilateral agreements also play an important role [Iura, 2024, pp. 67–91].

Slovakia

In 2016, the Slovak Ministry of Defence created the so-called White Paper, containing recommendations on the organisation, required armament and rules of operation of the Armed Forces of the Slovak Republic. The recommendations indicate the need

of the year. The transfer, which amounted to PLN 10.6 billion in 2023, should in fact be perceived as defence spending only when spent by FWSZ.

to accelerate the modernisation of the Slovak army and the reconstruction of structures of the army, air force and special forces by 2030. It is also planned to increase the number of professional soldiers from about 12.5 thousand to over 21 thousand [Dąbrowski, 2018].

This plan is being gradually implemented. Currently, about 18.5 thousand soldiers serve in the armed forces; about seven thousand in the army and 4.2 thousand civilian employees. An important support for the army is its sizeable, for a country of about five million citizens, air force. Initially, they were armed with a dozen or so MiG-29 fighters, which were withdrawn from service in 2022 [Janák, Stolár, 2022], and in 2023 they were given to fighting Ukraine. In return, the US government offered Bratislava partial financing for the delivery of 12 Bell AH-1Z Viper attack helicopters along with a package of 500 anti-tank guided missiles [Muczyński, 2023].

Between 2014 and 2023, Slovakia's defence spending increased from 1.0% to 2.0% of GDP [SIPRI, 2025]. It is worth noting that as part of the security priorities, it has been assumed that by 2050 at least 2% of GDP will be spent annually on defence, and at least 20% of defence spending will be devoted to armaments, technology and research [Lewkowicz, 2023]. According to estimates for 2024, the Slovak military equipment spending amounted to 27.2% of total defence spending and exceeded the minimum level of 20% recommended by NATO [NATO, 2024].

The main source of financing of defence tasks in Slovakia is the state budget. Private companies also play an important role in this respect, especially in the production of military equipment, defence technologies and logistics services.

Slovenia

Slovenia's defence policy has changed in recent years. Several strategies for the development of the armed forces have been created and several strategic reviews of defence policy made. Like most European countries, Slovenia had to make changes to its defence policy after the outbreak of war in Ukraine. The reorientation of the Slovenian defence policy is primarily related to changes in the command, size of the armed forces and armament. One of the actions taken by the Ministry of Defence was also the restoration of territorial defence.

Slovenia's defence policy can be described as passive – the minimum level of spending on this purpose, i.e. 2% of GDP, is not to be achieved until 2030, with the intermediate goal of achieving 1.5% of GDP by 2024 [Ministry of Defence, 2020, p. 11].

According to the adopted assumptions, the military capabilities of the Slovenian Armed Forces will be based on medium infantry with the possibility of forming a task unit at the brigade level. The basis for the potential and modernisation of the Slovenian Armed Forces is to be the creation of a medium battlegroup. The key elements of the equipment will be wheeled armoured vehicles with adequate firepower and ballistic and mine protection for the crew. The medium battalion battle group will be equipped with anti-aircraft, artillery, engineering, nuclear, radiological, chemical and biological defence, communications and reconnaissance defence. The first medium battle group will be formed by 2027, and the second by 2030 [Army Technology, 2022].

With regard to the sources of financing military spending, the most important role is played by the state budget. It does not mean that the Slovenian authorities are not looking for other sources of financing of this spending. A form of financing arms purchases is offset transactions; in 2022, Slovenia donated thirty-five amphibious armoured vehicles to Ukraine, for which it received a voucher from the United States for the purchase of weapons worth more than the donation amount [Army Technology, 2022]. The Slovenian authorities also intend to obtain funds from the EU to finance the development of military capabilities together with other member states [Adamowski, 2024].

Hungary

The development of the Hungarian armed forces is in apparent contradiction to the so-called narrative of peace created by the Hungarian government, in which Russia is not presented as a threat. It applies both to the security strategy adopted in April 2020 and to subsequent statements made by the authorities, including the prime minister. Investments in domestic armament and increased number of soldiers in the armed forces are explained by the need to adapt to the turbulent international reality and the resulting need to maintain significant defence capabilities in the event of the "erosion" of the regional security system. Building strong and modern armed forces is to serve the creation of a stable and influential state, both domestically and internationally.

Initially, Hungary was among the NATO members with the lowest budget spending on defence purposes, which was due, for example, to the lack of serious external threats, social and economic policy priorities and financial crises. It did not change until 2014 as a result of deteriorating security environment, improvement of Hungary's financial situation as well as the pressure exerted by the United States. The Hungarian government undertook to fulfil the commitments made at the Wales Summit (2% of GDP) by 2024 by updating the Zrínyi 2026 programme. However, Hungary plans to reduce defence spending to "less" than 2% of GDP in 2025. This is due to budgetary problems and the need to finance social programmes (especially in view of the 2026 elections).

The Hungarian defence spending is financed from budget funds and, as an auxiliary measure, also from instruments created by the EU (loans from the European Investment Bank to finance defence industry companies, and in the near future – SAFE).

A summary of the most important spending areas and types related to the defence of the CEE countries is presented in Table 2.

Table 2. Main areas/types of defence spending in CEE countries

Bulgaria	Bulgaria's national defence spending includes 1) modernisation and purchase of military equipment, including F-16 aircraft, combat vehicles and radar and air defence systems; 2) construction of military infrastructure, including new F-16 aircraft; 3) spending on military personnel (recruitment and training of new soldiers, introduction of compulsory training of reserves, improvement of living conditions in the barracks); 4) spending related to cybersecurity and use of artificial intelligence and quantum technologies in cyber defence
Croatia	Support for the Croatian Armed Forces included the purchase of twelve used Dassault Rafale F-3R aircraft (2021), modernisation of Bradley infantry fighting vehicles, purchase of new Black Hawk helicopters, construction of a new corvette for the navy and development of military cybersecurity capabilities
Czechia	The Czech government signed contracts for the purchase of military equipment, including a record USD 6.6 billion contract for 24 F-35 fighter jets. The country's air force will also receive two new C-390 Millenium military transport aircraft. The army will also receive 246 CV90 infantry fighting vehicles and in June 2024, the government approved a plan to purchase 77 Leopard 2A8 tanks
Estonia	Since 2014, Estonia's national defence spending has consisted of parts allocated to the creation and maintenance of defence potential and the costs of allied troops, including the costs of patrolling the airspace of the Baltic states. In 2018, the scope of spending was extended to include the defence investment programme, including the purchase of large-caliber ammunition
Lithuania	The government of this country plans to continue projects related to the purchase of weapons and equipment for the Lithuanian armed forces, including tanks, infantry fighting vehicles, artillery rocket systems, medium-range air defence systems, RBS 70 short-range mobile air defence system, howitzers, mobile radars and artillery radars and ships. There are also plans to develop military infrastructure, including training and storage
Latvia	The main plans for the development of the combat potential of the Latvian Armed Forces focus on the implementation of a layered air defence system, acquisition of coastal defence missiles and purchase of infantry fighting vehicles, artillery, ammunition and equipment. The largest infrastructure project is the construction of the new Selonia training ground
Poland	Since 2022, Poland has significantly increased the number and value of the acquired armament. The most important contracts concluded after 2021 include the purchase of six batteries of Patriot IBCS anti-aircraft and anti-missile systems, acquisition of elements of twenty-three batteries of air defence systems under the Narew programme, purchase of M1 and K2 tanks as well as artillery systems such as Krab, K9 and K239
Romania	Romania was the first in Europe to acquire the HIMARS system (54 units). It also purchased fifty-four tanks (M1A2 Abrams), drones (Watchkeeper X), modern infantry vehicles and howitzers (K9). There are also plans to acquire modern aircraft (F-35 Lighting II) and to modernise the navy, including the purchase of two submarines (Scorpene) and corvettes
Slovakia	The most important arms purchases concern the purchase of 14 F-16 multirole aircraft and the acquisition of 17 3D radars from Israel. Slovakia is also interested in arms purchases in Poland, in particular the Piorun man-portable anti-aircraft missile systems
Slovenia	The most important needs for armaments procurement, as Slovenia's strategic documents indicate, include the purchase of wheeled combat vehicles, self-propelled howitzers, short- and medium-range air defence systems and multifunctional helicopters

Hungary	Large arms purchases have been made in Hungary since 2018 (battle tanks, armoured infantry fighting vehicles, self-propelled howitzers, medium and light helicopters, surface-to-air missile systems and radars). One of the most urgent goals of equipment modernisation has been the development of force to meet NATO standards. In June 2018, 20 H145M helicopters were ordered and in 2019, Hungary signed a contract for the purchase of 16 Airbus H225M (Caracal) helicopters. Leopard tanks were also ordered

Source: Authors' own compilation based on the government websites, policy documents and press publications.

Tax instruments to support defence policy in selected CEE countries

One of the basic tasks of the state and one of the most important public policies implemented primarily by the government at the central level is to ensure internal and external security. Hence, public funds generated mainly by the tax system are the source of financing of spending under this policy. Due to non-targeted nature of taxes and the principle of budget unity, tax systems should not have taxes that are closely linked to a specific type of policy, in this case defence policy. In practice, however, instruments that contradict the above postulates are used. In the literature, the authors use the category of defence tax with regard to various tax structures that are related to defence policy.

These structures can be assigned to one of two groups. Firstly, these are various types of new taxes or changes in already existing tax regulations, not directly related to military tasks, but introduced in order to finance them. It seems that linking them to military spending is intended to increase public approval of their use. Secondly, these are specific taxes or, much more often, various types of tax preferences (Table 1), the subject or object of which is directly related to military issues. On the one hand, they directly concern military personnel (as taxpayers), and on the other hand, taxpayers carrying out specific spending on armament purposes.

Table 3. Comparison of defence tax preferences in selected CEE countries

Country	Defence tax/contribution
Croatia	Proposal to introduce a tax paid in kind by men up to the age of 30 (primarily military service); the taxable amount is to be the net salary minus the exempt amount of EUR 900 as an equivalent of accommodation and meals
Czechia	Tax investment incentives for companies planning to operate in the defence sector, especially in areas related to technology centres and production of strategic products, including full CIT exemption for new companies; exemption from VAT on supplies of goods and services purchased for the armed forces of the member states NATO and EU
Estonia	Income tax exemption for soldiers taking part in international missions (e.g. under the aegis of NATO or UN); tax reliefs for donors supporting defence purposes, VAT exemption for supplies of goods and services purchased by the Ministry of Defence of Estonia and the Estonian Armed Forces and intended for defence purposes; planned introduction of defence tax*

cont. Table 3

Country	Defence tax/contribution
Lithuania	Exemption from VAT and excise duty on supplies of goods and services for the armed forces of NATO member states participating in joint defence operations; other changes in the tax system not directly related to defence purposes**
Latvia	A three-year tax on financial sector profits to finance defence spending; tax exemption on the supply of goods and services to the armed forces of other NATO or EU member states participating in defence operations in Latvia; tax and contribution exemptions for NATO personnel, tax exemptions for the US armed forces
Poland	PIT and CIT reliefs for employers of soldiers; exemption from taxation of benefits: for performing military service other than professional military service, for housing allowance for professional soldiers, granted on the basis of separate acts or executive regulations to soldiers and military employees performing tasks outside the country, financial allowances paid to the soldiers to cover the costs of renting a dwelling; zero tax rate for the supply of goods or services to NATO and US armed forces
Slovakia	Tax investment incentives*** for companies planning to operate in the defence sector, especially in areas related to technology centres and production of strategic products, including full CIT exemption for new companies; exemption from VAT on supplies of goods and services purchased for the armed forces of the member states of NATO and EU
Hungary	Additional tax rates on financial transactions and government-issued securities on cash deposits, transfers made by private individuals, general tax rate, and special transactions; additional tax on financial transactions (currency conversion tax); a special tax on financial institutions; special tax for oil producers

* The Estonian government planned to introduce the so-called defence tax, covering three main elements:
1) an increase in VAT by 2 pp from 1 July 2025, allowing the rate to be increased from 22% to 24%,
2) additional personal income tax of 2% effective from 1 January 2026,
3) corporate profit tax of 2% effective from 1 January 2026, calculated on annual profit before tax.

However, according to the information from March 2025, the Estonian government plans to abandon the introduction of a 2% tax on corporate profits. This decision will not affect the planned VAT increase or the additional personal income tax, which remain in force.

** In order to increase defence spending, Lithuania introduced two changes in its tax system:
increase in corporate income tax as of 1 January 2025, the standard CIT rate increased from 15% to 16%, and the rate for small businesses was reduced from 5% to 6%,
gradual increases in excise duty on alcohol, tobacco and fuels in 2025–2027.

*** The defence sector is not directly eligible for these incentives. Projects in the field of industry, technology centres or research and development can be supported if they meet the appropriate conditions.

Source: Authors' own work.

The structure of tax preferences should be embedded in compensatory taxation. On 1 January 2025, Poland implemented Council Directive (EU) 2022/2523 of 15 December 2022 on ensuring a global minimum level of taxation for international corporate groups and large national groups in the EU [Official Journal of the European Union L 328 of 22.12.2022].

The structure of the global minimum tax (GloBE) is a restriction for individual jurisdictions in the freedom to shape tax preferences. Under the GloBE rules, the parent company's country of residence generally has the option of introducing additional taxation if constituent entities located in another country are not taxed at a minimum level. The low level of taxation may result from the tax policy applied in a given jurisdiction, which may encourage investment, including defence, through various types of tax preferences. If the effective level of income taxation for an international group is below 15%, a top-up tax will be imposed on it. The introduction of a top-up tax in Poland may limit tax competitiveness [Bernardelli, Jamroży, 2024]. The protection of the existing system of support with investment reliefs (e.g. exemption for activities within the Polish Investment Zone, R&D relief, IP Box relief) with regard to imposing a top-up tax of up to 15% requires a revision of the structure of the existing tax reliefs by adapting them to the new rules of taxation of capital groups. Also, when designing a potential relief for defence purposes, it is necessary to take into account options that are "harmless" from the perspective of compensatory taxation, i.e. in particular in the form of a qualified refundable tax credit within the GloBE mechanism, or the transfer of tax preferences to the area of taxation of the income of natural persons employed by constituent entities.

Defence spending in CEE countries – comparison[3]

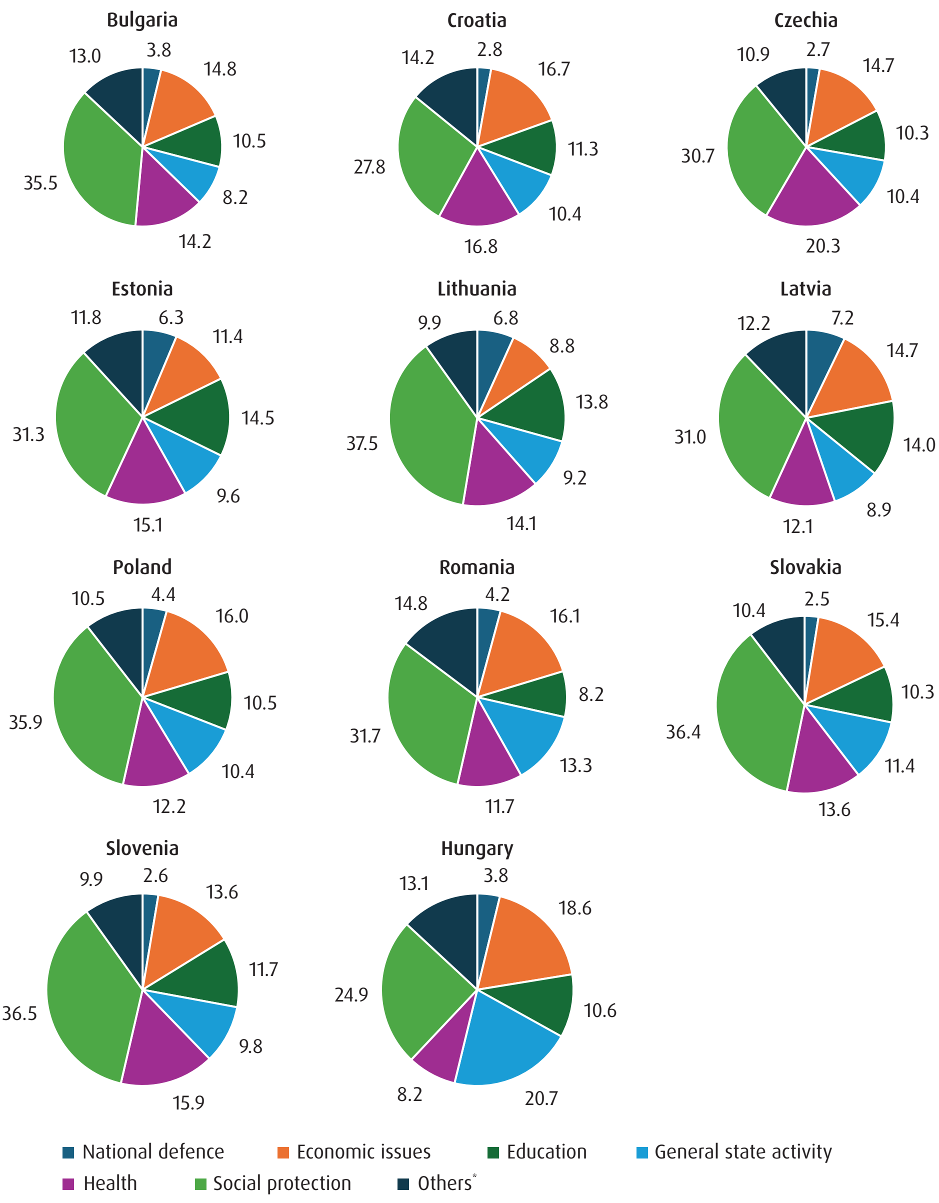
The data presented in Figure 1 show that in most CEE countries, spending on national defence is not dominant. In 2023 – depending on the country – they accounted for between 2.5% and 7.2% of total public spending. In the Baltic states, their share was highest and accounted for an average of about 6.8%, while in the Visegrad Group countries a much lower level was recorded – about 3.4% on average. Czechia (2.7%), Slovenia (2.6%) and Slovakia (2.5%) spent the least in this group. The national defence spending in Poland was slightly higher (4.4%) than the average for the analysed countries (4.3%). Seven out of eleven countries were characterised by a lower allocation of public funds for this purpose than Poland, while in three cases a higher share of this type of spending was recorded.

In the analysis of the amount of defence spending, the reference point is the level of the 2% share of this type of spending in GDP. In most CEE countries, this level was not achieved throughout the period under review (Figure 2). In Estonia, Latvia and Lithuania, an increase in defence spending has been observed in recent years. A reference level has also recently been developed in Poland. An interesting situation has arisen in Romania, where the threshold required in NATO was reached a few years ago, but recently there has been a certain decline in this ratio. In Hungary, on the other hand, defence spending as a percentage of GDP increased by reaching the benchmark level in the last analysed year. Bulgaria, Slovakia and Romania are the only countries

[3] This part of the study uses official Eurostat data, which for various reasons (e.g. financing defence spending from non-budgetary funds) may not include all spending.

to have recorded a visible decline in defence spending in relation to GDP in recent years. Slovenia and Czechia recorded the lowest level.

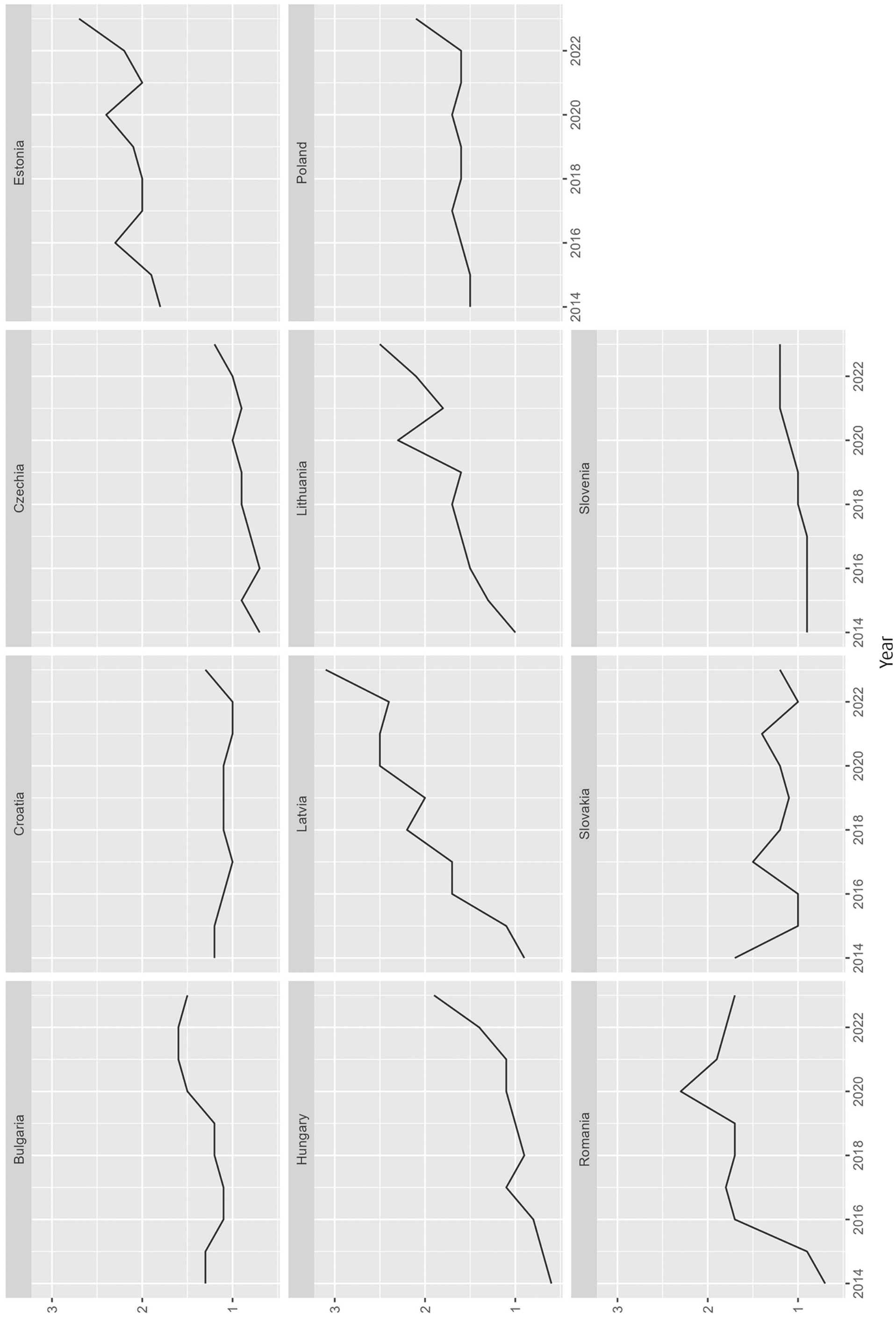
Figure 1. Structure of general government expenditure in CEE countries in 2023 by function (%)



* The following functions are included in this category according to the COFOG classification: security and public order, environmental protection, housing and municipal management, recreation, culture and religion.

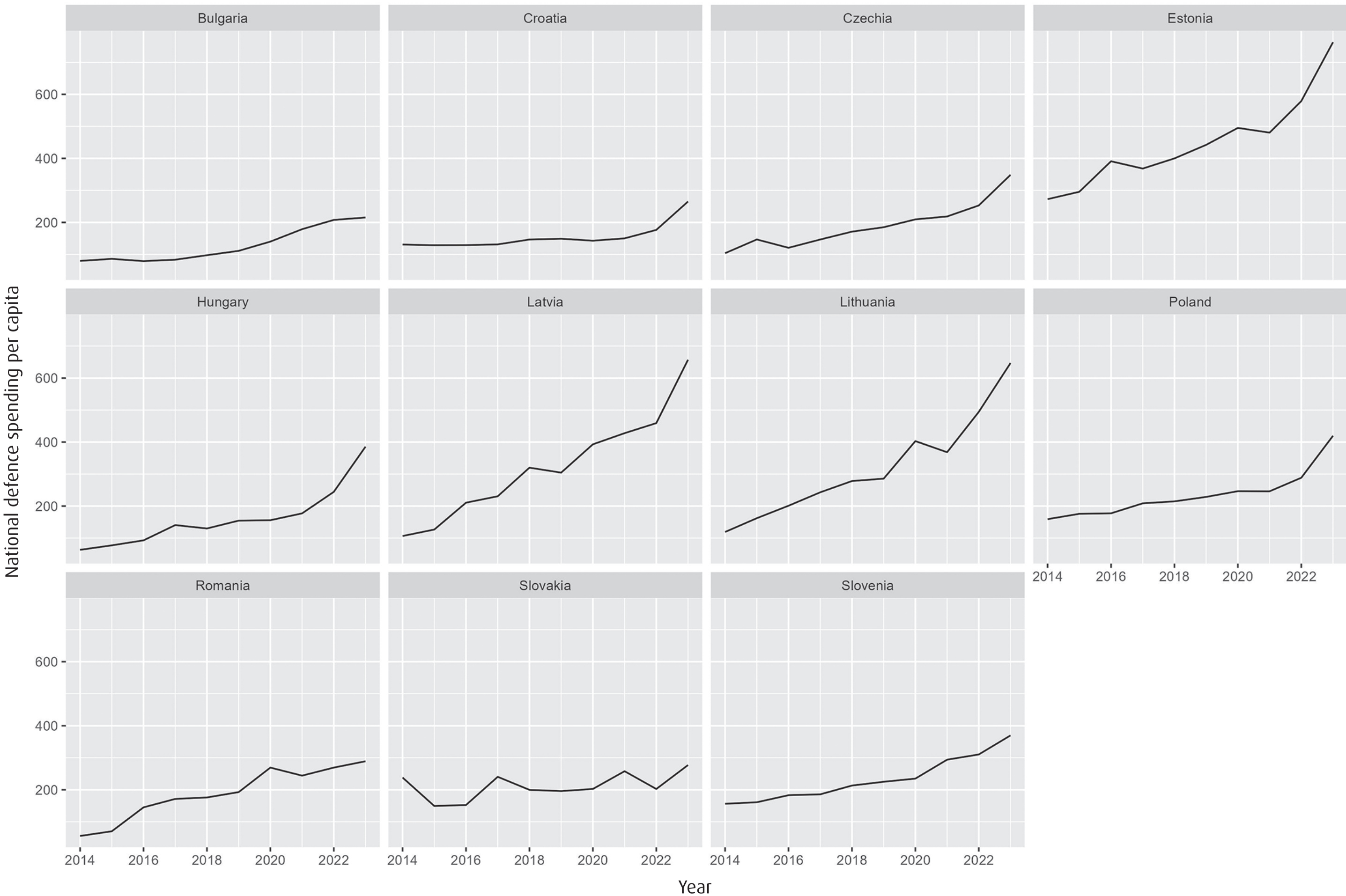
Source: Eurostat [2025a].

Figure 2. National defence spending in CEE countries in 2014–2023 (% of GDP)



Source: Eurostat [2025a].

Figure 3. National defence spending per capita in CEE countries 2014–2023 (EUR)



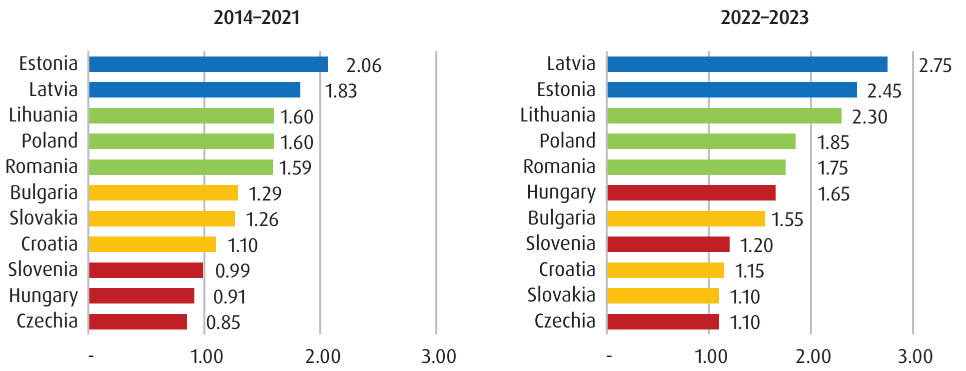
[*] Population data are from 2015 to 2024 (reflect the state of 1 January of the year); spending data are presented for 31 December 2014–2023.

Source: Eurostat [2025a, 2025c].

An important complement to the analysis made so far is the data presented in Figure 3, showing per capita national defence spending in 2014–2023. The CEE region as a whole has seen steady growth, but there are significant differences between countries. On the one hand, the national defence spending per capita in Estonia, Lithuania and Latvia have exceeded EUR 600 in recent years, while in Bulgaria, Croatia, Slovakia and Romania, it has been around EUR 200–300 per capita; in Czechia, Poland, Slovenia and Hungary, it came up to about EUR 400 per capita last year.

On the basis of the relation of national defence spending to GDP in the years 2014–2023, the CEE countries were divided into four groups, using the k-means algorithm with Euclidean distance as a measure of intergroup differentiation as well as intragroup similarities. For ease of reference, the rankings presented in Figure 4 use colours resulting from the conducted clustering. Due to the length of the analysed period, observations from 2022–2023 had a very limited impact on the result of the grouping, despite the fact that it was when many significant changes in the spending amounts on the military and defence sector occurred. Differences in spending can be observed by comparing the ranking of average defence spending of each country in 2014–2021 with the average defence spending in 2022–2023. In the dominant countries (blue), average spending on national defence increased significantly at this time (by 0.66 pp on average). Among the countries included in the next group (green), Lithuania deserves special attention (an increase of 0.7 pp). In the other countries of this group – Poland and Romania – the increase in defence spending was not so spectacular (by an average of only 0.2 pp). The third, diverse group (yellow) includes countries which recorded increased average spending on national defence, Bulgaria – 0.3 or a slight increase Croatia – 0.1 pp as well as a decrease in this type of spending, Slovakia – 0.2 pp).

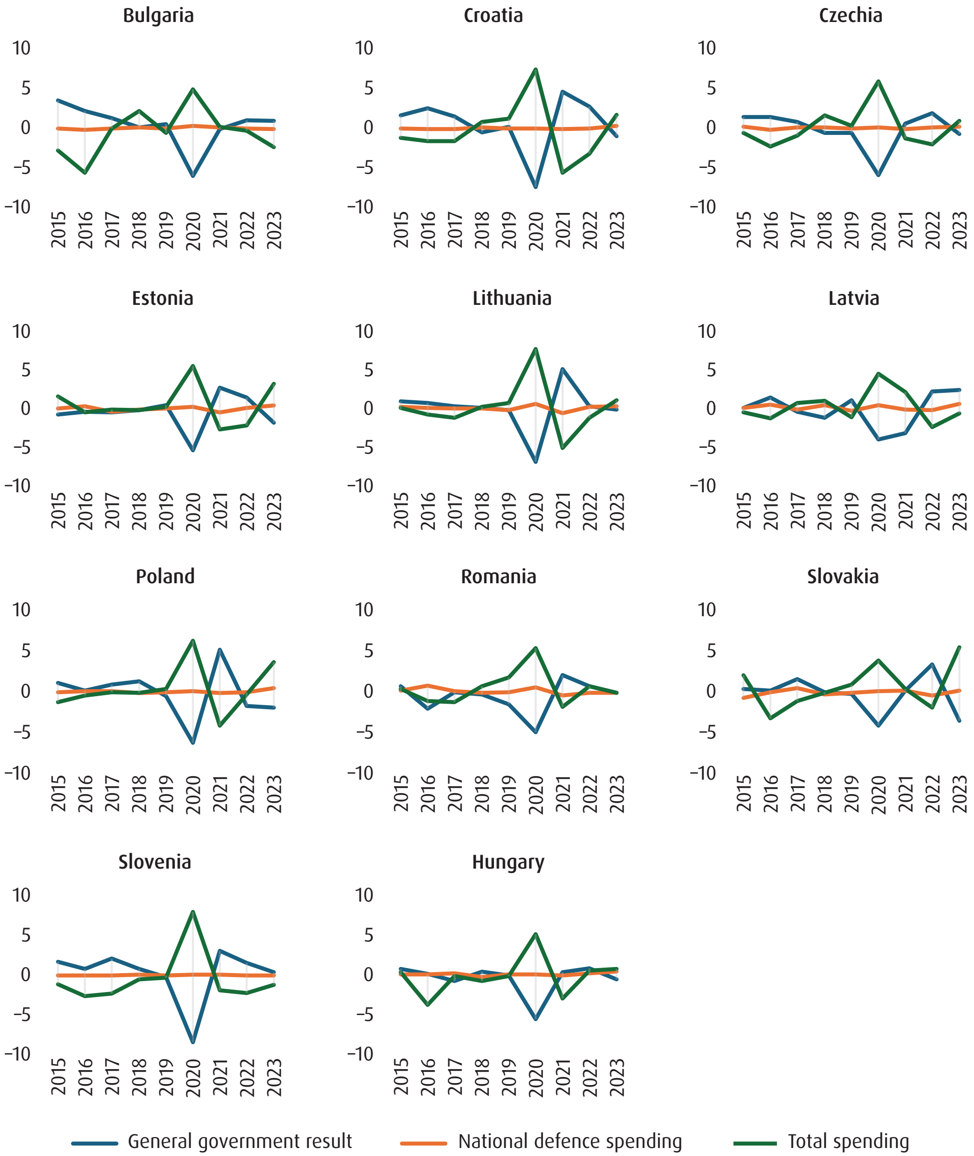
Figure 4. Average general government spending on national defence in CEE countries in 2014–2023 (% of GDP)



Source: Eurostat [2025a].

In the fourth group (red), there was a clear progress. Hungary stood out in this respect, with an increase in average spending by as much as 0.74 pp. It was also observed in other countries of this group compared to the first analysed period, Slovenia – an increase of 0.21 and Czechia – of 0.25 pp.

Figure 5. Changes in national defence spending, total spending and general government result in percentage points in selected CEE countries between 2014 and 2023 (% of GDP)



Source: Authors' own compilation based on Eurostat data [2025a–b].

Figure 5 shows how spending and general government performance evolved across countries. Such an approach was intended to clarify whether changes in national defence spending affected these results. In most CEE countries, changes in national defence spending were small. The Baltic states in some years achieved an increase of as much as 0.6–0.7 pp and Poland and Hungary, where an increase of 0.5 pp was recorded last year, are noteworthy. However, this spending did not have any impact on the budget deficit. On the other hand, when considering the category of total expenditure, it can be noted that in some years (primarily in the year of outbreak of the COVID-19 pandemic) its changes were significant in relation to the general government sector budget result. Possible divergences between spending and deficit levels should be explained by corresponding revenue developments (e.g. revenue increases when the change in deficit is smaller than the change in spending).

Impact of defence financing on public finance in Poland

The amount Poland spends on national defence can be considered according to two separate methodologies: national[4] and EU[5]. The discrepancies between total defence spending in the light of both approaches illustrated in Figure 6 result from the failure to include in the calculation according to ESA standards spending on pensions which are not functionally related to national defence and advances granted for the supply of armaments, which have not been accounted for in terms of material effects.[6] At the same time, there is a noticeable increase in the distance between the curves representing actual defence spending according to both methodologies since 2022, which is due to the intensification of armament purchases and related prepayments.

With regard to the spending calculated according to the national methodology, an alternative scenario was also presented, corresponding to the national defence spending planned before the outbreak of war in Ukraine.[7] A comparison of the curves for cash expenditure enables determining the absolute increase in defence spending

4 In this approach, the cash method is used and the scope of total expenditure included in national defence includes part 29 of the state budget, Section 752 and the Armed Forces Support Fund (FWSZ).

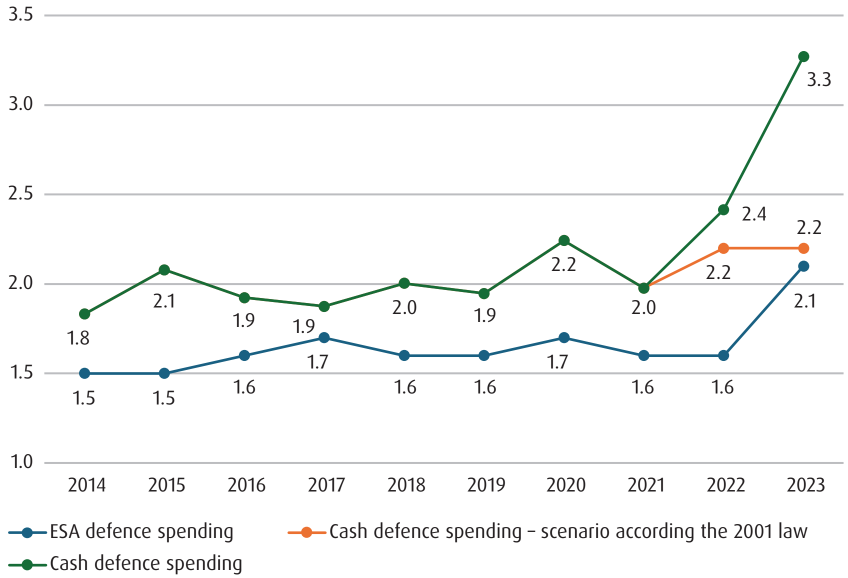
5 This methodology uses ESA standards and an accrual approach. In addition, only this spending which is functionally related to the sphere of defence is considered to be national defence spending.

6 According to NIK data [2024], at the end of 2023, the amounts of advance payments in part 29 of the state budget that were not settled for material effects amounted to approximately PLN 55 billion.

7 The amount of spending planned before the outbreak of war for the years 2022–2023 was determined on the basis of Article 7 of the Act of 25 May 2001 on the reconstruction and technical modernisation and financing of the Armed Forces of the Republic of Poland [Journal of Laws of 2001, item 804].

compared to plans before the outbreak of war, which in cash terms amounted to 0.2% of GDP in 2022 and 1.1% of GDP in 2023, respectively.

Figure 6. National defence spending in Poland in 2014–2023 according to national methodology and ESA (% of GDP)



Source: Authors' own compilation based on NIK (Supreme Audit Office) [2024], Ministry of Finance [2024] and Eurostat [2025a] data.

The Polish Armed Forces are primarily financed from the state budget in part 29, which is managed by the Minister of National Defence, and Section 752 – National Defence, which also includes items in other parts of the budget [Journal of Laws of 2022, item 655, Article 40(3)]. Although the plan implementation rate[8] was lower than expected, since 2022 an extremely important role in financing the Polish Armed Forces has been played by FWSZ, which is located in Bank Gospodarstwa Krajowego, outside the public finance sector. It is responsible for over 20%[9] of Poland's total defence spending, which is all the more important because it finances only arms purchases and debt servicing. The requirement introduced by the Homeland Defence Act to spend minimum 3% of GDP for defence applies only to planning within the

8 Its implementation in 2023 amounted to approx. 51% [Bank Gospodarstwa Krajowego, 2023; Ministry of Finance, 2023].

9 In 2023, about PLN 111.2 billion was spent on national defence, including PLN 24.2 billion from FWSZ.

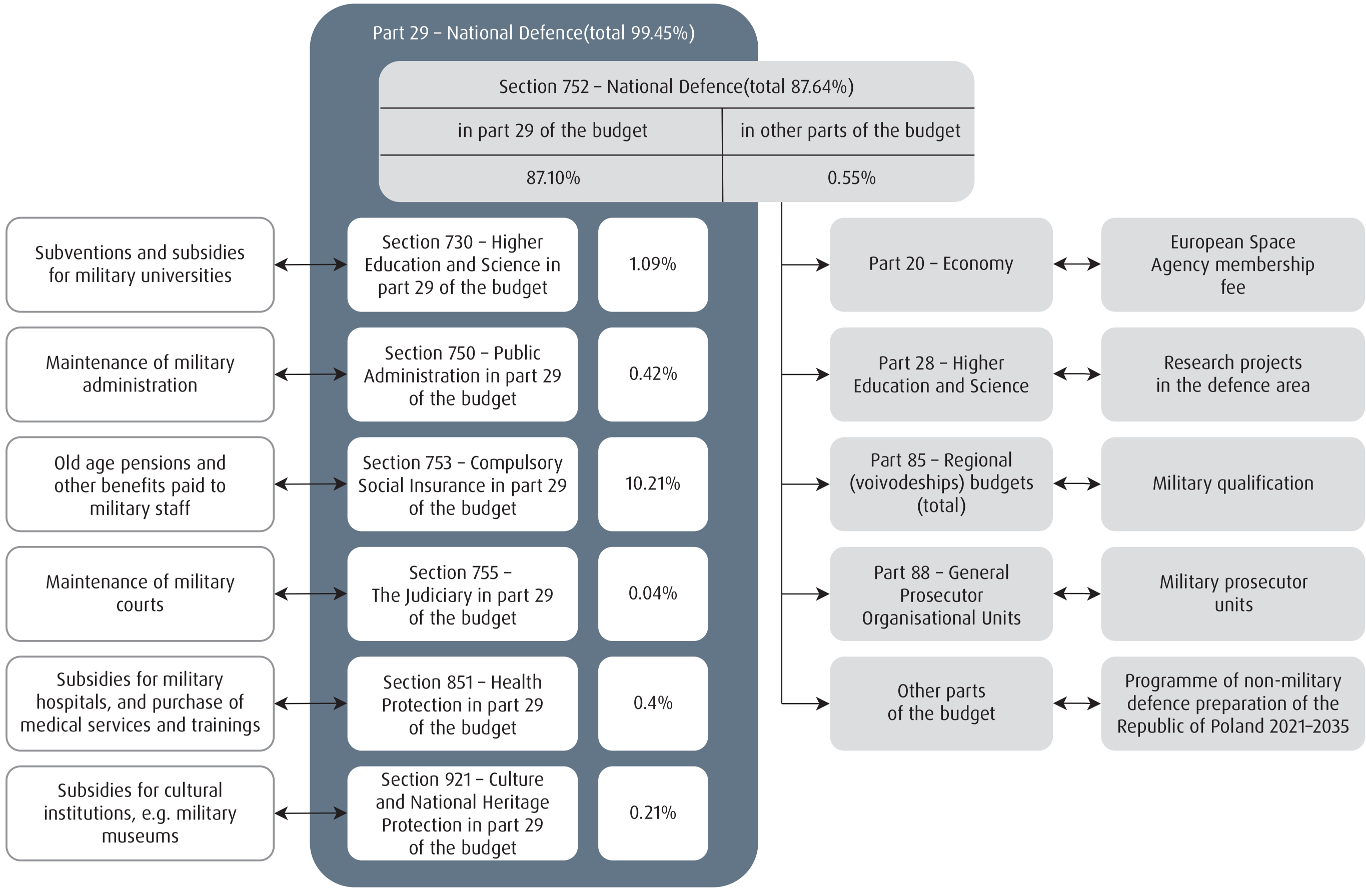
state budget using the national methodology. Therefore, the amount of spending on national defence should be analysed separately for the state budget items, in the context of verification of the implementation of the minimum level of spending on national defence and in the overall perspective, taking into account budget spending and FWSZ. The structure of budget spending on national defence in 2023, broken down by sections and purpose, is presented in Figures 7 and 8. In the case of items included in part 29, presented in detail in Figure 8, the amount of spending in each category is summed up in the headings. Below is a distribution of the same spending with an indication of their purpose. The area of central material plans has been specified, including spending that directly contributes to building the combat potential of the Polish Armed Forces. In the section presenting the purpose of spending, each item has a colour corresponding to the colours of categories in the headings. This colour illustrates the dominant outlay within the item.

The presented diagrams show that not all defence spending recorded according to the national methodology can be attributed with actual participation in building the Polish Armed Forces potential. A significant item is constituted by spending on pensions included in Section 753.

The increase in defence spending by Poland since 2022 has taken place in the conditions of increased inflation. Poland also incurs significant costs related to rebuilding the country energy system and maintains a high level of social transfers. These and other factors lead to a significant burden on public finance resulting in a high deficit of the general government sector.[10] As shown in Figure 9, despite the increase in defence spending in 2023 of 0.5% of GDP compared to the long-term average, it was not this factor that decisively affected the significant excess of deficit in the general government sector, i.e. the level of 3% of GDP. Even if this growth had not taken place at all, the general government deficit would still have exceeded the 3% of GDP threshold. At the same time, it should be noted that total public spending will increase significantly in 2023. The size of the fiscal expansion significantly exceeds 0.5% of GDP, by which defence spending was increased in the analogous period. As indicated by the increased deficit level, this expansion was mainly based on the use of debt instruments and not on increasing public revenues. Therefore, it should be concluded that although the increase in defence spending following the outbreak of war in Ukraine is one of the reasons for the deterioration of public finance, the defence sphere is the only or decisive area of expansion.

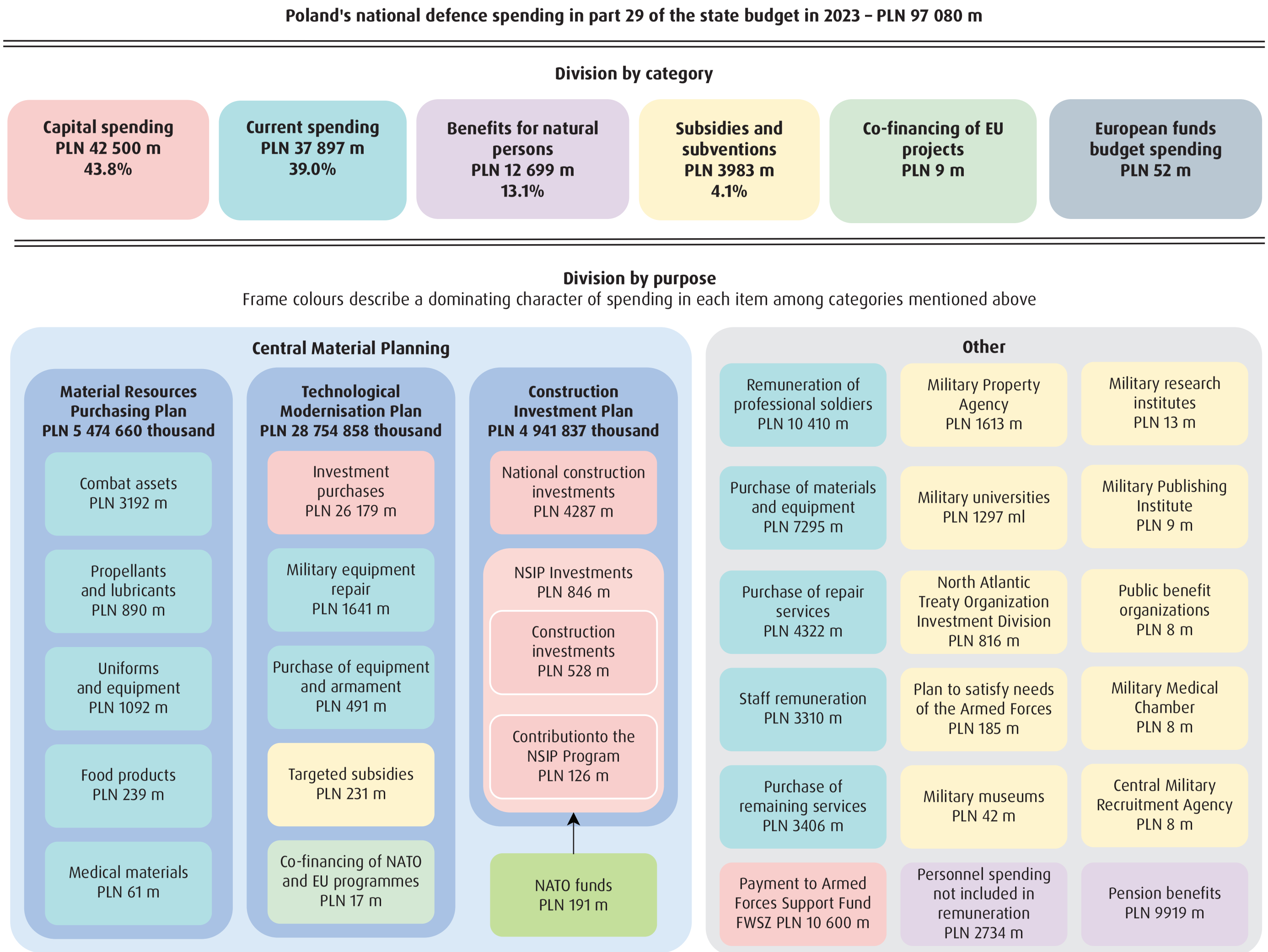
10 Due to the fact that FWSZ is outside the public finance sector, the analysis of the impact of the increase in defence spending on public finance should be carried out only on the basis of the ESA methodology.

Figure 7. National defence spending in Poland in part 29 and other parts of the state budget by sections in 2023



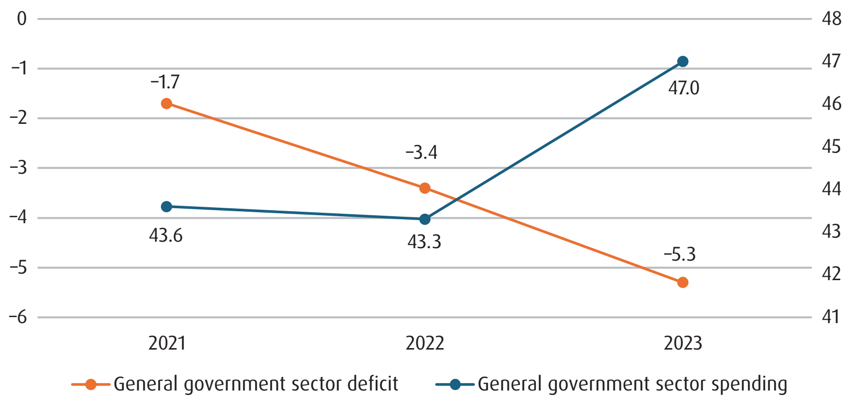
Source: Authors' own compilation based on NIK [2024] data.

Figure 8. Detailed functional distribution of Polish national defence spending in part 29 of the budget in 2023



Source: Authors' own compilation based on NIK [2024] data.

Figure 9. Selected macroeconomic figures for Poland in 2021–2023 according to the ESA methodology (% of GDP)



Source: Authors' own compilation based on Eurostat [2025a–b].

Conclusions and recommendations

Ensuring external security is one of the basic tasks of any state authority, and it has never been questioned even by supporters of the concept of state as a "night watchman". Financing defence has always been an important budgetary task. Its importance usually increases during periods of increased threat of foreign aggression and dominates during military operations. In longer periods of peaceful coexistence, during which such a *status quo* is expected to be maintained, defence recedes into the background, although even then views questioning the need for defence spending are rare.

Since World War II, the European NATO member states have not conducted full-scale warfare on their territories, which fostered the perception of external security as a permanent aspect of life, but what is more they have even benefited from a kind of pension (or – as one can say with some exaggeration – the status of a "stowaway") related to the role played by the United States in the organisation. It was only the annexation of Crimea by Russia and the continuing crisis situation in the Middle East that resulted in a reflection on the need to reverse the trend of a relative decline in defence spending. The "external shock" in the form of a full-scale Ukrainian Russian war is an unprecedented phenomenon, the impact of which on the defence activities of countries of the NATO eastern flank will probably manifest itself for many years to come, but the actions already taken are of fundamental importance for the public finances of these countries.

In all the analysed countries, defence policy is based on differently titled and wide-ranging strategic documents. In their least developed form, they concern the development of the armed forces, while their more complicated variants provide – in addition to the increased size of armed forces and directions of modernisation of equipment – also the development of the defence industry and, what is particularly important, the defence budget. The drawback of these strategies is usually their relatively weak anchoring in the structure of national strategic documents related to the overall national development strategy and the lack of legal basis for their creation and operation. They are often developed at the level of the relevant ministries of defence, which determines both their susceptibility to numerous modifications and insufficient guarantee of their implementation. As a result, the level of defence spending is often the subject of short-term (annual) arrangements by the government, and its implementation depends on the consistent attitude of the executive branch. Therefore, it is difficult to formulate general observations on the "planned" defence spending (except for Czechia and Poland, where the target share of defence spending in GDP has been defined by law).

On the one hand, many analysed countries point to the need to increase this spending above the relation established at the Welsh summit in 2014. The examples of Lithuania and Estonia are particularly spectacular in this respect. On the other hand, some countries (Croatia, Slovenia and, to a lesser extent, Hungary) are still struggling to reach the 2% of GDP threshold. The same applies to the share of purchases of equipment in defence spending, which, moreover, is rarely the subject of arrangements approved in strategic documents (Romania is an exception in this case).

The desire to modernise the armed forces and defence infrastructure in a very short period of time is a significant problem. It may result from no experience on the part of administrative staff in implementing such large programmes as well as from procurement procedures, which must be relatively lengthy if they are to be transparent and ensure competition and equal treatment (this applies in particular to the most commonly used procedures set out in the Defence Procurement Directive). It is a common phenomenon that procurement plans are incomplete in individual periods and, consequently, defence spending is incurred in an amount lower than assumed *ex ante*.

The most important source of financing of defence spending has always been the state budget, based on solidarity mechanisms and the principle of universalism (budget revenues constitute a uniform "fund" from which each budgetary task is financed; there are no links between individual tasks and specific sources of revenue). In some countries (e.g. Poland, Lithuania and Bulgaria), in recent years "special funds" have been separated from the central budget to finance only defence spending. These funds are supplied in different ways and the rules for their spending are also different. Defence policies also exert some impact on the system of public levies in some countries (e.g. Poland and Estonia), in particular through various tax preferences. A typical phenomenon here is a preferential treatment of various types of remuneration of military staff as well as other benefits for them (e.g. accommodation) in personal income taxes.

Defence spending occupies an important place in the structure of general government expenditure in all reviewed countries, although its importance varies greatly between countries (from 2.5% to 7.2%). In 2014–2023, a clear upward trend in the relation of defence spending to GDP was observed in Lithuania, Latvia and Hungary. On the other hand, since the Russian invasion of Ukraine in February 2022, the most spectacular increase in this share has been recorded in all Baltic states, Poland and Hungary. In the period preceding the outbreak of war and in 2022–2023, the Baltic states and Poland had the highest levels of per capita defence spending and the highest increases in defence spending (a very strong increase in defence spending was also recorded in Hungary).

The conducted analyses give rise to the formulation of some recommendations.

Firstly, defence strategies, in particular those concerning the development and modernisation of armed forces, should be properly anchored in law. Relevant acts should regulate the process of their drafting, the scope of their content, guarantee of stability and authorities competent to express their opinions on these matters. It would be desirable for the government (Council of Ministers) to adopt them after prior notification to the parliament, which would debate the bill.

Secondly, the strategies should cover the issues of defence industry development, including the promotion of innovation and competition in accordance with state aid rules.

Thirdly, as defence strategies are, as a matter of principle, long lasting, their financing should also be implemented in the long term. Since spending on the purchase of equipment is assigned to multiannual programmes, there are grounds for separating them from the framework of annual budget planning and considering a return to the "defence budgets' that used to exist in the past in some countries, adopted once every few years. Moreover, in the case of this type of spending, the issue of removing limits relating to compliance with public finance discipline should be considered to exclude them from general fiscal rules. These limits hinder increased military spending if we do not reduce other spending which is equally desired by the society. This is a kind of trade-off between different types of budget spending, which is particularly sensitive from a political point of view.

Fourthly, although the financing of defence spending with debt may seem justified by considerations of intergenerational justice (independence, as a continuous and current state, also results in benefits for the future), most studies indicate that this spending has no significant impact on economic development, which definitely weakens the argument for this justice. Therefore, it would be necessary to look for new sources of financing with tax levy or do it at the expense of reducing other kinds spending which do not serve development goals.

References

Act of 11 March 2022 on the defence of the Homeland (Journal of Laws of 2022, item 655).

Act of 25 May 2001 on the reconstruction and technological modernisation and financing of the armed forces of the Republic of Poland (Journal of Laws of 2001, item 804).

Adamowski, J. (2024). *Slovenia Picks Howitzers, Air Defense Systems and Armored Vehicles*, https://www.defensenews.com/global/arząd/2024/07/12/arządu-picks-howitzers-air-defense-systems-and-armored-vehicles/ (accessed: 28.03.2025).

Army Technology (2022). *Germany and Slovenia Provide Howitzers and IFVs to Ukraine*, https://www.army-technology.com/news/germany-slovenia-howitzers-ifvs-ukraine/?cf-view (accessed: 28.03.2025).

Bank Gospodarstwa Krajowego (2023). *Sprawozdanie Zarządu z działalności Grupy Kapitałowej BGK w 2023 r.*, https://www.bgk.pl/files/public/Pliki/Sprawozdanie_finansowe/2024-sprawozdanie_zarzadu/SSD_BGK_2023-12-31_PL.pdf (accessed: 5.03.2025).

Bankauskaitė, D., Šlekys, D. (2023). Lithuania's Total Defense Review, *Prism*, 10(2), pp. 54–77.

Bankier.pl (2025). *Czechy zwiększą wydatki na obronność. Fiala: Europa sama musi zadbać o własne problemy*, https://www.bankier.pl/wiadomosc/Czechy-zwieksza-wydatki-na-obronnosc-Fiala-Europa-sama-musi-zadbac-o-wlasne-problemy-8897530.html (accessed: 23.03.2025).

Bernardelli, M., Jamroży, M. (2024). *Potrzeba systemowej przebudowy ulg inwestycyjnych*, *Gazeta SGH Insight*, 383 (special edition).

Dąbrowski, M. (2018). *Słowacja wzmacnia pancerz. 'Nowy sprzęt, ale i modernizacje'*, https://defence24.pl/sily-zbrojne/zrownowazona-modernizacja-slowacja-wzmacnia-wojska-ladowe-analiza (accessed: 23.03.2025).

Dąbrowski, M. (2024). *Siły Zbrojne Bułgarii*, https://defence24.pl/sily-zbrojne/sily-zbrojne-bulgarii (accessed: 16.03.2025).

Domaradzki, S. (2022). Bułgaria – (nie)sprawny sojusznik NATO?, *Komentarze IEŚ*, 526(38).

Council Directive (UE) 2022/2523 z dnia 15 grudnia 2022 r. w sprawie zapewnienia globalnego minimalnego poziomu opodatkowania międzynarodowych grup przedsiębiorstw oraz dużych grup krajowych w Unii Europejskiej (Official Journal of the European Union L 328 of 22.12.2022, pp. 1–58).

Eurostat (2025a). *General Government Expenditure by Function*, https://ec.europa.eu/eurostat/databrowser/view/gov_10a_exp/default/table?lang=en (accessed: 22.03.2025).

Eurostat (2025b). *Government Deficit/Surplus, Debt and Associated Data*, https://ec.europa.eu/eurostat/databrowser/view/gov_10dd_edpt1/default/table?lang=en (accessed: 14.04.2025).

Eurostat (2025c). *Population on 1 January*, https://ec.europa.eu/eurostat/databrowser/view/tps00001/default/table?lang=en&category=t_demo.t_demo_pop (accessed: 22.03.2025).

Gombar, M. (2025). Transforming Croatia Through U.S. Military Modernization Policies: Economic and Societal Implications, *Open Journal of Social Sciences*, 13(2), https://www.scirp.org/journal/paperinformation?paperid=140481 (accessed: 14.03.2025).

Grein, J. (2024). Giving Dracula Some Teeth: Modernizing Romania's Military, *Georgetown Security Studies Review*, 23 March.

International Trade Administration (2025). *Croatia Country Commercial Guide. Aerospace and Defense*, https://www.trade.gov/country-commercial-guides/croatia-aerospace-and-defense (accessed: 14.03.2025).

Iura, A. (2024). Defence Financial Mechanisms in NATO Countries – Managerial Approaches, *Journal of Defense Resources Management*, 2, pp. 67–91.

Janák, M., Stolár, M.J. (2022). *Koniec MiG-ów-29 w słowackim lotnictwie*, https://zbiam.pl/artykuly/koniec-mig-ow-29-w-slowackim-lotnictwie/ (accessed: 28.03.2025).

Kucharski, B. (2023). *Republika Czeska zwiększa wydatki obronne do 2% PKB*, https://zbiam.pl/republika-czeska-zwieksza-wydatki-obronne-do-2-pkb (accessed: 17.01.2025).

Lewkowicz, Ł. (2023). *Słowacja: polityka bezpieczeństwa w programie rządu L'udovíta Ódora. Komentarze*, *Komentarze IEŚ*, 885(133).

LRT (2024). *New Fund Allows Individuals and Organisations to Donate to Lithuania's Military*, https://www.lrt.lt/en/news-in-english/19/2373070/new-fund-allows-individuals-and-organisations-to-donate-to-lithuania-s-military (accessed: 4.04.2025).

Ministry of Defence (2020). *Defence White Paper of the Republic of Slovenia*.

Ministry of Finance (2023). *Strategia zarządzania długiem sektora finansów publicznych w latach 2024–2027*, https://www.gov.pl/attachment/8576452d-de96-4063-8be9-85b3dd48dcea (accessed: 5.03.2025).

Ministry of Finance (2024). *Sprawozdania z wykonania budżetu państwa Ministerstwa Finansów za lata 2014–2023*. Warszawa.

Ministry of National Defence (2025). *Odpowiedź na interpelację Pana Posła Mariusza Błaszczaka nr 7004 w sprawie środków kierowanych do polskiego przemysłu zbrojeniowego*, https://sejm.gov.pl/INT10.nsf/klucz/ATTDDSJKD/%24FILE/i07004-o1.pdf (accessed: 23.03.2025).

Muczyński, R. (2023). *Słowacja przekazała Ukrainie wszystkie samoloty MiG-29Tekst pochodzi z Magazynu Militarnego MILMAG*, https://milmag.pl/slowacja-przekazala-ukrainie-wszystkie-samoloty-mig-29/ (accessed: 28.03.2025).

NATO (2024). *Defence Expenditure of NATO Countries (2014–2024)*, https://www.nato.int/nato_static_fl2014/assets/pdf/2024/6/pdf/240617-def-exp-2024-en.pdf (accessed: 28.03.2025).

NIK (2024). *Analiza wykonania budżetu państwa za lata 2014–2023*. Warszawa.

NIK (2024). *Wykonanie budżetu państwa w 2023 r. w części 29 – obrona narodowa*, https://www.nik.gov.pl/plik/id,29560.pdf (accessed: 15.02.2025).

Petrović, V. (2025). *Defense Spending in Croatia and New Investments Planned for the Upcoming Years*, https://china-cee.eu/2025/02/17/croatia-external-relations-briefing-defense-spending-in-croatia-and-new-investments-planned-for-the-upcoming-years/#_ftnref1 (accessed: 14.03.2025).

Republic of Estonia (2021). *National Defence Development Plan 2031*, https://kaitseministeerium.ee/en/national-defence-development-plan-2031 (accessed: 4.04.2025).

Republic of Estonia (2024). *Defence Budget*, https://kaitseministeerium.ee/en/objectives-activities/defence-budget (accessed: 4.04.2025).

Republic of Latvia (2025a). *Border Fortification*, https://www.mod.gov.lv/en/border-fortification (accessed: 4.04.2025).

Republic of Latvia (2025b). *Defence Policy*, https://www.mod.gov.lv/en/nozares-politika (accessed: 4.04.2025).

SIPRI (2025). *SIPRI Military Expenditure Database*, https://milex.sipri.org/sipri (accessed: 28.03.2025).

Şuhan, F. (2029). Study on Defence Expenditure and Its Financing, European Union's Structural Challenges: The Way Forward, *Eurint*, 6, pp. 256–268.

Świerkowski, A. (2023). *Bułgaria otrzymała rekompensatę od Danii za pomoc Ukrainie*, https://defence24.pl/polityka-obronna/bulgaria-przestawia-raport-o-stanie-obronnosci, (accessed: 16.03.2025).

The Defense Post (2025). *Estonia to Up Defense Spending to at Least 5.0% of GDP from 2026*, https://thedefensepost.com/2025/03/19/estonia-defense-spending/ (accessed: 4.04.2025).

The Republic of Bulgaria (2025). *Програма за управление на Република България за периода 2025–2029 г.*, https://www.gov.bg/special/bg/pravitelstvo/programa-za-upravlenie-na-republika-balgariya-za-perioda-2025-%E2%80%93–2029-g/programa-za-upravlenie-na-republika-balgariya-za-perioda-2025-%E2%80%93–2029-g (accessed: 16.03.2025).

Voltri, J. (2025). *Estonia Hopes to Put €1 Billion of EU Money Toward Defense*, https://news.err.ee/1609638064/estonia-hopes-to-put-1-billion-of-eu-money-toward-defense (accessed: 4.04.2025).

Zachová, A. (2025). *Czechy osiągnęły 2 proc. PKB wydatków na obronność*, https://www.euractiv.pl/section/bezpieczenstwo-i-obrona/news/czechy-osiagnely-2-proc-pkb-wydatkow-na-obronnosc/ (accessed: 17.02.2025).

EFFECTIVENESS OF HEALTHCARE SYSTEMS IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

Arkadiusz M. Kowalski
Małgorzata S. Lewandowska
Dawid Majcherek
Krystyna Poznańska
Monika Raulinajtys-Grzybek

DOI: 10.33119/978-83-8030-742-1.321_342

Abstract

The study aims to assess the effectiveness of healthcare systems in Poland and Central and Eastern European countries within the context of the entire EU, using the value-based healthcare (VBHC) framework. The analysis incorporates data on healthcare financing, system organisation, accessibility, lifestyle factors (e.g. tobacco use, alcohol consumption), and health outcomes (such as healthy life expectancy and avoidable mortality). Statistical methods, *k*-means clustering, and data envelopment analysis (DEA) were applied.

Findings reveal substantial differences in healthcare system performance across the EU. Poland belongs to a group of countries with low healthcare system efficiency, characterised by relatively low public health expenditure, limited access to services, and unfavourable public health behaviours. High avoidable mortality and low healthy life expectancy (HALE) rates raise particular concerns. In contrast, Czechia demonstrates significantly better outcomes, underscoring the importance of coherent, long-term health policies in keeping society healthy.

Key policy recommendations include increasing public health investment, improving access to medical services, strengthening prevention programmes, and implementing public campaigns promoting healthier lifestyles. The report highlights the need for systemic transformation of the Polish healthcare system towards a more value-based and patient-centred approach. The results offer critical insights for policymakers and stakeholders seeking to enhance health system efficiency in the region.

Authors

Arkadiusz M. Kowalski – Professor at SGH, Head of the Department of East Asian Economic Studies, Deputy Director of the World Economy Research Institute, SGH Warsaw School of Economics. Specialises in research into clusters, innovation economics, digitalisation, healthcare economics, technology transfer and international competitiveness.

Małgorzata S. Lewandowska – Professor at SGH, Department of International Management, Collegium of the World Economy, SGH Warsaw School of Economics. Specialises in research into sector and industry innovativeness, open innovation, eco-innovation, innovation policy and its impact on corporate behaviour, and health sector economics.

Dawid Majcherek – PhD, Assistant Professor, Department of International Management, Collegium of the World Economy, SGH Warsaw School of Economics. Specialises in research into health economics, sickness absenteeism, sports economics and machine learning.

Krystyna Poznańska – Professor, teaches at the Innovation Management Unit, Institute of Enterprise, SGH Warsaw School of Economics. Specialises in research into entrepreneurship and enterprise innovativeness. Published many books, monographs, articles and papers in this field, presented at scientific conferences, and participated in national and international research project in the field.

Monika Raulinajtys-Grzybek – Professor at SGH, Head of the Department of Management Accounting, Collegium of Business Administration, Warsaw School of Economics. Head of the SGH Healthcare Think Tank. Specialises in research into healthcare finance at both system and microeconomic levels.

The study aims to assess the effectiveness of healthcare systems in Poland and Central and Eastern European (CEE) countries within the context of the entire European Union (EU), using the value-based healthcare (VBHC) framework. This approach offers a new insight into the quality of medical services, focusing not only on clinical outcomes but also on patient satisfaction and cost-effectiveness.

Healthcare systems in CEE countries are evolving in response to regional challenges and transformation processes, striving to better adapt to the modern health needs of societies. The research questions that we seek to address through an empirical analysis are as follows:

- What are the key differences in the effectiveness of the healthcare system in Poland compared to the healthcare systems in selected CEE countries?
- How factors such as financing, system organisation, and quality and availability of services affect the ability to generate value in healthcare, measured by life expectancy while maintaining good quality of life?
- What reforms and practices can be introduced in the Polish healthcare system to improve its efficiency?

In the case of this study, it is important to understand that the effectiveness of healthcare systems in CEE cannot be considered in isolation from the dynamically changing global and European environment. An extended approach to the study of the effectiveness of healthcare systems in CEE countries enables not only a deeper understanding of the nature of their specific solutions, but also the identification of universal challenges and opportunities.

In this study, effectiveness is understood as the relationship between inputs and achieved outputs, the purpose of which is to maximise performance while minimising the use of resources. In institutional terms, this applies not only to operational efficiency but also to the ability to achieve social and strategic goals, which includes improving the well-being of the population. The effectiveness of healthcare systems, in turn, means the ability of the system to generate optimal health outcomes (such as healthy life expectancy or decrease in avoidable mortality) with a rational use of available resources – financial, human and organisational.

Literature review

Socio-economic and technological development extends people's lives and changes the quality of life of seniors. These changes have a direct impact on the costs incurred across the social security system, including the level of demand for health services. The costs and availability of health services are of significant importance, the effect of which in the form of human health, translating into participation in the labour force, is reflected in the GDP level [Węgrzyn, 2014].

The theoretical starting point for the analysis is the concept of value-based healthcare (VBHC), proposed by Porter [2010], which extends the evidence-based medicine (EBM) approach to include in the cost analysis the real value provided to patients. Evidence-based medicine assumes that clinical issues can be formalised or reduced to statistical problems. While EBM proponents focus on using the best available scientific evidence when choosing treatment options, VBHC representatives consider another layer of value measurement in healthcare – cost-effectiveness analysis. Porter [2009] defines value in healthcare as health outcomes achieved relative to costs incurred. This approach draws attention to the need to measure both the effects of treatment and the costs of achieving them, emphasising that real value is created only when the patient experiences real, positive changes in health at the lowest possible cost. Considerations extending the original concept focus on understanding value based not only on the patient's personal dimension but also on three other dimensions (pillars) – societal, technical and allocative [European Commission, 2019].

While the VBHC approach offers significant benefits, it also comes with many challenges, including the need for advanced IT systems to collect health data and measure outcomes [Teoh et al., 2024]. Operationalisation of outcomes through a standardised set of measures is also a key element. The literature describes attempts to compare clinical and process measures with patient-related outcome measures (PROMs). Most often, they concern a specific disease entity [Nijhuis, Franken, Ayers, 2021]. Researchers point to the need to develop measures that would allow the effectiveness and ability to deliver value to be assessed also from the perspective of the entire healthcare system [Wegner, 2016].

Research methodology and dataset

For the purpose of achieving the research objective, a database of measures and factors affecting the effectiveness of healthcare systems for all EU countries was created. The data include both inputs and outputs relating to the financing of the healthcare system, its organisation and accessibility, as well as the lifestyle of the population and health outcomes. The selection of indicators was based on the current recommendations of international health institutions and other organisations (WHO, OECD, Eurostat, UNECE) to ensure the comparability of data between countries as well as their validity and reliability. The indicators adopted enable a comprehensive assessment of the ability of healthcare systems to transform available resources and activities into measurable health outcomes for the population. The data collected cover the following areas:

1) financing:
   a) general government expenditure [Eurostat, 2022a],
   b) private health expenditure as percentage of current health expenditure [World Health Organisation, 2022];
2) access and organisation:
   a) density (number) of physicians per 1000 population [WHO, 2025],
   b) universal health coverage (UHC) index [UNECE, 2021],
   c) self-reported unmet needs for medical examination [Eurostat, 2022b];
3) lifestyle:
   a) prevalence of current tobacco use [WHO, 2020],
   b) total alcohol consumption per capita (litres of pure alcohol per capita above 15 years of age) [WHO, 2018];
4) effectiveness measures:
   a) healthy life expectancy at birth [WHO, 2024],
   b) avoidable mortality [OECD, 2022].

An analysis of the effectiveness of healthcare systems in EU countries requires the use of various research methods supporting a multidimensional approach to the problem. In this paper, three main approaches will be discussed: descriptive statistics, *k*-means clustering analysis, and data envelopment analysis (DEA).

The first stage of the analysis consists in the use of descriptive statistics, in particular the presentation of data in a graphic form, e.g. on a map of Europe or in the form of bar charts. This allows differences between EU countries to be readily captured in terms of measures of the effectiveness of the healthcare system, such as the average healthy life expectancy, the avoidable mortality rate or the availability of medical services [OECD, 2022].

The next step is *k*-means clustering, which classifies EU countries based on multidimensional data on the functioning of their health systems. This method allows countries to be divided into relatively homogeneous groups, which in turn facilitates the identification of patterns and the comparison of health systems with similar characteristics. Although the *k*-means algorithm was used as early as the 1950s and 1960s, it is still considered the most common and intuitive method of clustering [Jain, 2010; Ikotun, Ezugwu, Abualigah, Abuhaija, Heming, 2023]. Clustering also enables trends to be analysed and potential determinants of the effectiveness of healthcare systems to be identified.

To assess the effectiveness of healthcare systems, the data envelopment method was used. It allows the relationship to be determined between the effectiveness of the system (such as the average healthy life expectancy) and the factors determining its performance: financial (healthcare expenditure as a percentage of GDP) and related to the accessibility of services (density of physicians per 1000 population), the organisation of the healthcare system and lifestyle (e.g. tobacco consumption) [OECD, 2021]. The data envelopment method is widely used in research on the effectiveness of the health sector, which is confirmed by numerous studies [Jung, Son, Kim, Chung, 2023; Kohl, Schoenfelder, Fügener, Brunner, 2018; Stefko, Gavurova, Kocisova, 2018].

The use of the above research methods allows a comprehensive assessment of the effectiveness of healthcare systems in EU countries and the identification of key determinants of their performance.

Analysis of the effectiveness factors of the healthcare system in Poland compared to EU countries

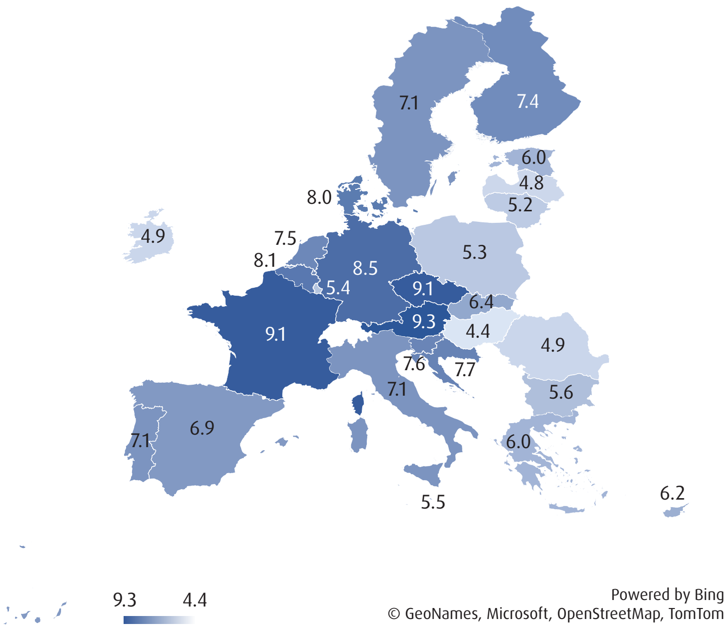
Any analysis of the effectiveness of the healthcare system requires a number of interrelated factors to be taken into account, such as the level of financing, accessibility of medical services, organisation of the healthcare system and the lifestyle of society.

Comparing Poland with other EU countries allows key areas for improvement and adaptable good practices to be identified. This part of the study presents a synthetic approach to the key determinants of health effectiveness and their impact on the outcomes of healthcare systems in EU countries, including Poland.

Financing

Financing is a key factor that affects the effectiveness of health systems. It is represented primarily by the level of expenditure on healthcare (expressed in % of GDP). Healthcare expenditure is a major factor in people's well-being and economic development of countries [Kowalski, 2022]. As demonstrated by Figure 1, Poland's situation in this respect is particularly unfavourable.

Figure 1. Public expenditure on healthcare in 2022 (% of GDP)

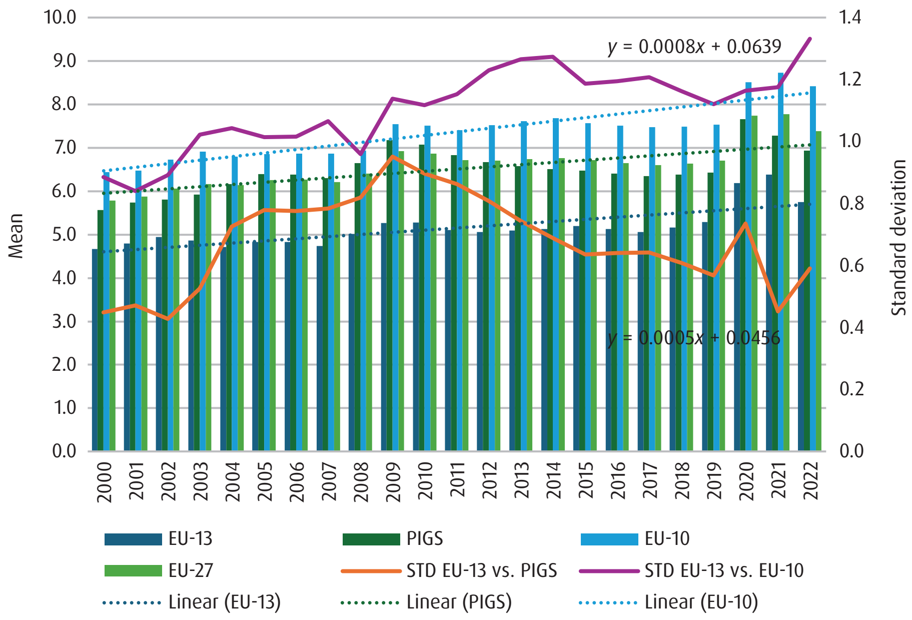


Source: Authors' own compilation based on Eurostat [2022a] data.

Public expenditure on healthcare amounts to 5.3% of GDP, much less not only than in Western European countries but also in other CEE countries. In most Western European countries, expenditure on healthcare is above 7% of GDP. Czechia is a noteworthy exception in CEE, with a share of expenditure on healthcare at 9.1% of GDP. In countries such as Slovenia, Estonia, Slovakia and Croatia, expenditure on healthcare is also higher than in Poland and amounts to 7.6%, 6.05%, 6.4% and 7.7% of GDP, respectively. On the other hand, in Hungary, Romania and Latvia, expenditure on healthcare is lower than in Poland and amounts to 4.4%, 4.9% and 4% of GDP, respectively.

It is interesting to compare the differences in the level of expenditure on health in 2000–2022 between different groups of EU member states (Figure 2). As can be seen, total health spending in the EU followed an upward trend. In 2000, it accounted for 5.8% of GDP, and in 2022 it accounted for 7.4% of GDP. However, differences in growth rates can be observed in individual groups of countries, i.e. in the EU-10 (Western Europe), the EU-13 (CEE) and in the PIGS countries (Portugal, Italy, Greece, Spain). The highest growth rate of healthcare expenditure is recorded in Western European countries, followed by the PIGS countries. The lowest growth rate of spending is recorded in the CEE countries. It is also interesting to compare the dynamics of health expenditure in the EU-13 and EU-10 countries on the one hand, and in the EU-13 countries and PIGS countries on the other. The former relationship is increasing, while the latter displays a clear disproportion from 2009 onwards in the level of expenditure between the groups of countries under study.

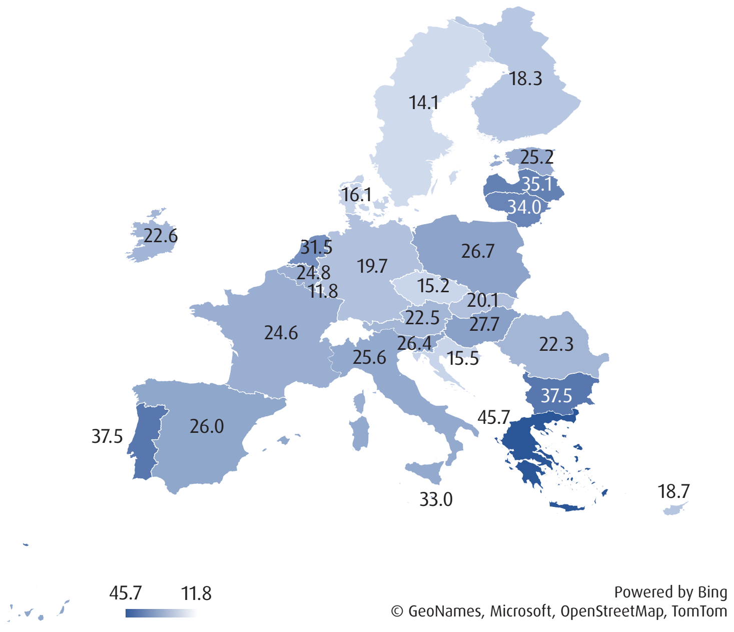
Figure 2. Differences in expenditure on healthcare between UE-10, UE-13 and PIGS countries in 2000–2022 (% of GDP)



Source: Authors' own compilation based on Eurostat [2022a] data.

The data presented in Figure 3 show a large variation in private expenditure on healthcare between CEE countries. In Poland, it accounts for 26.7% of total expenditure for this purpose. Lower levels of expenditure are observed in Romania and Estonia (22.3% and 25% of total expenditure). On the other hand, in countries such as Hungary, Bulgaria, Lithuania and Latvia, this expenditure is higher at 27.7%, 37.5%, 35.1% and 34.0% of total expenditure, respectively. Among the CEE countries, Czechia stands out, with private expenditure on healthcare accounting for 15.2% of total expenditure. A large variation in the level of private expenditure on healthcare is also evident in Western European countries. In Germany, for example, this expenditure accounts for 19.7% of total expenditure on healthcare, while in France it is 24.6%. The diversity in the level of spending on healthcare is related, among other things, to a different model of financing the systems adopted in the respective countries.

Figure 3. Private expenditure on healthcare in 2022 (% of total annual healthcare expenditure)

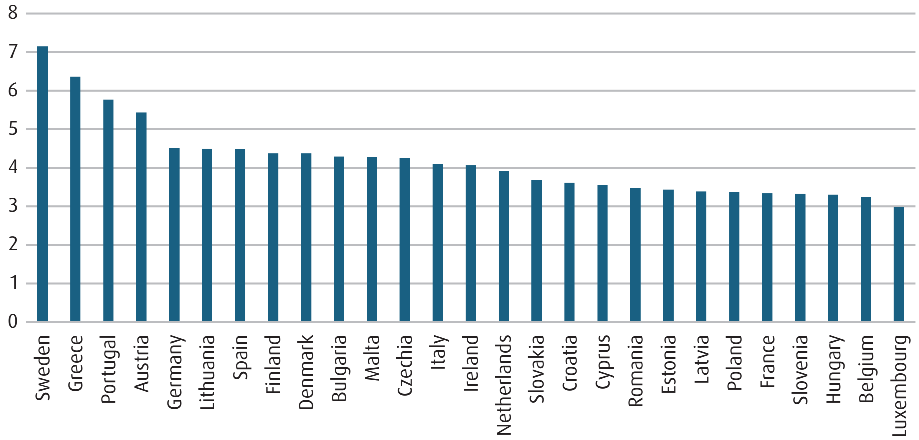


Source: Authors' own compilation based on WHO [2022] data.

Accessibility and organisation

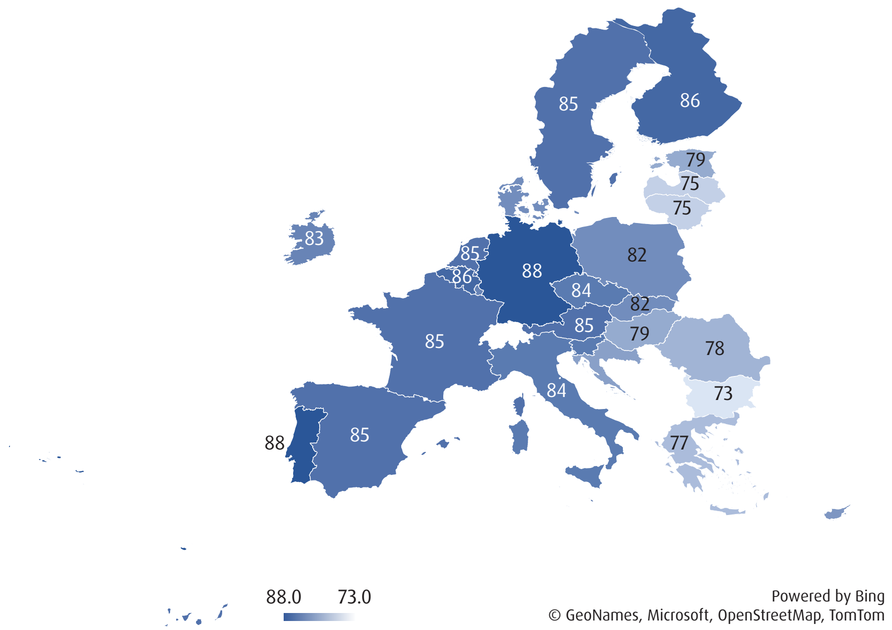
Another group of factors that affect the effectiveness of healthcare includes those related to the accessibility and organisation of healthcare systems. The most well-known and widely used measure of healthcare accessibility is the density of physicians per 1000 population (Figure 4).

Figure 4. Density of physicians per 1000 population in 2022



Source: Authors' own compilation based on WHO [2025] data.

Figure 5. Universal Health Coverage index (points)



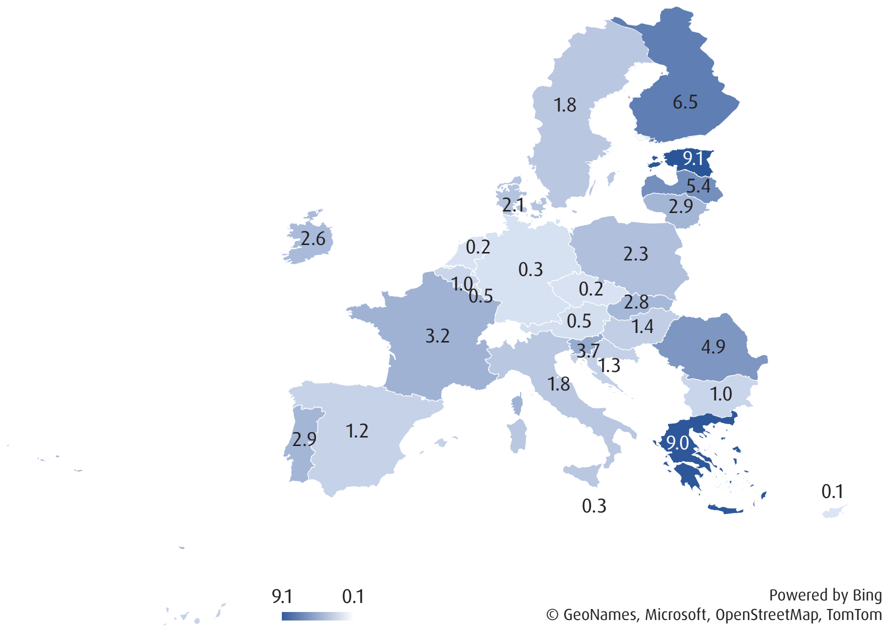
Source: Authors' own compilation based on UNECE [2021] data.

In Poland, this indicator is 3.4, comparable to such CEE countries as Slovenia (3.3), Slovakia (3.7), Hungary (3.3), Lithuania (3.4) and Romania (3.5), whereas Czechia (4.1), Bulgaria (4.3) and Latvia (4.5) boast much better ratios. In Western European countries, there is a large variation in the density of physicians per 1000 population. Countries such as Sweden (7.2), Greece (6.4), Portugal (5.8), Austria (5.4), Germany and Spain (4.5 each) deserve a mention. On the other hand, Belgium and France report a relatively low density of physicians per 1000 inhabitants (3.2 and 3.3, respectively).

Another measure is the Universal Health Coverage (UHC) index, which characterises the accessibility of basic health services (Figure 5).

In 2022, the UHC index in Poland was 82. The index value is comparable in countries such as Croatia (80), Slovakia (82), Denmark (82), Luxembourg and Denmark (83). Slightly higher health universal health coverage indexes are recorded in Western European countries, including Germany (88), Portugal (88), Belgium (86), France (86), Spain (86), Austria (85) and Sweden (85). In contrast, in Eastern European countries (Lithuania, Latvia, Romania and Hungary), these indicators are lower (at 75, 75, 79 and 78, respectively). It should be emphasised that accessibility of health services depends on an array of factors, including healthcare expenditure, the financing system, etc.

Figure 6. Self-reported unmet needs for medical examination (% of population)



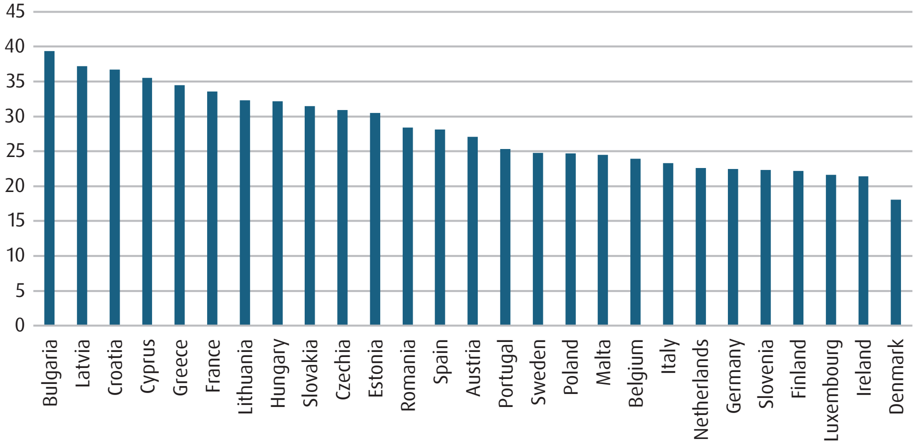
Source: Authors' own compilation based on Eurostat [2022b] data.

Another indicator used in the analysis for the assessment of accessibility and organisation is the rate of self-reported unmet needs for medical examination (as a % of the population). As shown in Figure 6, a large variation in this indicator is observed. Countries such as Czechia, Germany, Austria, Hungary and Italy clearly stand out in this respect. Self-reported unmet needs for medical examinations are relatively low at 0.2%, 0.3%, 0.5%, 1.4% and 1.9%, respectively. In Poland, this indicator stands at 2.3% and is comparable to such countries as Ireland (2.6%), Lithuania (2.9%) and France (3.2%). At the same time, it can be noted that there are countries where self-reported unmet needs for medical examination are much higher and exceed 4%. These countries include Romania (4.9%), Finland (6.5%) and Greece (9.0%). However, it should be kept in mind that self-reported unmet needs for medical examination may not reflect the actual state, as it is patients' subjective assessment.

Lifestyle

The data presented in Figures 7 and 8 show a significant variation in the lifestyle of EU citizens, as measured by the proportion of smokers and the amount of alcohol consumed per capita. The highest share of adult smokers is found in Bulgaria (39.4%), Latvia (37.2%) and Croatia (36.7%), indicating the health risks associated with nicotine addiction persisting in those countries. With a score of 24.7%, Poland fares relatively well, although still above the level witnessed in countries such as Finland (22.2%), Luxembourg (21.6%), Ireland (21.4%) and Denmark (18.1%).

Figure 7. Prevalence of current tobacco use (%)

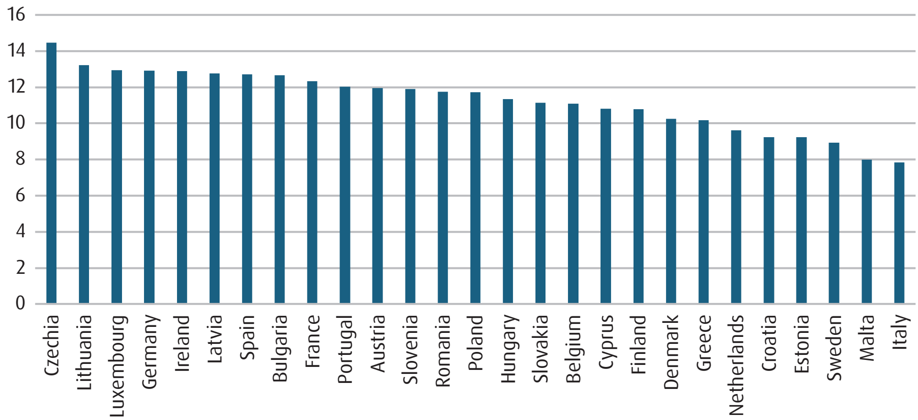


Source: Authors' own compilation based on WHO [2020] data.

The data in Figure 8 show that the highest level of alcohol consumption per capita (in litres of pure alcohol per year per person over 15 years of age) is reported in Czechia – as much as 14.45 litres, which makes the country the leader of the ranking. It is followed by Lithuania (13.22 litres), France (12.33 litres), Germany (12.91 litres) and Latvia (12.77 litres). High levels were also recorded in Austria, Bulgaria and Spain (approximately 12 litres each).

In terms of alcohol consumption, Poland ranks in the middle of the pack, with a score of 11.71 litres of pure alcohol per year per person over 15 years of age, which exceeds the values recorded in Italy (7.84 litres) or Sweden (8.93 litres) but is close to the EU average. High alcohol consumption co-occurs with a high percentage of smokers in many CEE countries, which in turn can have an adverse impact on the health of citizens. Lifestyle appears to be an important determinant of public health, and the reduction of alcohol and tobacco consumption should be one of the priorities of health policy, especially in Poland and other countries of the region.

Figure 8. Alcohol consumption per capita (litres of pure alcohol per person over 15 years of age)



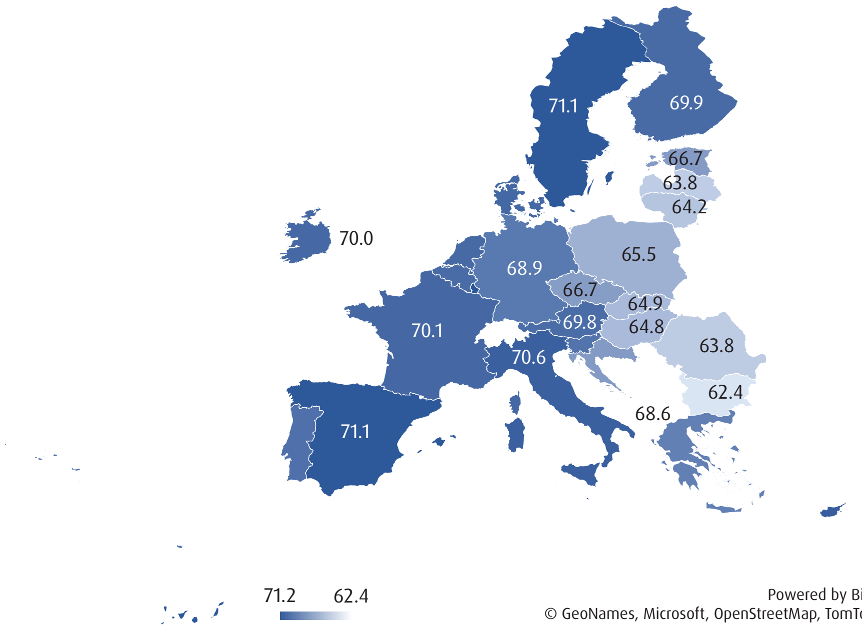
Source: Authors' own compilation based on WHO [2018] data.

Effectiveness measures

The basic measure of the effects of the healthcare system is healthy life expectancy (HALE), i.e. a demographic indicator combining information about life expectancy and health status of the population. It represents the average number of years a person can live in good health, free from serious disease and disability, taking into account both mortality and morbidity. This indicator is a measure with which to assess not only how long people live but also what quality of health they enjoy on a daily basis.

Healthy life expectancy in EU countries in 2021 ranged between 62.4 and 71.1 years. The lowest values were recorded in the countries in the eastern part of the EU (Bulgaria, Romania and Latvia) and the highest in its south-western region (Spain, France, Luxembourg, Italy) and in the Nordic countries (Sweden, Denmark). In Poland, this indicator stood at 65.5 years. Among the Visegrad Group countries, it was the second highest score, right after Czechia (66.7).

Figure 9. Healthy life expectancy at birth (in years)

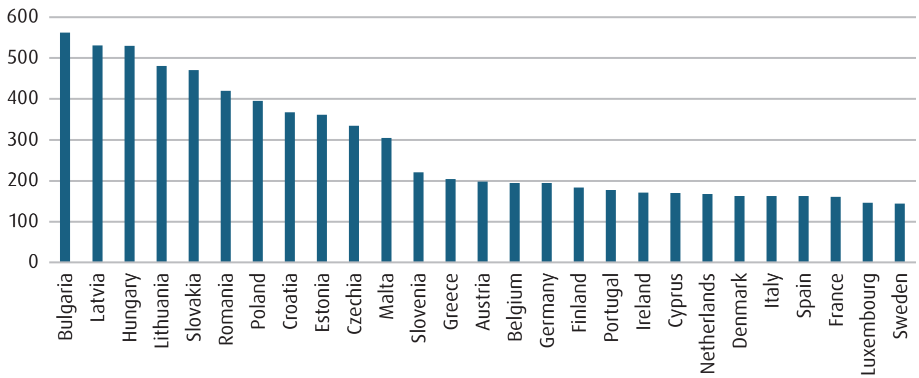


Source: Authors' own compilation based on WHO [2024] data.

The second indicator measuring the performance of the healthcare system is avoidable mortality. It is an indicator that measures the number of deaths that should not have occurred given effective and timely preventive measures or medical interventions. It is expressed as the number of avoidable deaths per 100,000 people in a given period and population. This measure reflects the contribution of the healthcare system and health policy to preventing premature deaths. Its use became popular especially during the COVID-19 pandemic.

The avoidable mortality rate in EU countries in 2021 (Figure 10) ranged between 144.5 and 561.8 deaths, showing a large disparity between countries. In six countries, its value was above 400 avoidable deaths per 100,000 people. In Poland, it was slightly lower, although it should be noted that the indicator increased between 2018 and 2021. In fourteen EU countries, avoidable mortality was below 200 deaths, reaching the lowest values in Sweden, Luxembourg and France, which is consistent with the previously presented healthy life expectancy index.

Figure 10. Avoidable mortality (number of avoidable deaths per 100,000 people)



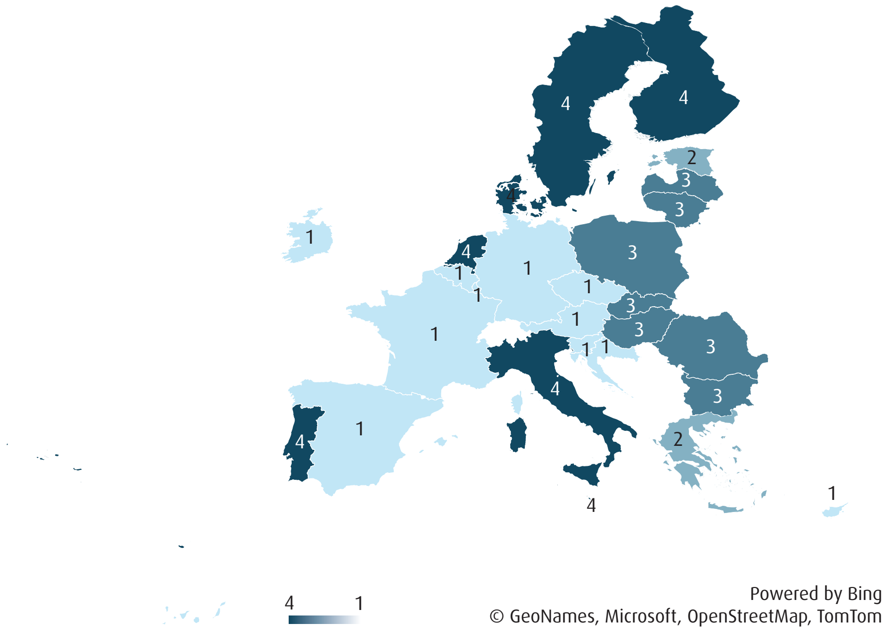
Source: Authors' own compilation based on OECD [2022b] data.

Clustering of EU countries in terms of similarities in factors and effectiveness of healthcare systems – cluster analysis

In order to identify the structural and effectiveness-related similarities between healthcare systems in EU countries, a cluster analysis using the *k*-means method was carried out. The study aimed to distinguish relatively homogeneous groups of countries (clusters) that are characterised by a similar profile in terms of key systemic determinants: the level of financing (public and private), the accessibility and organisation of medical services, the lifestyle of the population (smoking, alcohol consumption) and health outcomes (average healthy life expectancy, avoidable mortality). The results of the classification are shown in Figure 11 and Table 1.

Cluster 1 includes countries with a high level of public expenditure on healthcare (7.5% of GDP on average), a moderate share of private expenditure (20.7%), a low level of unmet medical needs and favourable health indicators (average healthy life expectancy of 69.5 years, and avoidable mortality rate of 211.1 deaths per 100,000 population). Countries belonging to this cluster, such as France, Germany, Spain and Austria, feature a highly developed system infrastructure and high-quality public healthcare management. It is a cluster of effective healthcare systems with a stable demographic and health profile.

Figure 11. EU divided into four clusters



Source: Author's own work.

Table 1. Characteristics of clusters

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Public expenditure on healthcare (% of GDP)	7.5	6.0	5.2	7.1
Private expenditure on healthcare (%)	20.7	35.5	29.1	25.1
Universal Health Coverage (points)	84.0	78.0	77.7	85.0
Unmet needs for medical examination (% of population)	1.3	9.1	3.0	2.2
Density of physicians per 1000 population	3.9	4.9	3.7	4.9
Average healthy life expectancy (years)	69.5	67.6	64.2	70.3
Avoidable mortality (deaths)	211.1	282.9	484.2	186.1
Prevalence of current tobacco use (%)	27.6	32.5	32.2	23.0
Alcohol consumption per capita (litres)	12.1	9.7	12.1	9.6

Source: Authors' own compilation based on data from Appendix 1A of the Annex.

Cluster 2 comprises countries with a mixed profile. They are characterised by a relatively high share of private expenditure on health (35.5% of GDP), a moderate level of average healthy life expectancy (67.6 years) and a moderately high avoidable mortality rate (282.9 deaths). Countries classified in this group, such as Greece and Estonia, reveal internal inconsistencies between the level of financing and health outcomes, which may indicate problems with the effective use of resources and a lack of regularity in health policy.

Cluster 3, which includes Poland, consists of countries with the lowest effectiveness of healthcare systems. It is characterised by the lowest level of public expenditure (5.2% of GDP), a relatively high level of private expenditure (29.1%), weaker Universal Health Coverage indexes (77.7 points, a very low average healthy life expectancy (64.2 years) and the highest average value of avoidable mortality (484.2 deaths). The high percentage of smokers and significant alcohol consumption in this group further aggravates health indicators.

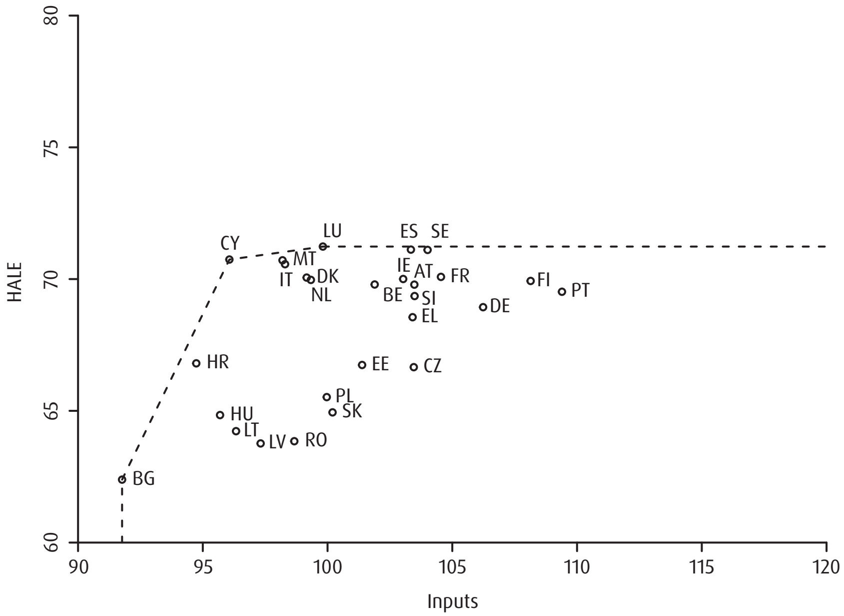
Cluster 4 brings together countries with relatively high health outcomes. The average healthy life expectancy here is 70.3 years, and the lowest avoidable average mortality is 186.1 deaths, with a moderate level of public expenditure (7.1% of GDP) and a relatively low level of tobacco and alcohol consumption. The countries falling within this cluster, including Sweden, Finland and Denmark, are characterised by high effectiveness of health policies and health culture of societies. Their profile demonstrates an effective combination of public investments with preventive measures and management of healthcare quality.

The cluster analysis clearly shows that the level of effectiveness of the healthcare system is strongly correlated with the level of public funding, the quality of service organisation and health-promoting behaviours of society. Assigned to Cluster 3, Poland performs poorly in all the analysed dimensions, which confirms the need to intensify systemic reforms. The example of Czechia, which falls into Cluster 1, proves that it is possible to significantly increase the effectiveness of the system through consistent public policy and increased investment in health. Poland's further divergence from the most effective EU systems may exacerbate health inequalities and reduce the overall quality of life of the population.

Assessment of the effectiveness of the healthcare system in Poland in the context of EU countries

The assessment of the effectiveness of the healthcare system in Poland in the context of the CEE countries and the entire EU was carried out using the data envelopment analysis (DEA) method. This tool is particularly useful in examining the effectiveness of healthcare systems, as it allows many expenditures and outcomes to be taken into account simultaneously, enabling the comparison of entities with different organisational structures and levels of financing.

Figure 12. Results of the data envelopment analysis (DEA)



Source: Authors' own work.

The results of the analysis are presented in Figure 12. The Y axis represents the average healthy life expectancy index, and the X axis stands for the determinants of healthcare system effectiveness, including financing (public and private healthcare expenditure), accessibility and organisation of the system (density of physicians, UHC, accessibility of medical examinations) and lifestyle factors (alcohol consumption, smoking). The countries with the lowest average healthy life expectancy and the lowest values of the determinants include Bulgaria, Lithuania, Latvia, Poland, Slovakia and Romania, which is indicative of the poor effectiveness of their healthcare systems. Low financial outlays, limited access to medical services and adverse lifestyle factors (e.g. high alcohol consumption, high proportion of smokers) have a negative impact on health outcomes in these countries. On the other hand, countries with relatively high healthcare effectiveness, despite lower levels of the determinants, include Cyprus, Italy and Luxembourg, suggesting that their health systems are more effective in transforming resources into health outcomes, and that citizens lead healthy lifestyles. Among the CEE countries, Czechia stands out, showing a level of the determinants similar to that reported in France or Austria, but the average healthy life expectancy remains at the level characteristic of the countries of the region. It is worth monitoring this trend in the long term to assess whether Czechia will catch up with the Western European countries in terms of the effectiveness of the healthcare system, where the average healthy life expectancy is close to 70 years. The highest effectiveness and high level of all determinants (financing, accessibility and organisation of medical care and lifestyle) are achieved by Scandinavian countries, such as Finland or Sweden, as well as Germany and Portugal. These results are consistent with the conclusions on clustering presented in the previous part of the chapter.

Conclusions and recommendations

The comparative analysis of the effectiveness of healthcare systems in Poland and in CEE countries using cluster analysis and the DEA method reveals significant disproportions in the ability of healthcare systems to generate health value. Despite its EU membership and progressive integration, Poland remains among the countries with lower system-level effectiveness, which is reflected in unfavourable indicators, such as low healthy life expectancy, high avoidable mortality and limited accessibility of medical services. What raises particular concern is the persistence of high rates of health-hazardous behaviours, such as smoking and excessive alcohol consumption. Compared with other countries in the region, Czechia is a noteworthy exception, where the healthcare system displays a higher level of public expenditure, greater accessibility of services and better health outcomes. Falling within a cluster with higher performance indicators, the country demonstrates the effectiveness of its long-term, coherent reforms in the field of health policy. At the same time, the example of Czechia refutes the assumption that geographical, demographic or historical constraints necessarily determine the low effectiveness of the healthcare system.

By increasing expenditure on healthcare and improving its accessibility, the state plays a key role in creating conditions conducive to public health, which has a direct impact on the economic activity of citizens [Lewandowska, Dzienis, Kowalski, Majcherek, Poznańska, 2024]. These investments make it possible not only to meet current health needs but also to address long-term development and health challenges, such as the ageing of the population or diseases of affluence [Kowalski, 2022; Lewandowska, 2022].

In the light of the above findings, the key recommendations for Poland are as follows:

- increase public expenditure on healthcare – a low level of public funding limits the opportunities for infrastructure development, employment of medical staff and the accessibility of modern diagnostic and therapeutic procedures;
- improve the accessibility and organisation of health services by educating more physicians, optimising the network of medical facilities and developing primary and preventive care; it is also important to reduce access barriers to health services, including queues and non-system costs;
- increase public health efforts, including education campaigns and prevention programmes aimed at lifestyle change; systemic solutions are needed to reduce the consumption of alcohol and tobacco and promote physical activity and healthy eating;
- implement the concept of value-based healthcare as a strategic framework for the healthcare system; efforts should be made to implement tools to measure health outcomes (both clinical and patient-reported) and to integrate IT systems to assess the cost-effectiveness and qualitative effectiveness of health interventions;
- benchmark and adapt good practices, including organisational and legislative solutions such as those implemented in Czechia, the Scandinavian countries and Germany; it is necessary to constantly monitor the effectiveness of health services and to respond flexibly to changing population and systemic needs.

In summary, improving the effectiveness of the health system requires coordinated, long-term, evidence-based policies aimed at increasing the health value delivered to citizens. Transition towards a value-based health system that not only extends life but also improves life quality with optimal use of resources is essential.

ANNEX

Appendix 1A. Dataset

Country	Country code	Public expenditure on healthcare (% of GDP)	Private expenditure on healthcare (%)	Density of physicians per 1000 population	UHC (points)	Access to medical examination (%)	Healthy life expectancy (age)	Avoidable mortality (deaths)	Smoking (%)	Alcohol (litres)	Cluster
Croatia	HR	7.7	15.5	3.6	80	1.3	66.8	367.0	36.7	9.23	1
Czechia	CZ	9.1	15.2	4.3	84	0.2	66.7	335.0	30.9	14.45	1
Cyprus	CY	6.2	18.7	3.6	81	0.1	70.7	169.8	35.5	10.81	1
Belgium	BE	8.1	24.8	3.2	86	1.0	69.8	195.2	23.9	11.08	1
France	FR	9.1	24.6	3.3	85	3.2	70.1	161.5	33.6	12.33	1
Spain	ES	6.9	26.0	4.5	85	1.2	71.1	162.1	28.1	12.72	1
Slovenia	SI	7.6	26.4	3.3	84	3.7	69.4	220.6	22.3	11.90	1
Austria	AT	9.3	22.5	5.4	85	0.5	69.8	198.2	27.1	11.96	1
Germany	DE	8.5	19.7	4.5	88	0.3	68.9	194.6	22.5	12.91	1
Ireland	IE	4.9	22.6	4.1	83	2.6	70.0	171.4	21.4	12.88	1
Luxembourg	LU	5.4	11.8	3.0	83	0.5	71.2	146.9	21.6	12.94	1
Estonia	EE	6.0	25.2	3.4	79	9.1	66.7	361.8	30.5	9.23	2
Greece	EL	6.0	45.7	6.4	77	9.0	68.6	204.0	34.5	10.18	2
Bulgaria	BG	5.6	37.5	4.3	73	1.0	62.4	561.8	39.4	12.65	3
Slovakia	SK	6.4	20.1	3.7	82	2.8	64.9	470.7	31.5	11.14	3
Hungary	HU	4.4	27.7	3.3	79	1.4	64.8	529.7	32.2	11.35	3
Lithuania	LT	5.2	34.0	4.5	75	2.9	64.2	480.9	32.3	13.22	3
Latvia	LV	4.8	35.1	3.4	75	5.4	63.8	531.3	37.2	12.77	3
Poland	PL	5.3	26.7	3.4	82	2.3	65.5	395.2	24.7	11.71	3
Rumania	RO	4.9	22.3	3.5	78	4.9	63.8	419.7	28.4	11.74	3
Malta	MT	5.5	33.0	4.3	85	0.3	70.7	304.0	24.5	7.99	4
Italy	IT	7.1	25.6	4.1	84	1.8	70.6	162.5	23.3	7.84	4
Denmark	DK	8.0	16.1	4.4	82	2.1	70.1	162.8	18.1	10.26	4
Finland	FI	7.4	18.3	4.4	86	6.5	69.9	183.6	22.2	10.78	4
Netherlands	NL	7.5	31.5	3.9	85	0.2	70.0	167.8	22.6	9.61	4
Portugal	PT	7.1	37.5	5.8	88	2.9	69.5	177.4	25.3	12.03	4
Sweden	SE	7.1	14.1	7.2	85	1.8	71.1	144.5	24.8	8.93	4

Source: Authors' own compilation based on: public expenditure on healthcare [Eurostat, 2022a], private expenditure on healthcare [WHO, 2022], density of physicians per 1000 population [WHO 2025], UHC [UNECE, 2021], access to medical examinations [Eurostat, 2022b], healthy life expectancy [WHO, 2024], avoidable mortality [OECD, 2022b], smoking [WHO, 2020], alcohol [WHO, 2018].

References

Boyd, C.M., Kent, D.M. (2014). Evidence-Based Medicine and the Hard Problem of Multimorbidity, *Journal of General Internal Medicine*, 29, pp. 552–553.

European Commission (2019). *Directorate-General for Health and Food Safety, Defining Value in 'Value-Based Healthcare' – Opinion by the Expert Panel on Effective Ways of Investing in Health (EXPH)*. DOI: 10.2875/148325.

Eurostat (2022a). *General Government Expenditure by Function (COFOG) [Dataset]*. DOI: 10.2908/GOV_10A_EXP.

Eurostat (2022b). *Self-Reported Unmet Needs for Medical Examination by Sex, Age, Main Reason Declared and Income Quintile [Dataset]*. DOI: 10.2908/HLTH_SILC_08.

Ikotun, A.M., Ezugwu, A.E., Abualigah, L., Abuhaija, B., Heming, J. (2023). K-Means Clustering Algorithms: A Comprehensive Review, Variants Analysis, and Advances in the Era of Big Data, *Information Sciences*, 622, pp. 178–210. DOI: 10.1016/j.ins.2022.11.139.

Jain, A.K. (2010). Data Clustering: 50 Years Beyond K-Means, *Pattern Recognition Letters*, 31, s. 651–666. DOI: 10.1016/j.patrec.2009.09.011.

Jung, S., Son, J., Kim, C., Chung, K. (2023). Efficiency Measurement Using Data Envelopment Analysis (DEA) in Public Healthcare: Research Trends from 2017 to 2022, *Processes*, 11(3), 811. DOI: 10.3390/pr11030811.

Kohl, S., Schoenfelder, J., Fügener, A., Brunner, J.O. (2018). The Use of Data Envelopment Analysis (DEA) in Healthcare with a Focus on Hospitals, *Health Care Management Science*, 22(2), pp. 245–286. DOI: 10.1007/s10729-018-9436–8.

Kowalski, A.M. (2022). Healthcare Systems and Pharmaceutical Industry in Emerging and Developed Economies. China and Poland **versus the US and the EU. In: *Economics and Mathematical Modeling in Health-Related Research* (pp. 165–179), M.A. Weresa, C. Ciecierski, L. Filus (Eds.). Leiden: BRILL. DOI: 10.1163/9789004517295_010.

Lewandowska, M.S. (2022). Meeting Grand Challenges. Assessment of Horizon 2020 Health, Demographic Change and Wellbeing Projects. In: *Economics and Mathematical Modeling in Health-Related Research* (pp. 121–145), M.A. Weresa, C. Ciecierski, L. Filus (Eds.). Leiden: BRILL. DOI: 10.1163/9789004517295_008.

Lewandowska, M.S., Dzienis, A., Kowalski, A.M., Majcherek, D., Poznańska, K. (2024). Wpływ czynników demograficznych i społeczno-ekonomicznych na zdrowie w kontekście funkcjonowania rynku pracy. In: *Raport SGH i Forum Ekonomicznego* (pp. 355–388), A. Chłoń-Domińczak, R. Sobiecki, M. Strojny, B. Majewski (Eds.). Warsaw: SGH Publishing House. DOI: 10.33119/978-83-8030-678-3_355-388.

Nijhuis, W., Franken, A., Ayers, K. et al. (2021). A Standard Set of Outcome Measures for the Comprehensive Assessment of Osteogenesis Imperfecta, *Orphanet Journal of Rare Diseases*, 16, 140. DOI: 10.1186/s13023-021–01682-y.

OECD (2021). *Health at a Glance 2021: OECD Indicators*. Paris: OECD Publishing.

OECD (2022a). *OECD Health Statistics 2022*. Paris: OECD Publishing.

OECD (2022b). *Avoidable Mortality [Dataset]*, https://data-explorer.oecd.org/vis?df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_HEALTH_STAT%40DF_AM&df[ag]=OECD.ELS.HD&df[vs]=1.0&dq=.A...._T.......&pd=2010%2C&to[TIME_PERIOD] =false&ly[cl]=TIME_PERIOD&ly[rs]=MEASURE%2CCALC_METHODOLOGY&ly[rw]=REF_AREA%2CCOMBINED_UNIT_MEASURE&vw=tb (accessed: 10.02.2025).

Porter, M.E. (2010). What is Value in Health Care?, *New England Journal of Medicine*, 363(26), pp. 2477–2481.

Stefko, R., Gavurova, B., Kocisova, K. (2018). Healthcare Efficiency Assessment Using DEA Analysis in the Slovak Republic, *Health Economics Review*, 8(1), 6. DOI: 10.1186/s13561-018-0191-9.

Teoh, S.Y., Dias, M., Vesty, G., Jansson, M., Rana, T., Butler-Henderson, K. (2024). Health Information Systems in Value-Based Healthcare. In: *Accounting for Healthcare: The Digital Transition to Value-Based Healthcare* (pp. 55–74), G. Vesty (Ed.). New York: Routledge.

UNECE (2021). Universal Health Coverage (UHC) *Service Coverage – Sustainable Development Goals – United Nations Economic Commission for Europe [Dataset]*, https://w3.unece.org/SDG/en/Indicator?id=192 (accessed: 10.02.2025).

Wegner, S.E. (2016). Measuring Value in Health Care: The Times, They Are **A-Changin', *North Carolina Medical Journal*, 77(4), pp. 276–278.

Węgrzyn, M. (2014). Wydłużanie życia ludności a problem zapewnienia bezpieczeństwa zdrowotnego, *Studia Ekonomiczne*, 167, pp. 77–86.

WHO (2018). *Global Health Observatory – Total Alcohol Consumption Per Capita [Dataset]*, https://www.who.int/data/gho (accessed: 15.02.2025).

WHO (2020). *Global Health Observatory – Prevalence of Current Tobacco Use [Dataset]*, https://www.who.int/data/gho (accessed: 10.02.2025).

WHO (2022). *Domestic Private Health Expenditure (PVT-D) as Percentage of Current Health Expenditure (CHE) (%) [Dataset]*, https://www.who.int/data/gho/data/indicators/indicator-details/GHO/domestic-private-health-expenditure-(pvt-d)-as-percentage-of-current-health-expenditure-(che)-(-) (accessed: 20.02.2025).

WHO (2024). *Healthy Life Expectancy at Birth (Years) [Indicator]*, https://data.who.int/indicators/i/48D9B0C/C64284D (accessed: 19.12.2024).

WHO (2025). *Density of Physicians (per 10 000 Population) [Indicator]*, https://data.who.int/indicators/i/CCCEBB2/217795A (accessed: 12.03.2025).

IMPACT OF INVESTMENT ON THE COMPETITIVENESS OF FOOD MANUFACTURERS IN SELECTED CENTRAL AND EASTERN EUROPEAN COUNTRIES

Weronika Daniłowska
Katarzyna Dostaw
Iwona Łuczyk
Roman Sobiecki
Yuliia Zolotnytska

DOI: 10.33119/978-83-8030-742-1.343_374

Abstract

Competitiveness derives from the competitive potential of an economic entity regardless of the type of activity. The main long-term source of growth of this potential is investment in resources, especially investment in innovation. Agriculture is the initial link in the food production chain, as it provides basic raw materials for further processing. Building the competitive potential of agriculture determines the competitiveness of both agriculture itself and the entire food production sector.

The main objective of the study is to search for the competitive advantages of agriculture and their long-term sources in selected countries of Central and Eastern Europe (CEE). The analysis focuses on investments in agriculture, which are treated as a long-term source of competitiveness, increasing the competitive potential of producers. Other sources which play an important role, especially in the agricultural sector, such as basic natural conditions – soil quality, climate, terrain, agricultural culture, as well as agrarian structure, are not examined.

We consider exports of agri-food commodities (in value terms) as a multifactor measure of the external competitiveness of a country's agricultural sector. Since exports are partly dependent on imports (exported goods may be processed products based on raw materials imported from abroad), imports will also be analysed in this study.

Authors

Weronika Daniłowska – assistant, Market Analysis Unit at SGH. SGH graduate and psychologist by education (University of Warsaw). Her interests include issues related to corporate property management, research in the field of new institutional economics and economic psychology.

Katarzyna Dostaw – PhD, lecturer, Finance and Accounting Unit, John Paul II Academy in Biała Podlaska. Since 2010, owner of a family farm. Author and co-author of many publications and projects in agricultural economics, competitiveness of enterprises and family entrepreneurship, as well as reports commissioned by the Office of the Marshal of the Mazowieckie Voivodeship and others.

Iwona Łuczyk – PhD, Assistant Professor, Food Safety Market Unit at SGH. Completed courses at Joint Vienna Institute and Columbia University (Columbia Centre on Sustainable Investment). Her research interests include development economics, sustainable development and finance, national development banks, international financial institutions and food security. Author of scientific articles, published in *Zagadnienia Ekonomiki Rolnej* and *Obserwator Finansowy*, and co-author of collaborative publications released by the SGH Publishing House and Routledge.

Roman Sobiecki – Professor at SGH, Food Safety Market Unit, SGH Warsaw School of Economics. Vice Rector for Development in 2020–2024, Director of the Institute of Statistics and Demography at SGH. In 2005–2012, Vice Dean and in from 2012 to 2020, Dean of Collegium of Business Administration at SGH. Author and co-author of numerous publications in agricultural economics, globalisation, business, theory and practice of competition. Involved in business practice – since 2012, Chair of the Supervisory Board of Makarony Polskie SA and since 2024, Chair of Scientific Council, Polish Craft Association.

Yuliia Zolotnytska – PhD, Assistant Professor, Food Safety Market Unit at SGH. Her research interests include competitiveness of the agri-food sector, food security, sustainable development management of rural areas and the development of family farming. Author of compendia, monographs and scientific articles, including several indexed in the Scopus and Web of Science databases. In 2023–2025, participated in research projects as both principal investigator and project team member.

Competitiveness derives from the competitive potential of an economic entity regardless of the type of activity. The main long-term source of growth of this potential is investment in resources, especially investment in innovation. Agriculture is the initial link in the food production chain, as it provides basic raw materials for further processing. Building the competitive potential of agriculture determines the competitiveness of both agriculture itself and the entire food production sector.

The main objective of the study is to search for the competitive advantages of agriculture and their long-term sources in selected countries of Central and Eastern Europe (CEE). One such factor is investment, especially in innovation, which increases the competitive potential of economic entities. Of course, investments are not the only source of building competitive potential, particularly so in agriculture. Natural conditions, including soil quality, climate, terrain, as well as general agricultural culture, also play a key role in this sector. In addition, the agrarian structure of agriculture is a very important element, including the size of the farm, which is closely related to the capability of achieving economies of scale, and thus affects unit costs and the price of agricultural products.

This study considers exports of agricultural commodities (in terms of value) as a multifactor measure of the external competitiveness of a country. Due to the fact that exports are partly dependent on imports (exported goods may be processed products based on raw materials imported from abroad), imports will also be analysed.

For the purposes of the study, which covers the years 2004–2023, we have selected the CEE countries with the highest value of exports of agri-food products in 2022 (according to FAOSTAT data), i.e. Poland, Ukraine, Hungary, Romania[1] and Czechia. Statistical data come from resources made available by FAOSTAT, Eurostat and FADN[2] as well as domestic databases.

Basic notions relating to competition

In order to better understand the analyses laid down below and the resulting conclusions, it is necessary to clarify the notions related to competition, i.e. "the process one must experience to become competitive" [Gorynia, 2009, p. 48].

Competition itself is a mechanism of market rivalry. It is a process in which market participants, striving to pursue their interests, try to present offers that are more advantageous than others in terms of price, quality, terms of delivery and other characteristics, influencing the decision to enter into a transaction [Encyklopedia PWN, 2025]. From a practical point of view, we can say that competitiveness is not a choice but a necessity for survival – it is the ability of a company to compete and achieve advantages over other economic entities, thus being the quintessence of its existence. Therefore, it is about pursuing activities aimed at achieving the same or similar goals that other companies strive for within a given timeframe and in a particular environment. Competitiveness can be defined as the ability to plan, create and sell a product that is more attractive than competitors' products [Encyklopedia Zarządzania, 2025a].

1 Romania has been an EU member since 2007.
2 The EU Farm Accountancy Data Network (FADN) was transformed in 2025 into the Farm Sustainability Data Network (FSDN).

The long-term competitiveness of an economic entity depends on its competitive potential. This potential consists of all resources used or available for use by the company. They can be classified into one of three groups:

a) primary resources,
b) secondary resources, and
c) resultant resources.

Primary resources are the entrepreneur's philosophy, strategy, organisational culture, and the organisation's ability to accumulate know-how and other necessary resources. **Secondary resources** include tangible factors of production (fixed assets, materials, raw materials, semi-finished products and consumables), human resources, innovations, distribution channels, the way the company is organised and information resources. Finally, **resultant resources** are understood to include the corporate image, the buyer's attitude (affinity) to a product and barriers to customers switching providers/suppliers.

Competitive potential has a key impact on the competitive position of a company. It is the company's location in the market, which determines its opportunities and threats in competition with other players. Various tools are used to determine the competitive position, including portfolio methods (e.g. McKinsey matrix, ADL matrix, Hofer matrix, sector synergy matrices) and non-portfolio methods, as well as SPACE and SWOT analyses. According to the criterion of competitive position (role) proposed by Philipp Kotler, companies can be divided into [Encyklopedia Zarządzania, 2025b]:

- market leaders, controlling at least 40% of the market,
- challengers, i.e. companies that hold 30% of the market,
- followers – or dependent market participants, including companies responsible for the stable maintenance of 20% of the market (entrenched in market niches),
- nichers, busy looking for a market niche, i.e. those that have not yet reached a 10% market share.

The position of an enterprise in the market in relation to other enterprises shows a competitive gap, which can be understood as [Gorynia, 2001, pp. 172–179]:

a) differences in the current (present) competitive position of a company vis-à-vis its rivals (detailed variables describing it include market share or profitability);
b) differences in the future competitive position of a company in relation to competitors (determined on the basis of a similar set of competitive position measures, but referred to a point in the future);
c) differences in the current (baseline) competitive potential, which indicates the range of possible competitive strategies;
d) differences in the strategy of competition over the period under consideration.

The company's position in the market, which enables it to offer higher quality products, lower prices and better service than the competition, results from competitive advantage, which is considered in three dimensions: quality, price and information.

To summarise major concepts of competition, competition strategies also need to be mentioned. They form a set of decision-making rules based which the company recognises, interprets and solves specific problems of its development, looking for an answer to the question of how it wants to accomplish its vision and mission or how it wants to be better than its competitors, and what will make the company stand out from the crowd. In designing and then implementing a strategy, the company undertakes specific offensive or defensive actions that are intended to contribute to its survival in the market or to maintaining or improving its current position in a particular sector.

Referring the definitions of competition to the recent initiatives of the European Commission (EC) on agriculture, it is worth pointing out that it is a strategic sector in the European Union (EU), which provides safe and high-quality food for its 450 million inhabitants and plays a fundamental role in global food security. Food is also part of the EU's competitiveness strategy.[3]

In February 2025, the EC presented a communication titled *A Vision for Agriculture and Food. Shaping together an attractive farming and agri-food sector for future generations*. In this document, it indicated that the Union of 2040 must be a place where farming is attractive for future generations, and the agri-food sector is competitive, resilient, future-proof and fair. This competitiveness and resilience of the agricultural sector means its ability to withstand rising global competition and shocks resulting from unpredictable global or regional developments (pandemics, wars and other armed conflicts, natural disasters, etc.). This skill – as pointed out by Mario Draghi [2024] in his report *The Future of European Competitiveness* – will be determined, among other things, by diversifying trade relations, creating new export opportunities for the sector and reducing critical dependencies.

3 The agri-food system, based on the European Single Market and its diverse businesses, as well as its scope, scale and production methods, generated value added of more than EUR 900 billion in 2022, providing jobs for around 30 million people, representing around 15% of total employment in the Union. As the world's largest exporter of agri-food products, the Community was steadily increasing its trade surplus over the years, reaching EUR 70 billion in 2023 [European Commission, 2025, p. 2].

Level of investment in farms under FADN observation in selected CEE countries in 2004–2022

Investments are a manifestation of the tendency of agricultural entities to take measures to adapt to changes in the environment, and an impulse for structural changes. They determine the aspirations and plans of agricultural producers for further development, increase in their competitiveness and expectations in terms of ensuring income in the future that exceeds the capital expenditure incurred [Grzelak, 2022, p. 87]. In a situation where the perception of the economic situation is optimistic or there is a successor ready to continue farming activity, the willingness to invest increases, or otherwise it decreases.

Table 1. Average investment per farm in farms under FADN observation (category SE516) in Poland, Romania, Czechia and Hungary in 2004–2022 (current prices, EUR)

Description	Poland	Romania	Czechia	Hungary
2004	6594	n.d.	18 968	5472
2005	3123	n.d.	24 754	5430
2006	3781	n.d.	30 260	4631
2007	4430	727	34 187	8326
2008	4171	453	39 616	7502
2009	3466	907	31 749	8794
2010	3710	619	34 449	5486
2011	3540	475	54 816	7828
2012	5386	581	52 187	7218
2013	4365	636	58 696	8910
2014	3783	31	51 444	11 047
2015	4396	669	44 118	7954
2016	2672	911	46 218	6691
2017	3820	893	54 361	7737
2018	4437	2369	58 598	11 345
2019	4764	477	58 721	13 538
2020	4207	2797	65 440	14 010
2021	4573	2405	61 535	16 316
2022	4768	4102	90 715	24 248

Source: Authors' own compilation based on FADN [2024] data.

Due to the growing fixed costs of depreciation and the need to increase the scale of production (to ultimately reduce unit costs), a continuous increase in investment is necessary. A rise in the average value of investment per farm in dynamic terms was recorded in almost all the analysed farms[4] (Table 1). The increase in capital expenditure was largely influenced by integration with the EU and the inclusion of agriculture in each country in the support system under the Common Agricultural Policy (CAP), which contributed to a significant improvement in the income standing of the agricultural sector, which in turn translated into a willingness to invest [Baraniak, 2017, pp. 21–30]. In 2022, the highest value of the average investment per farm was recorded in Czechia and Hungary, while the lowest was found in Romania and Poland. In the case of Czechia, the high value of the indicator was determined by the dominance of large farms with an average area of over 130 ha, hence the investments incurred by them were correspondingly higher on average than in the other analysed countries. On the other hand, the low level of investment per farm in Poland and Romania results from the high fragmentation of farms and, consequently, low economic prowess of the majority of such entities (operating in those countries), leading to a low absorption of financial resources, which is a barrier to investment. In addition, agrarian overpopulation, which is reflected in the average value of investment, was of great importance, also in the case of Hungarian farms [Piwowar, 2017, p. 152–160].

Investment financing sources in selected CEE countries in 2004–2022

Until the EU accession of most countries[5] under analysis, i.e. Poland, Romania, Czechia and Hungary, the external source of capital in farms included preferential loans. Later, they lost their significance in favour of direct payments and funding from EU programmes.[6] One of the most important forms of intervention under the EU CAP has been the modernisation of farms by supporting investments [Kirchweger, Kantelhardt, 2015, pp. 73–93]. Structural funds under the second pillar of the CAP played a prominent role in this case. This was particularly important in the countries covered

4 In Poland, in the base year (2004), the highest value of investments was recorded among all investments included in the time series concerned, significantly deviating from the values recorded in other years.

5 Ukraine was included in the analysis subject to the availability of data. For this purpose, the resources of FAOSTAT and Ukrstat (SSSU) were used (for which the description of the data collection methodology shows that the information is collected and made available in the same way as by the Eurostat database).

6 In Poland, throughout the entire period of the country's membership in the EU, funding support was obtained for activities aimed at boosting the competitiveness and efficiency of farms with a total value of state aid received in 2004–2021 exceeding PLN 32.5 billion, which allowed some 480 thousand projects to be implemented by about 350 thousand farms.

by the analysis,[7] where, in terms of capital endowment, farms lag far behind the level reached in the "old" EU member states long ago (which was achieved, by the way, to a large extent thanks to the measures introduced as early as 1962, when the CAP began to be implemented). Most significantly, from the point of view of the analysed group of countries, the importance of funds allocated for investments is very high, much greater than in other EU countries. Nevertheless, it is worth noting that agricultural income or savings from previous income remain the prevailing component in the internal structure of investment financing. Therefore, agricultural income is considered to be a crucial criterion for farms deciding whether to invest [Wysokiński, Klepacki, 2013, pp. 60–73; Ziętara, Adamski, 2014, s. 97–115]. Due to the fact that in family farms the household is combined with the farm, the investments they undertake often require a simultaneous reduction of consumption in the short term, while in the long term they can be a source of income growth [Woś, 2000, pp. 56–79].

Investments (and, as a result, renewals of fixed assets) are undertaken mainly by large, economically viable farms due to their financial potential and the ability to obtain subsidies and investment loans. This applies mostly to investments in the machine park. The agricultural activity carried out by the remaining farms does not enable them to replace fixed assets, and therefore the degree of their physical depreciation increases [Woś, 2000, pp. 12–45]. Barriers to investment for smaller farms include access to investment funding. Such entities usually have limited resources of their own and suffer shortages even in funds for pre-financing and co-financing investments supported by the EU budget. At the same time, low creditworthiness prevents access to bridging loans for the implementation of needed investment projects. Entities that finance investments from non-agricultural sources of income are an exception.

In quantitative terms, the structure of farms in Poland and Romania is dominated by entities with a low competitive potential and limited development capability, while at the opposite end of the spectrum there are commercial farms, economically strong agricultural entities supplying the market with about 80% of the food available, which are much fewer in number in those countries but employ modern techniques and methods of production and display a high level of competitiveness [Judzińska, Łopaciuk, 2014, pp. 12–45]. In terms of competitive potential, the structure of farms in Czechia is much more favourable, where large entities with high competitive capacity prevail.

7 Except Ukraine, which is not a member of the EU.

Table 2. Structure of investment funding sources in farms under FADN observation in Poland, Romania, Czechia and Hungary in 2004–2022 (%)

Year	Poland			Romania			Czechia			Hungary		
	SE406/ SE516	SE485/ SE516	SE420/ SE516	SE406/ SE516	SE485/ SE516	SE420/ SE516	SE406/ SE516	SE485/ SE516	SE420/ SE516	SE406/ SE516	SE485/ SE516	SE420/ SE516
2004	0.0	100.1	92.7	n.d.	n.d.	n.d.	3.4	725.6	128.1	9.1	568.1	117.4
2005	0.6	231.2	186.8	n.d.	n.d.	n.d.	4.7	596.9	72.5	12.3	635.2	107.2
2006	1.1	202.9	197.0	n.d.	n.d.	n.d.	4.2	519.6	78.9	5.8	593.0	159.0
2007	3.5	217.7	225.3	4.1	255.2	416.4	5.4	455.1	106.3	8.3	495.6	156.4
2008	5.8	276.9	196.5	5.3	452.8	1259.6	5.6	453.0	71.8	12.2	585.2	219.2
2009	5.3	266.5	186.0	2.9	207.6	399.5	12.1	532.9	36.6	17.1	349.3	78.2
2010	6.9	243.2	269.1	1.0	187.9	790.0	12.8	522.7	67.9	14.8	559.6	240.4
2011	7.2	255.5	307.5	2.5	201.5	1213.3	15.7	378.2	93.2	9.3	443.8	276.8
2012	5.0	183.0	201.9	0.3	110.3	903.6	10.6	363.5	86.6	6.4	406.3	268.1
2013	6.4	227.2	226.1	0.8	89.8	868.7	5.1	319.8	81.6	9.5	339.1	205.3
2014	7.8	254.4	230.1	422.6	3335.5	16 632.3	5.4	364.8	109.8	15.0	272.7	193.0
2015	6.4	243.4	182.9	11.8	224.8	523.5	12.8	412.3	85.8	12.5	371.7	219.5
2016	10.0	374.7	293.5	4.2	129.1	503.2	0.7	424.0	75.8	0.1	411.8	300.0
2017	6.4	272.8	259.4	5.6	114.2	656.2	9.5	384.3	75.0	0.3	372.2	280.4
2018	5.8	322.2	235.7	1.6	160.9	539.5	13.9	393.1	80.8	1.4	310.2	227.1
2019	5.2	285.6	259.8	1.1	734.6	2552.2	12.5	402.1	75.4	1.7	268.9	195.8
2020	5.7	290.2	288.7	0.7	86.6	372.4	12.0	449.2	85.0	1.1	310.5	209.4
2021	5.7	236.0	346.7	0.3	93.6	638.7	11.5	509.9	92.7	0.9	313.2	206.3
2022	5.1	198.0	513.5	0.1	100.7	384.8	8.3	394.2	96.4	2.6	263.1	157.7

Notes: The respective columns take into account:
- the ratio of subsidies on investments to gross investment on fixed assets SE406/SE516,
- the ratio of total liabilities to gross investment on fixed assets SE485/ SE516,
- the ratio of family farm income to gross investment on fixed assets SE420/ SE516.

Source: Authors' own compilation based on FADN [2024] data.

A high investment activity of farms in both Poland and Romania in the period under study was the result not only of greater availability of financial support based on foreign capital, but also of significant underinvestment in the years preceding the EU accession. Despite the favourable economic situation, the propensity to seek support for investment and development of farms in individual countries was uneven. As a result, the average level of capital expenditure of the analysed entities in Poland and Romania in 2022 was lower than the value of this metric in the base year (2004) in Hungary (approx. 1.5 times) and Czechia (approx. 4 times). This contributed to a significant variation in the use of support for farm investment in different countries. As a result, in 2022, the disparities in terms of investment activity of entities in the countries under study became even more pronounced, and the economies of scale in the case of farms in Hungary and Czechia grew yet further. It should be noted that it is not investing itself that matters, but achieving the *ex-ante* results expected of it,[8] which translates into the operation of the development mechanism [Kusz, Gędek, Kata, 2015, pp. 54–68]. The reference literature shows that support instruments intended for direct investment purposes are too concentrated in nature from the perspective of the rationality of choices made by an agricultural producer, which may contribute to the formation of irrational relationships between production factors [Bezat-Jarzębowska, Rembisz, Sielska, 2013, pp. 5–14]. One example is land, a factor the flow of which from less efficient units (with a smaller scale of production) to more efficient ones is hindered by area payments. The prospect of receiving political rent (the payments mentioned above) significantly inhibits the flow of resources and prevents the smallest farmers from giving up agricultural activity, and even if they do discontinue farming, it encourages owners to lease land instead of selling it [Czyżewski, 2017, pp. 34–53].

The acceleration of the modernisation of farms in the analysed CEE countries was possible thanks to the implementation of CAP mechanisms. This was confirmed by the results of both pre-accession activities and those pursued in the first years of membership [Bułkowska, 2011; Drygas, Rosner, 2008]. Hence, it was very important to properly programme support for the successive financial perspectives, especially in the second pillar and mechanisms supporting investments where it is necessary for future beneficiaries to prepare in advance. It seems particularly important to determine the forms and rules of the support provided. The research period presented in this study was consistent with the implementation and effects of the financial perspectives for

[8] It is also a matter of both fixed assets being technologically up to date and the ability to finance investments in fixed assets.

2007–2013 ($n + 2$) and for 2014–2020 ($n + 2$).[9] In this context, the key factors supporting investments in farms were the "Setting up young farmers" and "Modernisation of agricultural holdings" programmes [Pawłowski, Czubak, 2018, pp. 109–123]; hence, the effects of these activities are mainly hidden behind the investment subsidies obtained.[10] The largest amount of funds in terms of value as part of investment subsidies went to Polish, Hungarian and Romanian farms. On the other hand, the highest share of investment subsidies in the budget of the entire Rural Development Programme (RDP) for 2007–2013 was recorded in Hungary. Moreover, also in Hungary, the largest part of the funds for that programming period was allocated to investment subsidies. The lowest allocation to this area in percentage terms was in Czechia, where the average area of farms was the largest.

The importance of investment subsidies in the context of investment activity varied between countries. The highest rank and value of the indicator was recorded for farms in Czechia, where the share of investment subsidies in the analysed time series already in the financial perspectives 2007–2013 and 2014–2020 amounted to several percentage points (with the exception of the years 2013–2014, a final period of one financial perspective, and the years 2016–2017, when the low share of investment subsidies was caused by a delay in the implementation of programmes under the financial perspective and the disbursement of related funds). The importance of investment subsidies is also apparent for farms in Hungary, but it seems that the RDP financial perspective 2014–2020 for that country was designed so that budgetary funding was allocated to investment subsidies to a much smaller extent than under the RDP 2007–2013. On the other hand, both in Poland and Romania, the share of investment subsidies in the value of investments incurred over the entire time series did not exceed a few percentage points, which proves that transfers of funds intended for investments in farms contribute to the improvement of competitiveness by these entities to a moderate extent, and that they are highly dependent on EU funding for investment. In the case of Romania, the exception is the value of the indicator recorded in 2014. It derives from the value of the measure of average investments per farm in the same year. The low average investment level was mainly attributable to the fact

9 The $n + 2$ rule under the Rural Development Programme (RDP) means that all disbursements of funds under this programme should be accounted for by the end of two years after the last year of the programming period concerned.

10 Despite the assumptions imposed by the European Commission at the stage of programming individual measures, the countries were allowed some discretion in how to adapt them to the needs of national agriculture. All countries had the same main goal, but it could be achieved through different specific objectives. Therefore, support for such measures as "Modernisation of agricultural holdings" or "Setting-up of young farmers" could be addressed to farms in different areas of production and involve different levels of intensity and requirements for beneficiaries. One of the key differences was also the maximum amount of support that a beneficiary could receive over the entire programming period.

that 2014 was a period of political and economic change in Romania. Fluctuations in economic policy, changes in government and uncertainty about future agricultural policies led to greater caution in agricultural investment decision-making. In addition, the low level of farm investment in Romania in 2014 may have been influenced by combinations of factors such as difficulties in accessing financing, problems with the use of EU funds, structural problems in agriculture, the sector's low profitability, lack of support for small farmers, political and economic uncertainty, and crises in individual agricultural sub-sectors (e.g. in the dairy sub-sector).

Due to the structure of measures forming the main part of support for farms through investment subsidies, the maximum amount of allocation under a particular measure may represent (depending on the country and the financial perspective) a maximum of 60% of eligible costs. Therefore, the gross cost of investment is most often covered by the investor's own funds and/or borrowed capital, and only in subsequent periods are payments obtained with support granted under a specific measure. In this context, the ratio of debt to investment provides important information. Analysing its value, it can be concluded that the highest debt in relation to the value of investments was recorded for farms in Czechia and Hungary, which indicates that entities in these countries probably incur debt not only to cover the costs of investments but perhaps also for operating purposes. The lowest level of debt (representing, however, about 2.5 times the investment incurred) was recorded in farms in Poland and Romania. This may be indicative of a cautious acquisition of foreign capital only for the purpose of pre-financing and co-financing investments under support from the EU budget. It should be noted that such investing activity is mainly associated with larger and stronger farms. Barriers for smaller farms in this respect include obtaining funds to finance investments. Such entities usually have limited funds of their own. At the same time, low credit rating prevents access to bridging loans for the implementation of needed investment projects. Entities that finance investments from non-agricultural sources of income are an exception.

In addition to EU accession, the COVID-19 pandemic and the war in Ukraine also proved to be an important stimulus for farms to undertake investments, as those developments increased interest (to a moderate extent) in investing in digital technologies and triggered efforts to ensure the resilience of agricultural entities to shocks occurring in the labour market, including seasonal work [Bezat-Jarzębowska, 2021, p. 7].

Changes in the structure of investments will also be necessitated in the future by market demand and economic changes resulting from the development of Industry 4.0. The digital transformation of enterprises is in line with the main goals set by the European Commission in the 2030 Digital Compass. The implementation of the Industry 4.0 concept is based on digital transformation, which involves automation and the use of smart machines, smart manufacturing and data to enhance productivity, flexibility and agility across the chain of supply [IBM definition – see Peng, Tao, 2022, p. 3]. The processes of implementing digital transformation solutions[11] for the agri-food industry are today widely discussed in the literature [Brynjolfsson, Rock, Syverson, 2021, pp. 333–372; Figiel, 2019, p. 27]. Despite the poor understanding of the phenomenon, some changes can also be observed at the level of individual farms. Technological progress is based not only on the purchase of modern tractors with a wide array of accessories but also on the implementation of systemic solutions that would allow farms to move away from the labour-intensive nature of farm operations in favour of a better ratio of labour to capital input. This would require replacing human work with technology (e.g. robots for milking dairy cows, autonomous vehicles, drones to monitor production progress and changes in weather conditions), as well as the use of dedicated computer programs and applications that enable the collection, analysis and work on big data sets at each stage of the production process, so as to improve the response to changing environmental conditions and adapt the method of production accordingly.

Unfortunately, both farms and agri-food industry enterprises appear to implement only isolated measures, without a pre-planned strategy for their implementation along with the expected outcomes.[12] The employment of digital solutions can translate into an increase in innovation and productivity (following some possible declines), improved financial performance and competitiveness, as well as environmentally friendly effects, i.e. optimisation of resource consumption, reduction of adverse environmental impacts and support for green transformation and sustainable development.[13]

---

11 Digital transformation is defined as "a process of fundamental change enabled by the innovative use of digital technologies, accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity [an entity could be either: an organisation, a business network, an industry, or a society] and redefine its value proposition for fits stakeholders" [see Gong, Ribiere, 2021, p. 1].

12 "Companies are pouring millions into 'digital transformation' initiatives – but a high percentage of those fail to pay off. That's because companies put the cart before the horse, focusing on a specific technology ('we need a machine-learning strategy!') rather than doing the hard work of fitting the change into the overall business strategy first" [see Tabrizi, Lam, Girard, Irvin, 2019].

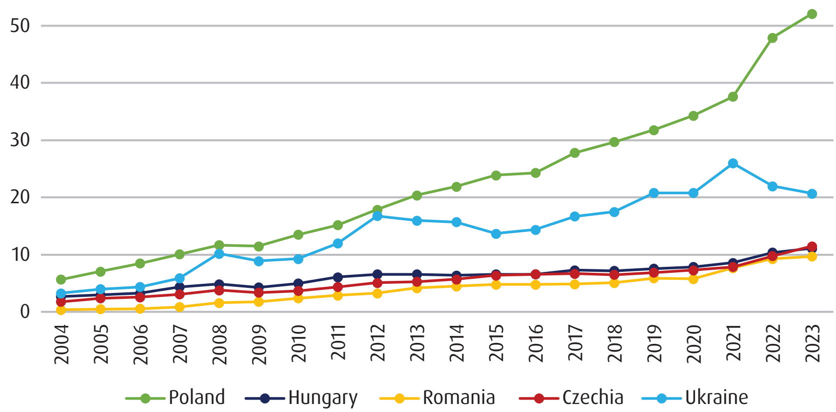
13 In addition to the positive effects of using such solutions, it is also important to take into account their possible consequences taking the form of market imbalances (only the largest and richest entities can afford the transformation) and new types of threats (cyberattacks, data security).

The level and structure of exports and imports of agri-food products in selected CEE countries in 2004–2023

Exports (in terms of value), in this case involving agri-food products, are understood as a multifactorial measure of the external competitiveness of a country. Due to the fact that they partly depend on imports (exported goods may be processed products based on raw materials brought from abroad), imports will also be analysed in this study.

The study draws on statistical data from the database of the Statistical Office of the European Communities (Eurostat) and the State Statistics Service of Ukraine (SSSU). The analysis presented includes agri-food products classified according to the Standard International Trade Classification (SITC), Section 0 – Food and live animals (live animals; meat and meat preparations; dairy products and birds' eggs; fish (not marine mammals); crustaceans, molluscs and aquatic invertebrates and preparations thereof; cereals and cereal preparations; vegetables and fruit; sugars, sugar preparations and honey; coffee, tea, cocoa, spices, and manufactures thereof; feeding stuff for animals, not including unmilled cereals; miscellaneous edible products and preparations) and Section 1 – Beverages and tobacco (beverages; tobacco and tobacco manufactures) [UN, 2006]. In the analysis of the structure of foreign trade, we took into account the main groups of agri-food products, classified according to the Combined Nomenclature of Foreign Trade (CN) [UN, 2000], i.e. 1) cereals, including cereal products and 2) meat and offal, meat products; dairy products; birds' eggs; honey.

Figure 1. Comparison of the value of agri-food exports in Poland, Romania, Czechia, Ukraine and Hungary in 2004–2023 (EUR billions)



Source: Authors' own compilation based on Eurostat [2024], GUS [2024] and SSSU [2024] data.

The study focused on the export and import of agri-food products in selected CEE countries (Poland, Ukraine, Hungary, Romania and Czechia). The timeframe of the analysis, determined by the moment of the first enlargement of the EU to include countries from the CEE region, the outbreak of the COVID-19 pandemic and the Russian–Ukrainian war, and the availability of data, concerned the years 2004 and 2023.

Table 3. Exports, imports and foreign trade balance of agri-food products in selected CEE countries in 2004–2023 (EUR billions)

Year	EU			Poland			Hungary			Romania			Czechia			Ukraine		
	exports	imports	balance	exports	imports	balance	exports	imports	balance	exports	imports	balance	exports	imports	balance	exports	imports	balance
2004	210.2	201.1	9.1	5.7	4.4	2.7	2.7	1.8	0.9	0.4	1.6	−1.2	1.8	2.6	−0.8	3.3	1.8	1.5
2005	226.0	215.4	10.6	7.1	5.4	3.1	3.0	2.3	0.7	0.5	1.8	−1.3	2.4	3.1	−0.7	4.0	2.5	1.5
2006	244.9	232.6	12.3	8.5	6.4	3.7	3.3	2.5	0.8	0.6	2.2	−1.6	2.6	3.6	−1.0	4.4	3.0	1.4
2007	270.0	259.0	11.0	10.1	8.1	3.6	4.4	2.9	1.5	0.9	3.0	−2.1	3.1	4.3	−1.2	5.9	3.9	2.0
2008	294.2	280.5	13.7	11.7	10.3	1.2	4.9	3.4	1.5	1.6	3.8	−2.2	3.8	4.7	−0.9	10.2	6.1	4.1
2009	276.7	265.9	10.8	11.5	9.3	4.2	4.3	3.1	1.2	1.8	3.4	−1.6	3.4	4.6	−1.2	8.9	4.6	4.3
2010	306.2	286.0	20.2	13.5	10.9	4.3	5.0	3.3	1.7	2.4	3.3	−0.9	3.7	5.0	−1.3	9.3	5.4	3.9
2011	337.7	315.4	22.3	15.2	12.6	5.3	6.1	3.9	2.2	2.9	3.7	−0.8	4.4	5.7	−1.3	12.0	6.0	6.0
2012	360.1	327.0	33.1	17.9	13.6	6.8	6.6	3.9	2.7	3.3	4.1	−0.8	5.1	6.2	−1.1	16.8	7.1	9.7
2013	379.5	338.7	40.8	20.4	14.3	7.6	6.6	3.8	2.8	4.2	4.3	−0.1	5.3	6.4	−1.1	16.0	7.7	8.3
2014	386.2	346.5	39.7	21.9	15.1	8.8	6.4	4.1	2.3	4.5	4.5	0.0	5.7	6.5	−0.8	15.7	5.7	10.0
2015	404.4	366.3	38.1	23.9	16.1	8.2	6.6	4.3	2.3	4.8	5.4	−0.6	6.4	7.2	−0.8	13.7	3.3	10.4
2016	416.2	379.2	37.0	24.3	17.3	10.5	6.6	4.6	2.0	4.8	6.1	−1.3	6.6	7.4	−0.8	14.4	3.7	10.7
2017	440.7	402.0	38.7	27.8	19.3	10.4	7.3	4.9	2.4	4.9	6.6	−1.7	6.7	7.8	−1.1	16.7	4.0	12.7
2018	446.0	407.9	38.1	29.7	20.0	11.8	7.2	5.2	2.0	5.1	6.8	−1.7	6.5	8.0	−1.5	17.5	4.8	12.7
2019	469.8	420.6	49.2	31.8	21.3	13.0	7.6	5.6	2.0	5.9	7.5	−1.6	6.9	8.6	−1.7	20.8	5.4	15.4
2020	472.5	415.6	56.9	34.3	22.7	14.9	7.9	5.7	2.2	5.8	7.9	−2.1	7.3	8.5	−1.2	20.8	6.1	14.7
2021	514.5	449.3	65.2	37.6	25.0	22.9	8.6	6.2	2.4	7.7	9.0	−1.3	7.9	9.3	−1.4	26.0	7.3	18.7
2022	608.8	544.6	64.2	47.9	32.2	19.9	10.4	8.0	2.4	9.3	11.1	−1.8	9.8	11.3	−1.5	22.0	5.7	16.3
2023	639.9	574.0	65.9	52.1	33.4	18.7	11.1	8.6	2.5	9.7	12.1	−2.4	11.5	12.7	−1.2	20.7	6.5	14.2

Source: Authors' own compilation based on Eurostat [2024], GUS [2024] and SSSU [2024] data.

The 2004 EU enlargement and the integration of 10 new countries into the European Single Market (ESM) led to a marked boost in agri-food trade (Table 3).

In the analysed group of countries, the first symptoms of this phenomenon were observed in Poland as early as 2004, when a positive trade balance (EUR 2.7 billion) was recorded. In the years 2004–2023, Poland held the position of a net exporter of agri-food products, and the foreign trade balance in 2023 amounted to EUR 18.7 billion (in 2021 – EUR 22.9 billion). The growth rate of the trade balance in the first decade of Poland's membership of the EU reached almost 25–50% y/y. In the years 2008–2023, the balance growth rate began to decrease and ranged at an average of 6–12% y/y. The main reason for this phenomenon was the global economic crisis that began in the second half of 2008 and the related economic slowdown, resulting in a decline in internal demand in Western European countries [Pawlak, 2014, pp. 170–184]. Poland also became the undisputed leader in terms of the value of exports – in the analysed period, it increased 9.1 times – to EUR 52.1 billion. At the same time, imports also grew 7.6 times, to EUR 33.4 billion, and the trade balance rose 6.9 times, to a level of EUR 18.7 billion.

Hungary also witnessed a positive effect of joining the ESM. In 2023, as a result of Hungary's accession to the customs union, agri-food products worth EUR 11.1 billion were exported from Hungary, while EUR 8.6 billion was spent on imports.

Poland's and Hungary's positive performance in foreign trade was attributable to:

a) a higher value of exports and imports stimulated by an increase in consumer demand and higher transaction prices;
b) appropriate preparedness of the agri-food industry for operating in the ESM;
c) good knowledge of EU rules and procedures applicable to intra-Community trade.

Foreign trade in agri-food products in Romania and Czechia showed no improvement in performance between 2004 and 2023. Over the analysed years, both countries were net importers with an upward trend towards negative values of the balance of trade in the agri-food sector. Export receipts in Romania in 2023 amounted to EUR 9.7 billion, and expenditure on foreign food purchases was EUR 12.1 billion. There was also a negative balance of trade in agri-food products, reaching EUR 2.4 billion. The volume of exports in Czechia in 2023 amounted to EUR 11.5 billion, and the volume of imports – EUR 12.7 billion. The negative balance of trade in agri-food products in Czechia reached EUR 1.2 billion.

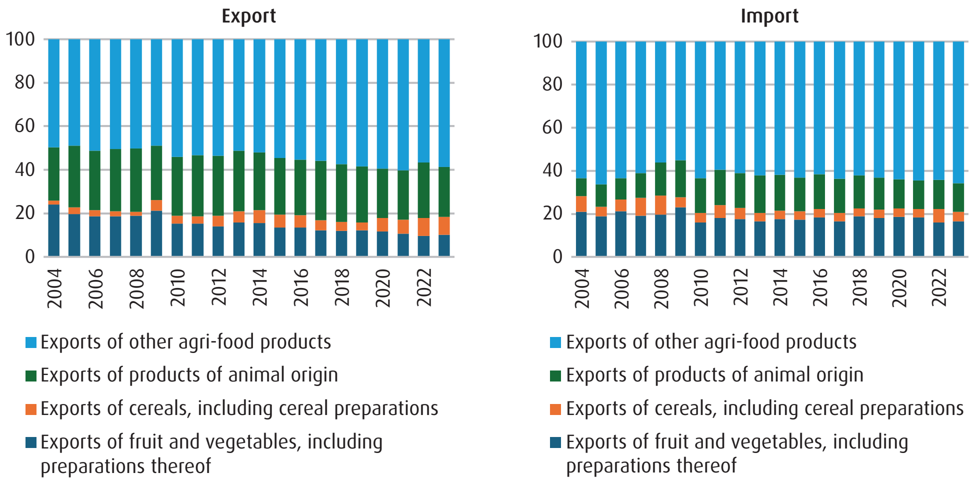
The upward trend of negative trade balances in the agri-food sector in Romania and Czechia resulted mainly from a significant recovery in foreign trade in intra-Community markets and the lack of production potential in agriculture in both countries.

Changes in Ukraine's foreign trade in agri-food products were initiated by the implementation of agrarian reforms in 1996–2000. The high production potential in agriculture allowed Ukraine to increase the value of exports to EUR 20.7 billion in the period 2004–2023 (6.3 times more than in 2004), while the value of imports reached EUR 6.5 billion (3.6 times more than in 2004). Between 2004 and 2023, the balance of trade in agri-food products improved steadily, reaching EUR 14.2 billion in 2023.

At the beginning of the 2000s, the balance grew at a rate of about 30–45% y/y, to then decline in 2013–2016. However, the upward trend recovered in 2017–2021 and remained at 18–27% y/y. The outbreak of the war in 2022 was followed by a decrease in the growth rate of the agri-food trade balance to approximately 13% y/y.

In order to illustrate the export activity of selected CEE countries more clearly, we present below an analysis of the structure of exports and imports of selected agri-food products, namely: products of animal origin (which include meat and offal, meat products; dairy products; bird eggs; honey) and products of plant origin (which include cereals and cereal preparation, vegetables and fruit). Other agri-food products comprise articles that are not included in the above-mentioned items.

Figure 2. Structure of exports and imports of agri-food products in Poland in 2004–2022 (%)

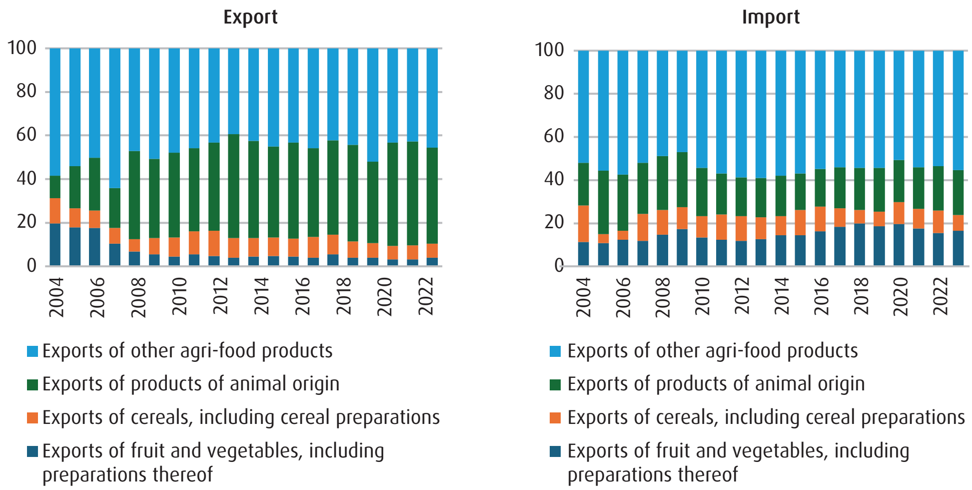


Source: Authors' own compilation based on Eurostat [2024] data.

The share of the EU market in Polish agri-food exports in 2023 was 74%, and that of non-EU countries – 26%. The largest share of Polish exports to EU countries in 2024 went to Germany (25%), France (6%), the Netherlands (6%), Italy (5%) and Czechia (5%). As in previous years, the main significant recipients of agri-food products exported from Poland to non-EU countries were the United Kingdom (8%), Ukraine (2%), the United States (1.5%), Turkey (1%).

The commodity structure of Polish exports of agri-food products in 2023 was dominated by animal products (meat, meat preparations, dairy products, eggs, honey – 22.8% share with the value of EUR 11.1 billion). Ranking next in exports in terms of value were cereal grains and preparations (EUR 4.1 billion – 8.3%) and vegetables, fruit and preparations thereof (EUR 5.0 billion – 10.1%).

Figure 3. Structure of exports and imports of agri-food products in Romania in 2004–2022 (%)

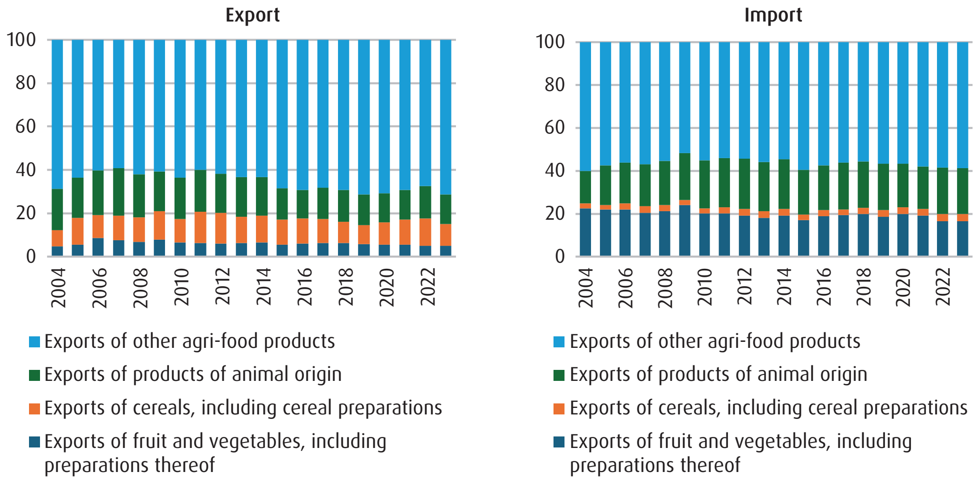


Source: Authors' own compilation based on Eurostat [2024] data.

In Romania, a dynamic increase in exports of agri-food products, especially cereals and vegetable oils, could be observed after 2007 (EU accession). Imports also increased in the analysed period, but at a slower pace. Since 2013, Romania has been a net exporter – the value of exports exceeds imports. A large share of cereals (including wheat and maize) is visible in foreign trade, which demonstrates Romania's importance as a supplier of agricultural commodities to the EU. In 2007–2009, exports from Romania saw an increase, which was mainly attributable to integration with the EU market (the abolition of tariff barriers) and the inflow of foreign investment in the agricultural sector. 2010 saw a temporary collapse in exports, which was significantly influenced by extreme weather conditions (droughts), a decrease in yields and the global economic crisis (lower demand). The years 2011–2019 can be described as a period of stable export growth, which was supported by the improvement of logistics infrastructure (ports, railways) and the increase in grain prices in global markets. Between 2020 and 2021, fluctuations in export and import levels caused by the COVID-19 pandemic and supply chain disruptions began to occur. In 2022, the war in Ukraine triggered an increase in grain prices, and Romania became an alternative logistics hub for grain from Ukraine. Then, in 2023, low grain prices combined with market saturation and stabilisation led to a decline in exports from the country.

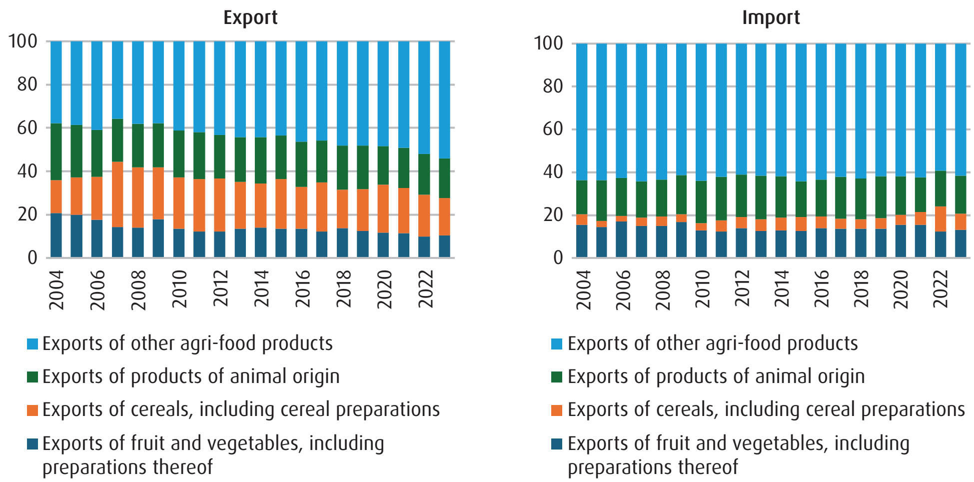
The structure of Czech exports and imports is more balanced (Figure 4). In the analysed period, Czechia was a net importer. Its exports were mainly processed products, and imports consisted of raw materials and finished products. The relative stability indicates that there is little impact of climatic and geopolitical disturbances in the food sector. On the other hand, the low volatility of the foreign trade balance may be indicative of resilience to external shocks.

Figure 4. Structure of exports and imports of agri-food products in Czechia in 2004–2022 (%)



Source: Authors' own compilation based on Eurostat [2024] data.

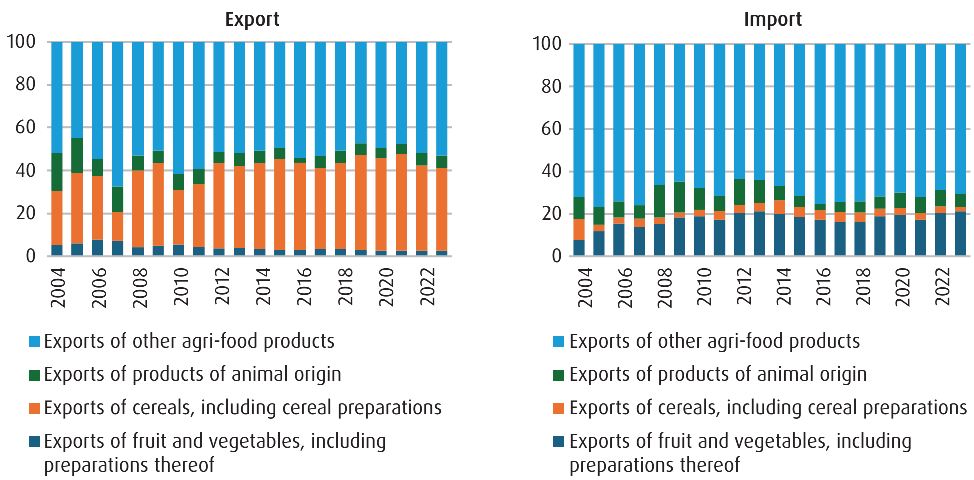
Figure 5. Structure of exports and imports of agri-food products in Hungary in 2004–2022 (%)



Source: Authors' own compilation based on Eurostat [2024] data.

Hungary is a regular net exporter of agri-food products, with an export surplus already visible in the initial period of the analysis (Figure 5). Its export activity involves mainly maize, wheat, processed meats and beverages. Between 2007 and 2010, Hungary experienced a rapid increase in exports, mainly due to the country's strong position in the EU market in fodder maize trade. 2012 marked the beginning of a strong decline in exports, which was mainly due to drought and record low maize yields. The increase in exports in 2018–2019 was caused by high cereal yields and favourable weather conditions. The war in Ukraine resulted in a sharp increase in exports in 2022, which was mainly determined by the transit of Ukrainian grain through Hungary and rising maize prices in global markets. The structure of the country's foreign trade shows strong links with regional markets (Austria, Germany, Italy). Exports were also affected by weather changes and the transit of grain from Ukraine (after 2022). The foreign trade balance in 2021–2023 was also significantly affected by high cereal prices, which contributed to an increase in the export surplus.

Figure 6. Structure of exports and imports of agri-food products in Ukraine in 2004–2022 (%)



Source: Authors' own compilation based on SSSU [2024] data.

Between 2004 and 2023, Ukraine had a negative trade balance (in all products; Figure 6). The sharp increase in the negative trade balance followed Russia's invasion of Ukraine in February 2022 and amounted to USD 11.2 billion (16.8% of GDP). In 2023, the trade balance deficit was already USD 27.4 billion (– 20.9% of GDP).

Before the outbreak of the war in 2022, the structure of Ukrainian exports was as follows: agri-food products accounted for 45.1%; metallurgical products – 18.4%; mechanical engineering products – 11.0%; mineral products – 10.8%; chemical industry products – 5.5%. The following represented the largest shares in the total import volume in 2021: mechanical engineering products – 34.2%; chemical industry products – 19.8%; mineral products – 15.9%; agri-food industry products – 12.0%; metallurgical products – 5.8%; light industry products – 5.5% [SSSU, 2021]. The commodity structure of exports and imports changed dramatically after the outbreak of the war in 2022. Food products and agricultural raw materials began to dominate exports, whose share increased to 60.6% of total exports. It is worth noting that the structure of exports of agri-food products had so far been dominated by the export of cereals, including cereal preparations (about 40%), as opposed to the minimum share of animal production, at several percent. The share of non-agricultural goods in exports decreased to 39.4%. In particular, the share of exports of metals and metal-based products fell (to almost 11%) due to the reduced production in metallurgical enterprises, as well as logistical problems. The share of exports of mineral products also decreased (to 5.1% – mainly due to a lower volume of exports of iron and titanium ore), machinery, equipment and means of transport (to 8.6%), chemical industry products (to 3.1%) and fuel and energy products (to 1.2%). On the import side, a decline was witnessed, mainly in the share of fuels and energy carriers (to 19.2% of the total import volume), which indicates that the domestic market was gradually being saturated with these products. At the same time, there was an increase in the share of imports of machinery, equipment and means of transport (to 29.2%) and agri-food products (to 11.4%) [SSSU, 2023].

An analysis of data for 2004–2023 shows the need to implement an integrated, flexible and climate-resilient export policy in the CEE region. The growing importance of non-economic factors (climate, geopolitics) requires the use of modern tools for international trade management and institutional support to export-oriented agriculture.

Comparison of foreign trade in agri-food products and government expenditure on agriculture, forestry and fisheries in selected CEE countries in 2004–2023

The analysis used data from the FAOSTAT database, maintained by the Food and Agriculture Organisation of the United Nations (FAO). The variable values shown refer to the years 2004–2023.[14] In accordance with the methodological guidelines used by

[14] For government expenditure, no 2023 data were available for Poland, Hungary and Romania at the time of preparing this publication.

the FAO, in selecting goods classified as plant and animal production, the aforementioned SITC classification was used. Import, export and trade balance data include the aggregate value of production under Section 0 (Food and live animals) and Section 1 (Beverages and tobacco). Thus, each of the following charts shows the total value of trade including fruit and vegetables; cereals and cereal preparations; dairy products and birds' eggs; meat and meat preparations; fish and crustaceans; sugar, sugar preparations and honey; coffee, tea, cocoa and spices; miscellaneous edible products and preparations; feeding stuff for animals; live animals; beverages; tobacco and tobacco manufactures.

Government expenditure on agriculture, forestry and fisheries represents the financial resources allocated by the state to support this sector, including the creation of favourable external and internal conditions.

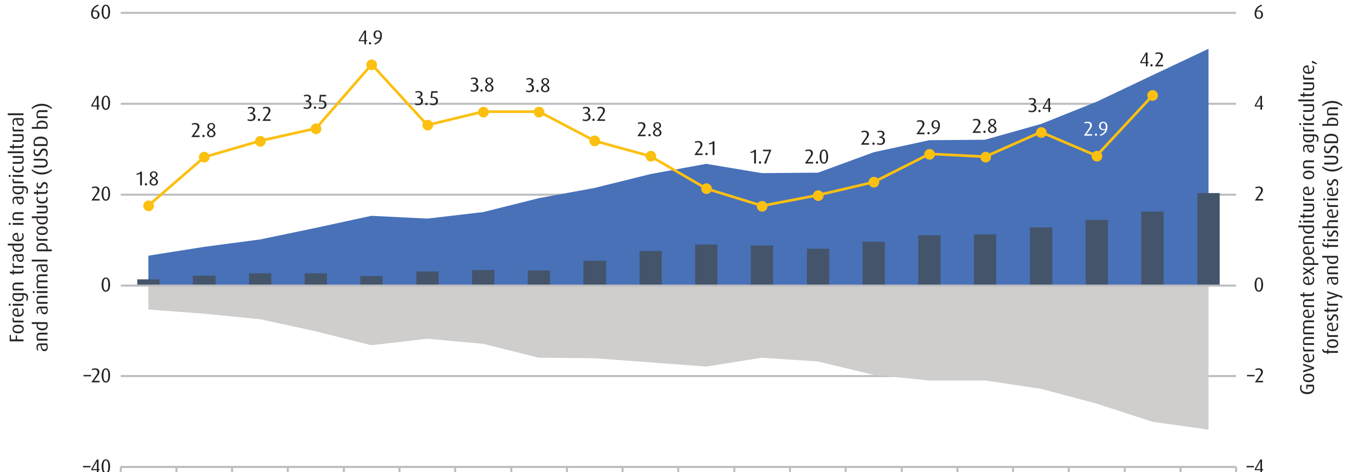
Figures 7–11 compare foreign trade in agri-food products with government expenditure on agriculture, forestry and fisheries in Poland, Ukraine, Czechia, Romania and Hungary in 2004–2023.[15]

Between 2004 and 2023, an increase in both exports and imports of agri-food products was observed in all countries covered by the survey. In Poland, Ukraine and Romania, government expenditure on agriculture, fisheries and forestry continued to increase until 2008, with the largest expenditure under this heading having been recorded in Poland, where it amounted to USD 4.9 billion in 2008. Similarly, after 2004, funding was increased in Hungary (until 2007) and in Czechia (until 2009). The following years saw a decrease in government spending, which even briefly reached values close to or lower than in the year of the country's EU accession (such a situation occurred in Poland – 2015, Czechia – 2018, and Romania – 2016). Likewise, in Ukraine, the level of expenditure fell from USD 1.8 billion (2008) to USD 0.2 billion (2016), and in 2023 it ranged between USD 0.3 billion and USD 0.6 billion per year.

Interestingly, in Hungary, the level of government expenditure on agriculture, forestry and fisheries stabilised from 2010 and its value stood in the range of USD 0.6 to 0.9 billion until 2022. At the same time, the country's trade balance remained positive throughout the period under review, reaching its highest values in 2012 (USD 4.41 billion) and in 2013 (USD 4.46 billion). Therefore, it can be assumed that the investments made in previous years contributed to the increase in the export capacity of agricultural producers. In the following years, exports and imports grew at a similar pace.

[15] Due to technical constraints, for the purposes of data presentation on the charts, it is necessary to show import information as negative values.

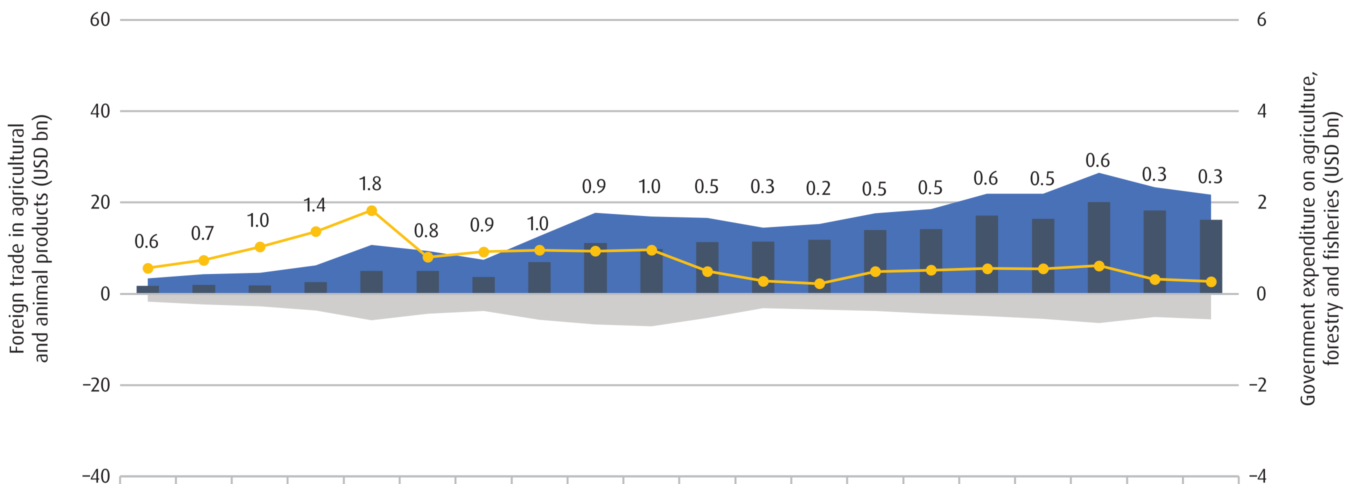
Figure 7. Comparison of foreign trade in agri-food products and government expenditure on agriculture, forestry and fisheries in Poland in 2004–2023 (current prices, USD billions)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	-5.27	-6.27	-7.42	-10.0	-13.2	-11.6	-12.8	-15.9	-16.0	-16.9	-17.8	-15.8	-16.7	-19.7	-20.9	-20.8	-22.7	-26.0	-30.0	-31.7
Exports	6.57	8.44	10.10	12.67	15.28	14.72	16.16	19.20	21.49	24.48	26.77	24.68	24.83	29.30	31.91	32.10	35.51	40.47	46.24	52.07
Trade balance	1.30	2.17	2.68	2.61	2.07	3.02	3.33	3.27	5.41	7.56	8.94	8.79	8.09	9.58	10.99	11.22	12.79	14.44	16.19	20.34
Government expenditure	1.8	2.8	3.2	3.5	4.9	3.5	3.8	3.8	3.2	2.8	2.1	1.7	2.0	2.3	2.9	2.8	3.4	2.9	4.2	

Source: Authors' own compilation based on FAOSTAT [2024] data.

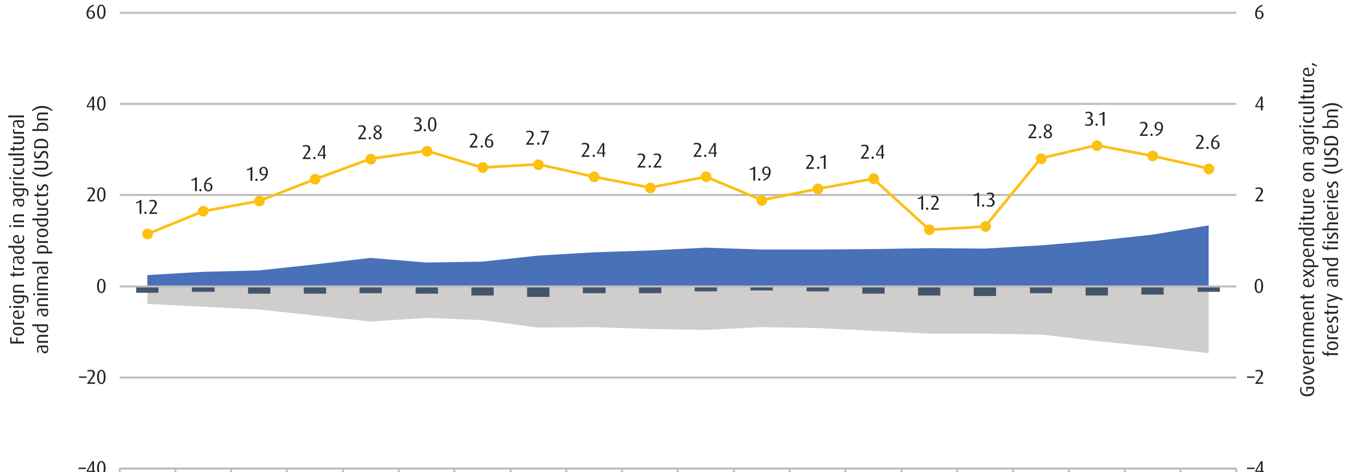
Figure 8. Comparison of foreign trade in agri-food products and government expenditure on agriculture, forestry and fisheries in Ukraine in 2004–2023 (current prices, USD billions)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	−1.66	−2.32	−2.74	−3.60	−5.74	−4.39	−3.76	−5.72	−6.69	−7.14	−5.29	−3.11	−3.41	−3.70	−4.35	−4.83	−5.51	−6.42	−5.08	−5.57
Exports	3.39	4.29	4.63	6.21	10.73	9.38	7.47	12.65	17.79	16.96	16.62	14.53	15.28	17.68	18.52	21.95	21.97	26.46	23.32	21.77
Trade balance	1.74	1.97	1.89	2.61	4.99	4.99	3.71	6.93	11.10	9.82	11.33	11.42	11.87	13.97	14.17	17.12	16.46	20.04	18.24	16.20
Government expenditure	0.6	0.7	1.0	1.4	1.8	0.8	0.9	1.0	0.9	1.0	0.5	0.3	0.2	0.5	0.5	0.6	0.5	0.6	0.3	0.3

Source: Authors' own compilation based on FAOSTAT [2024] data.

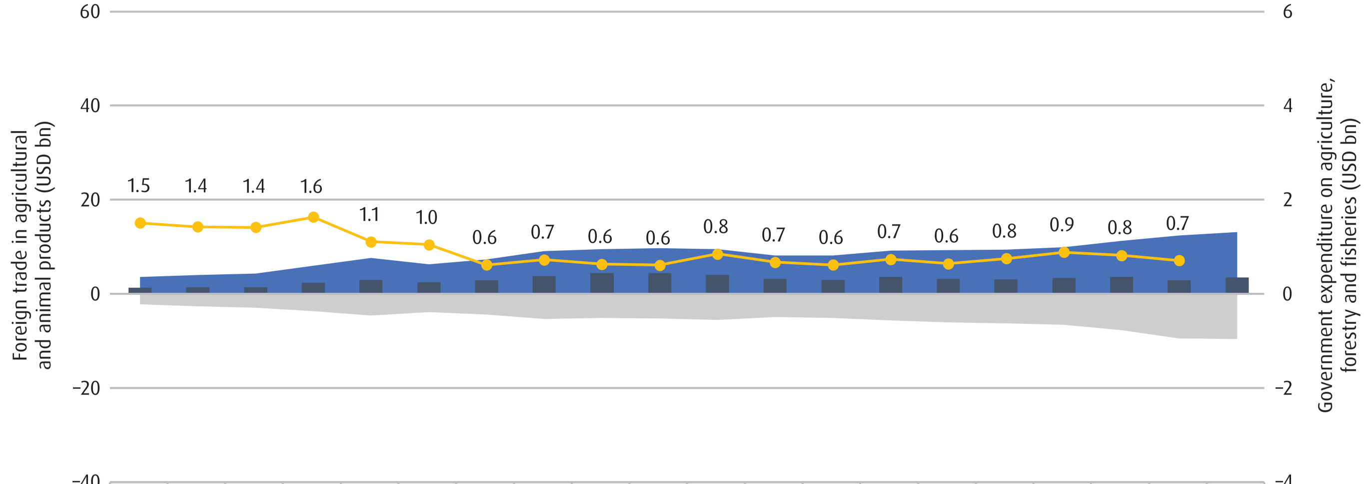
Figure 9. Comparison of foreign trade in agri-food products and government expenditure on agriculture, forestry and fisheries in Czechia in 2004–2023 (current prices, USD billions)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	−3.88	−4.41	−5.10	−6.43	−7.75	−6.88	−7.44	−8.99	−8.97	−9.38	−9.51	−8.95	−9.16	−9.74	−10.4	−10.4	−10.5	−12.0	−13.1	−14.6
Exports	2.52	3.22	3.49	4.79	6.22	5.24	5.39	6.70	7.43	7.90	8.45	8.06	8.06	8.18	8.36	8.29	8.99	10.02	11.37	13.39
Trade balance	−1.36	−1.19	−1.61	−1.64	−1.53	−1.64	−2.05	−2.30	−1.54	−1.48	−1.06	−0.89	−1.10	−1.56	−2.04	−2.11	−1.55	−2.01	−1.80	−1.25
Government expenditure	1.2	1.6	1.9	2.4	2.8	3.0	2.6	2.7	2.4	2.2	2.4	1.9	2.1	2.4	1.2	1.3	2.8	3.1	2.9	2.6

Source: Authors' own compilation based on FAOSTAT [2024] data.

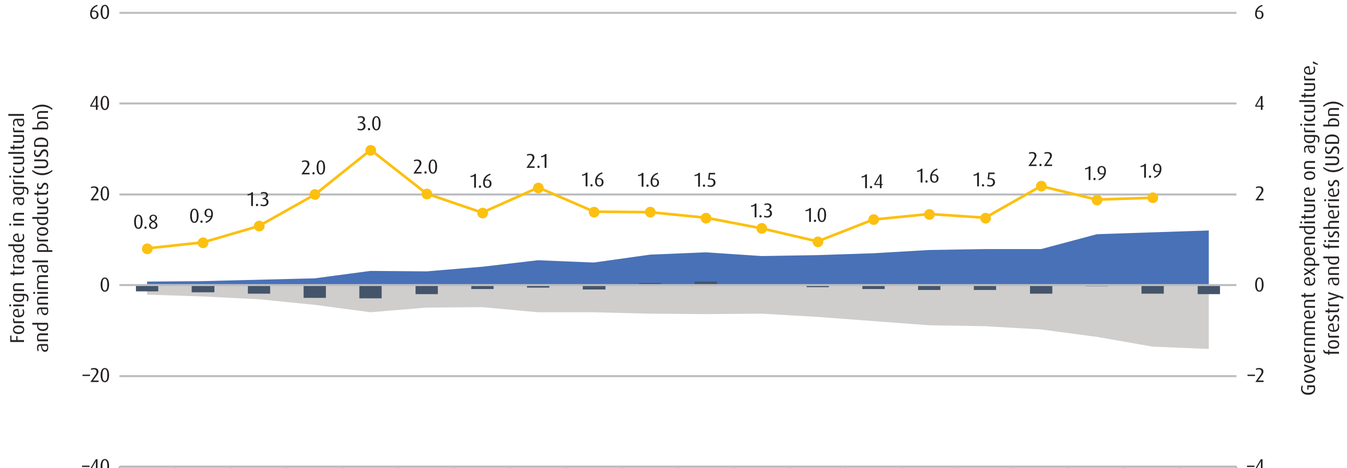
Figure 10. Comparison of foreign trade in agri-food products and government expenditure on agriculture, forestry and fisheries in Hungary in 2004–2023 (current prices, USD billions)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	−2.26	−2.62	−2.91	−3.65	−4.63	−3.87	−4.43	−5.39	−5.12	−5.20	−5.56	−4.92	−5.12	−5.68	−6.11	−6.29	−6.55	−7.72	−9.51	−9.57
Exports	3.55	4.00	4.27	5.97	7.58	6.27	7.32	9.13	9.53	9.65	9.52	8.12	8.12	9.23	9.30	9.38	9.90	11.28	12.40	13.09
Trade balance	1.28	1.37	1.36	2.31	2.94	2.41	2.89	3.74	4.41	4.46	3.96	3.19	2.99	3.55	3.19	3.09	3.36	3.56	2.89	3.51
Government expenditure	1.5	1.4	1.4	1.6	1.1	1.0	0.6	0.7	0.6	0.6	0.8	0.7	0.6	0.7	0.6	0.8	0.9	0.8	0.7	

Source: Authors' own compilation based on FAOSTAT [2024] data.

Figure 11. Comparison of foreign trade in agri-food products and government expenditure on agriculture, forestry and fisheries in Romania in 2004–2023 (current prices, USD billions)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Imports	−2.11	−2.46	−3.08	−4.38	−6.02	−4.97	−4.90	−5.95	−5.96	−6.26	−6.39	−6.32	−7.04	−7.87	−8.79	−9.01	−9.81	−11.4	−13.5	−14.0
Exports	0.75	0.85	1.22	1.55	3.14	3.03	4.03	5.44	5.02	6.76	7.20	6.38	6.58	7.04	7.69	7.96	7.95	11.17	11.64	12.05
Trade balance	−1.36	−1.61	−1.86	−2.83	−2.88	−1.94	−0.86	−0.50	−0.93	0.50	0.81	0.06	−0.45	−0.83	−1.10	−1.05	−1.86	−0.25	−1.86	−2.01
Government expenditure	0.8	0.9	1.3	2.0	3.0	2.0	1.6	2.1	1.6	1.6	1.5	1.3	1.0	1.4	1.6	1.5	2.2	1.9	1.9	

Source: Authors' own compilation based on FAOSTAT [2024] data.

In Poland, the value of the trade balance began to increase significantly after 2012 (USD 5.41 billion), which could also be due to the deferred nature of the outcome of investments associated with increased government funding in previous years. It is worth noting that in the years 2004–2022, Poland ranked fifth or sixth every year in terms of the amount of government spending allocated to this area of activity among the 27 current EU member states. The value of Polish exports of agri-food products grew faster than the value of imports.

Looking at the chart for Romania (Figure 11), it is worth noting that the government spending curve followed a similar pattern to that for Poland. However, in the analysed period, the country did not record a positive trade balance. The value of exports grew less dynamically than the value of imports every year. No significant changes in the structure of foreign trade were observed as a result of increasing or decreasing the level of state investment. Therefore, presumably the scale of these activities was insufficient, or they were carried out ineffectively.

A similar situation occurred in Czechia, where government spending was higher and remained at USD 2.1–3.1 billion from 2007 (excluding 2015, 2018 and 2019, when it was lower). The country's trade balance was negative. Despite higher capital expenditure than in Romania, imports of food products in Czechia grew faster than their exports.

The highest trade balance among the five countries included in the survey was recorded in Ukraine. Although the value of its exports in all the years (2008–2023) was lower than in Poland, and the amount of state capital expenditure on agriculture, forestry and fisheries was lower than in Hungary, a relatively low but fairly constant level of imports of agri-food products translated into favourable results in the country's international trade. The reason for this is to be sought in very good natural conditions for agricultural production, especially plant production. Fertile soils largely substitute investments. Ukraine is the "granary" of Europe, and it is largely self-sufficient in satisfying its own food needs. In addition, the country is outside the EU and has different legislation on agricultural production. At the same time, it is a country that has been at war since 2022 and is struggling not only with a reduction in capital expenditure on agriculture but also with the exclusion from use of huge swaths of land belonging to the country's leading agricultural producers. Despite such a challenging situation, exports of agri-food products, mainly plant-based, which accounted for about 45% until 2022 and now represent about 60% of Ukraine's total exports, still remain the principal source of revenue for the country's economy.

Conclusions and recommendations

Based on the analysis, the following conclusions and recommendations can be made, addressed to the business community and economic politicians.

First, the most important conclusions are presented.

1. The competitiveness of food producers, measured by exports of agri-food products, arose from investments in agriculture to a varying extent, as other factors had a major impact on competitiveness. Foreign trade in agri-food products in Czechia, as well as in Romania, did not show any improvement between 2004 and 2023. Over the analysed period, these countries were net importers and experienced an upward tendency to withstand a negative balance of trade in the agri-food sector. In Poland, in the initial period following its EU accession, low production costs achieved through low labour costs were an important source of competitiveness ("backwardness rent"). A steady increase in investment in agriculture was reflected in the growing export of agri-food products. Therefore, it can be concluded that investments made in Poland had a positive effect on the competitiveness of food producers. A good performance of foreign trade in Poland and Hungary was attributable to:
   a) higher export and import volumes driven by increased consumer demand and higher transaction prices;
   b) proper preparedness of the agri-food industry for operation in the ESM;
   c) good knowledge of EU rules and procedures applicable to intra-Community trade.
2. Poland is also the undisputed leader in terms of the volume of exports – in the analysed period, it increased 9.1 times to EUR 52.1 billion (i.e. more than twice that in Ukraine, which ranks second), and imports, which increased 7.6 times to EUR 33.4 billion, as well as the trade balance, which grew 6.9 times to EUR 18.7 billion. This was the outcome of rational investment, although in this respect there are still significant reserves in terms of capability to exploit the economies of scale.
3. Ukraine has the highest trade balance among the five countries included in the study. While the value of its exports in all the analysed years (2008–2023) was lower than in Poland, and the amount of state capital expenditure on agriculture, forestry and fisheries was lower than in Hungary, its relatively low yet constant level of imports of agri-food products translated into good performance in the country's international trade. This situation is attributable to very good natural conditions for agricultural production, especially plant production. Fertile soils largely substitute investments. Ukraine is the "granary" of Europe, which is also largely self-sufficient in satisfying its own food needs.

4. Investments, primarily in innovation, are among the key long-term factors in building competitive potential in agriculture, thus constituting a source of competitiveness for food producers. It should be noted, however, that simple and low-cost factors for building competitiveness tend to be depleted in this case. Over time, they will have to be replaced by modern factors that require investments, especially in innovation (product, technological, organisational and structural, marketing, financial innovations, etc.).

Below we are also presenting key recommendations for agricultural producers and economic politicians.

1. Agricultural producers who fail to invest in innovation will be excluded from the market. They can also be absorbed by other producers who understand the key value of innovation.
2. Changes in the structure of investments will also be necessitated in the future by market demand and economic changes resulting from the development of Industry 4.0. The digital transformation of enterprises is in line with the main goals set by the European Commission in the *2030 Digital Compass*. Industry 4.0 is based on automation and the use of smart machines, smart manufacturing and data to increase productivity, flexibility and agility across the entire supply chain.
3. Due to the rising costs of investment, efforts should be made to improve the agrarian structure (to increase the area of farms in EU countries, limit concentration and take into account environmental and quality standards in Ukraine), driving a rational increase in the scale of production.
4. Supporting investment in agriculture, mainly for innovation, from external sources (EU funds, national budgets) is necessary due to the long payback period resulting from the nature of agricultural production.
5. In order to invest more effectively in agricultural activity, it is necessary to separate agriculture-supporting instruments (fulfilling their production and environment-related functions) from welfare instruments (these instruments should not be confused with social instruments).
6. A competitive agricultural sector requires significant investment and thus resolute action to finance and mitigate the risks associated with the transition to a sustainable model. The agricultural sector faces a large funding gap, estimated at EUR 62 billion in 2022, significantly larger than in 2017 [European Commission, 2025, p. 11].

References

Baraniak, A. (2017). Działalność inwestycyjna gospodarstw rolnych w Polsce z uwzględnieniem finansowania własnego, *Annales Universitatis Mariae Curie-Skłodowska. Sectio H*, 51(6), pp. 21–30.

Bezat-Jarzębowska, A. (Ed.). (2021). *Dochody i łańcuchy rynkowe w sektorze żywnościowym*. Warsaw: IERiGŻ-PIB.

Bezat-Jarzębowska, A., Rembisz, W., Sielska, A. (2013). *Wpływ polityki rolnej na decyzje producentów rolnych odnośnie dochodów i inwestycji*. Warsaw: IERiGŻ-PIB.

Brynjolfsson, E., Rock, D., Syverson, Ch. (2021). The Productivity J-Curve: How Intangibles Complement General Purpose Technologies, *American Economic Journal: Macroeconomics*, 13(1), pp. 333–372.

Bułkowska, M. (2011). Efekty WPR w odniesieniu do rolnictwa. In: *Analiza efektów realizacji polityki rolnej wobec rolnictwa i obszarów wiejskich. Raport Programu Wieloletniego* (Vol. 26, pp. 56–80), M. Wigier (Ed.). Warsaw: IERiGŻ-PIB.

Czyżewski, A., Klepacki, B. (Ed.). (2015). *Problemy rozwoju rolnictwa i gospodarki żywnościowej w pierwszej dekadzie członkostwa Polski w Unii Europejskiej*. Warsaw: PTE.

Czyżewski, B. (2017). *Kierat rynkowy w europejskim rolnictwie*. Warsaw: Wydawnictwo Naukowe PWN.

Draghi, M. (2024). *The Future of European Competitiveness: Report by Mario Draghi*, https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en (accessed: 6.04.2025).

Drygas, M., Rosner, A. (red.). (2008). *Dylematy i kierunki przemian*. Warsaw: IRiRW.

Encyklopedia PWN (2025). *Konkurencja*, https://encyklopedia.pwn.pl/haslo/;3925091 (accessed: 6.04.2025).

Encyklopedia Zarządzania (2025a). *Konkurencyjność*, https://mfiles.pl/pl/index.php/Konkurencyjno%C5%9B%C4%87 (accessed: 6.04.2025).

Encyklopedia Zarządzania (2025b). *Pozycja konkurencyjna*, https://mfiles.pl/pl/index.php/Pozycja_konkurencyjna (accessed: 6.04.2025).

European Commission (2025). Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions, *A Vision for Agriculture and Food Shaping together an attractive farming and agri-food sector for future generation*, COM (2025) 75.

EUROSTAT (2024). *Database*, https://ec.europa.eu/eurostat/data/database (accessed: 27.02.2025).

FADN (2024). *Public Database (SO)*, https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html# (accessed: 27.02.2025).

FAOSTAT (2024). *Data*, https://www.fao.org/faostat/en/#data (accessed: 20.03.2025).

Figiel, S. (2019). *Rynki rolne i żywnościowe w dobie innowacji cyfrowych*. Warsaw: IERiGŻ-PIB.

Gong, C. Ribiere, V. (2021). Developing a Unified Definition of Digital Transformation, *Technovation*, 102, 102217.

Gorynia, M. (2001). Luka konkurencyjna – koncepcja i metodyka badania, *Zeszyty Naukowe Politechniki Poznańskiej*, 32, pp. 172–179.

Gorynia, M., Łaźniewska, E. (Ed.). (2009). *Kompendium wiedzy o konkurencyjności*. Warsaw: Wydawnictwo Naukowe PWN.

Grzelak, A. (2022). *Dochody a aktywa w gospodarstwach rolnych w Polsce na tle krajów Unii Europejskiej*. Poznań: Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu.

GUS (2024). *Databases*, https://stat.gov.pl/banki-i-bazy-danych/ (accessed: 20.03.2025).

Judzińska, A., Łopaciuk, W. (2014). *Wpływ WPR na rolnictwo w latach 2004–2012*. Warsaw: IERiGŻ-PIB.

Kirchweger, S., Kantelhardt, J. (2015). The Dynamic Effects of Government-Supported Farm-Investment Activities on Structural Change in Austrian Agriculture, *Land Use Policy*, 48, pp. 73–93.

Kusz, D., Gędek, S., Kata, R. (2015). Egzogeniczne uwarunkowania inwestycji w rolnictwie polskim. In: *Problemy rozwoju rolnictwa i gospodarki żywnościowej w pierwszej dekadzie członkostwa Polski w Unii Europejskiej* (pp. 54–68), A. Czyżewski, B. Klepacki (Eds.). Warsaw: PTE.

Pawlak, K. (2014). Zmiany w polskim handlu zagranicznym produktami rolno-spożywczymi po akcesji do Unii Europejskiej, *Zeszyty Naukowe SGGW w Warszawie – Problemy Rolnictwa Światowego*, 14(2), pp. 170–184.

Pawłowski, K., Czubak, W. (2018). Identyfikacja sposobów implementacji II filaru WPR w krajach Europy Środkowo-Wschodniej, *Zeszyty Naukowe SGGW – Ekonomika i Organizacja Gospodarki Żywnościowej*, 124, pp. 109–123.

Peng, Y., Tao, C. (2022). Can Digital Transformation Promote Enterprise Performance? From the Perspective of Public Policy and Innovation, *Journal of Innovation and Knowledge*, 7(3), 100198.

Piwowar, A. (2017). Struktury rolne i produktywność rolnictwa w Grupie Wyszehradzkiej, *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie – Problemy Rolnictwa Światowego*, 17(1), pp. 152–160.

SSSU (2020–2024). *State Statistics Service of Ukraine*, http://www.ukrstat.gov.ua/ (accessed: 12.02.2025).

Tabrizi, B., Lam, E., Girard, K., Irvin, V. (2019). *Digital Transformation Is Not About Technology*, https://hbr.org/2019/03/digital-transformation-is-not-about-technology (accessed: 31.12.2022).

UN (2000). *Commission Communication – Code of Conduct for the Management of the Combined Nomenclature*, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=uriserv:OJ.C_.2000.150.01.0004.01. ENG (accessed: 20.04.2022).

UN (2006). Standard International Trade Classification. Revision 4, *Statistical Papers*, 34.

Woś, A. (2000). *Inwestycje i akumulacja w rolnictwie chłopskim w latach 1988–1998*. Warsaw: IERiGŻ-PIB.

Wysokiński, W., Klepacki, B. (2013). Poziom i parytet dochodów gospodarstw mlecznych o różnym stopniu koncentracji produkcji, *Zagadnienia Ekonomiki Rolnej*, 4(337), pp. 60–73.

Ziętara, W., Adamski, M. (2014). Skala produkcji, efektywność i konkurencyjność polskich gospodarstw rolnych wyspecjalizowanych w produkcji mleka, *Zagadnienia Ekonomiki Rolnej*, 1, pp. 97–115.

SMART CITY COMPETITIVENESS INDEX AND ITS APPLICATION TO THE ANALYSIS OF SELECTED URBAN CENTRES IN POLAND

Agnieszka Domańska-Sikorzak
Krzysztof Kozłowski
Radosław Malik
Anna Visvizi
Roman Wosiek

DOI: 10.33119/978-83-8030-742-1.375_389

Abstract

The objective of this study is to model and construct the Smart City Competitiveness Index (SCCI) and apply it as a tool for analysing the competitiveness of selected urban centres in Poland over the period 2015–2022. The SCCI is a composite index, an innovative analytical tool designed to evaluate the competitiveness of smart cities. It utilises 39 variables, encompassing five key dimensions of smart city competitiveness: economic and financial, built environment, ICT infrastructure, institutions/e-government and skills/digitalisation/market sophistication. This study applies the SCCI to examine the competitiveness of eight selected Polish urban centres, including Warsaw, Kraków, Gdańsk, Katowice, Poznań, Łódź, Lublin and Rzeszów, over the period 2015–2022. The results of the study indicate that Warsaw and Kraków were consistently ranked as the most competitive cities, with Kraków's competitiveness gradually increasing, thus narrowing the gap with the leader of the ranking, i.e. Warsaw. However, data for 2021–2022 suggest that it was Kraków that ranked as the top performer. Gdańsk, despite significant fluctuations in competitiveness ratings over 2015–2022, was the third best performer in 2022. Lublin and Rzeszów exhibited the lowest levels of competitiveness, indicating structural challenges in developing these centres as competitive smart cities in Poland.

Authors

Agnieszka Domańska-Sikorzak – Professor at SGH, International Economic Policy Unit, SGH Warsaw School of Economics. Since 2020, President of the Polish Chapter of the Principles for Responsible Management Education (PRME), an initiative where she is actively involved in promoting sustainable development and social responsibility in higher education. Her research interests include international economics, transformation of economies, economic geopolitics, economic security and the role of institutions in socio-economic development.

Krzysztof Kozłowski – Professor at SGH, Director of the Institute for International Studies. In 2016–2025, served as Vice Rector for Teaching and Student Affairs at the SGH Warsaw School of Economics. His research interests focus on issues in the field of international relations and political science, in particular concerning the countries of Central and East Asia, and political change.

Radosław Malik – PhD, Assistant Professor, International Economic Policy Unit, SGH Warsaw School of Economics. He actively supports the development of young researchers as coordinator of the "Young SGH Researcher" programme, addressed to undergraduate and graduate students, under which he conducts workshops and edits monographs prepared by programme participants. His research interests include offshoring of business services, economic megatrends, international business, labour markets and the use of technology (including smart city technology).

Anna Visvizi – Professor at SGH, Head of the International Economic Policy Unit, SGH Warsaw School of Economics. Since September 2024, the Rector's Representative for the SGH Doctoral School; responsible for international collaboration. Her research interests include international economics and political science, especially the impact of modern technologies on economic processes and innovation management, mainly in the context of smart cities.

Roman Wosiek – PhD, Assistant Professor, International Economic Policy Unit, SGH Warsaw School of Economics. His research interests focus on macroeconomics of the open economy, international technological competitiveness, innovation and innovation policy, national innovation systems and the role of services in the contemporary global economy.

The concept of smart cities in economic analyses

Due to the diversity of research perspectives, there are many complementary definitions of the smart city. One popular research concept claims that smart cities represent an urban development model based on the utilisation of human, collective and technological capital of urban agglomerations [Angelidou, 2014] and is "an ultra-modern urban area that addresses the needs of businesses, institutions, and especially citizens" [Khatoun, Zeadally, 2016]. In the light of other studies, the smart city is analysed as territorially delimited and administratively delineated space, in which ICT-enhanced services and applications are widely used and support the sustainable development of the city and reduce the vulnerability of the city and its inhabitants to various risks and threats [Visvizi, Lytras, 2018]. Finally, it is also emphasised that the analysis of smart cities requires an interdisciplinary approach, where the smart city is viewed as an analytical concept, an object of research and a public policy imperative [Lytras, Visvizi, 2020].

Analyses of smart cities place emphasis on the need to correctly recognise and distinguish the subjects (stakeholders) populating the smart city and the objects defining the smart city's structure; in another approach, it is sometimes referred to as the context in which the smart city's stakeholders operate. The factors defining the structure of smart cities include built environment, as well as information and communication technology (ICT) infrastructure and institutions [Visvizi, Abdel-Razek, Wosiek, Malik, 2021]. An important trend in scientific research, drawing on the conclusions of these analyses, is represented by attempts to quantify and measure various aspects of the reality of smart cities [Sáez, Heras-Saizarbitoria, Rodríguez-Núñez, 2020]. Another major contribution to the development of research on smart cities involves efforts to assess the functioning of smart cities based on a typology of variables used in key domains of smart cities, with particular emphasis on elements such as the economy, people, governance, environment, mobility, life and data [Sharifi, 2020].

Referring to the conclusions from the analysis of the smart city theory and the growing number of publications on this topic, it is worth noting that surprisingly little space is devoted to the economic aspects of the smart city, including the issues of economic competitiveness and innovation of smart cities. While these issues were analysed in the past [Ferrara, 2015], they represented only a part of a broader debate on strategies and policies promoting the development of smart cities. It is therefore important to determine the relationship between ICT-based solutions, smart services, ICT infrastructure and the economic competitiveness of smart cities [Malik, Visvizi, Troisi, Grimaldi, 2022].

This study aims to conceptualise, model and measure the complex relationship behind the competitiveness of a smart city. In other words, due to the key role of ICT-based services, applications and infrastructure in the functioning of a smart city, this paper conceptualises the relationship between the smart city and competitiveness and emphasises the importance of the concept of smart city competitiveness. The aim of the study is also to present a model for measuring the competitiveness of smart cities, i.e. the smart city competitiveness index (SCCI), and its application to the analysis of the main urban centres in Poland. The conclusions from this research will be used to formulate recommendations in the context of planning and shaping public policy within the smart city space.

Competitiveness of smart cities

The concept of competitiveness of smart cities was initiated in debates on smart cities 1.0, in which the various meanings of urban competitiveness and the primacy of achieving economic goals were pointed out [Visvizi, Godlewska-Majkowska, 2024; Glasmeier, Christopherson, 2015]. Over the past years, with the development

of the smart city concept and the evolution of the paradigm of urban space development, the smart city 1.0 perspective has given way to the 2.0, 3.0 and 4.0 approaches, respectively [Visvizi, Godlewska-Majkowska, 2024]. Consequently, in the academic debate, three approaches to the determinants of the competitiveness of smart cities are distinguished:
1) economic efficiency-based approach,
2) enterprise competitiveness-based approach,
3) sustainability-focused approach.

In the economic efficiency-based approach, the competitiveness of a smart city is defined as a city's ability to attract and retain capital, businesses and talent – or human and social capital, including visitors and investors. A key aspect of this concept is the city's ability not only to attract resources but also to use them effectively to maximise economic growth and innovation [Caragliu, Del Bo, Nijkamp, 2023]. This approach emphasises the importance of creating and distributing wealth and raising the level of well-being of city inhabitants. These processes are often measured by gross domestic product (GDP) and other macroeconomic indicators, which are also used in a broader perspective of regional and urban development. In addition, it should be noted that alternative indicators such as quality of life, employment levels and private sector innovation have an increasingly important role. They support a more comprehensive assessment of the competitiveness of cities.

In the second approach, the role of enterprises is highlighted as the main players driving smart city development. In this case, cities are perceived as economic ecosystems where the activities of enterprises, large corporations and dynamic start-ups shape the economic structure, level of innovation and attractiveness of an urban centre. Therefore, the ability of the private sector to gain and maintain competitive advantages is considered a key factor in increasing the competitiveness of the city as a whole. Thus, access to capital, technological innovation, operational efficiency and the ability of enterprises to adapt to the changing economic environment have a direct impact on the development of the urban economy. In addition, particular attention is paid to the role of cross-sectoral cooperation, including public-private partnerships (PPPs), innovation clusters and synergies between academic institutions and businesses. Creating favourable conditions for enterprises, public policy tools, development of technological infrastructure or access to skilled human capital resources are perceived as a set of factors determining the competitiveness of smart cities [Visvizi, Troisi, Wosiek, Grimaldi, 2024; Tokoro, 2016].

The third approach to the competitiveness of smart cities focuses on the integration of sustainable development principles, covering both economic, social and environmental aspects. In this view, a city's competitiveness is defined not only by its ability to attract capital and investment but also by its ability to create long-term strategies that link economic growth with the quality of life of its inhabitants and the protection of natural resources [Monfaredzadeh, Berardi, 2015]. Sustainable urban planning, energy efficiency, a low-carbon economy, and policies that foster social inclusion and reduce inequalities play a key role in this approach. Thus, competitive cities are those that can harmoniously combine technological innovation with environmental protection and care for social welfare. In addition, research increasingly emphasises the importance of smart solutions based on information and communication technologies (ICT), which foster the optimisation of economic processes taking place within urban space, minimising adverse impacts on the environment and strengthening local communities. Hence, the success of a competitive city is measured not only by economic indicators but also by the quality of life of its residents, resilience to climate change and the ability to adapt to global challenges [Su, Fan, 2023].

The concepts of competitiveness of smart cities described above support the assumption that economy and economic activity are among the most efficient drivers of social development [Visvizi, Wosiek, Malik, 2025]. At the same time, the key role of ICT in the development of smart cities is indicated. By integrating growth strategies with advanced ICT infrastructure, cities can increase their efficiency, innovation and overall quality of life [Kashef et al., 2021]. ICT-based solutions have significant potential to support the competitiveness of smart cities. Even more so, it is the synergies that develop between them and other components of the city's ecosystem that contribute to the competitiveness of smart cities. This creates dynamic urban environments that are not only economically efficient but also technologically advanced. At the same time, they promote sustainable growth and provide better living conditions for residents [Visvizi, Godlewska-Majkowska, 2024].

Smart city competitiveness index

In order to examine the competitiveness of smart cities, a novel, composite index, i.e. the SCCI, was developed [Visvizi et al., 2025] using multidimensional statistical analyses, including relative taxonomy methods and qualitative methods. This approach allows various aspects and levels of analysis to be included, so as to reflect the complexity of the phenomenon of competitiveness of smart cities and has already been used to analyse the competitiveness of economies [Wosiek, 2019]. It is also recommended for the analysis of complex socio-economic phenomena [Wydmus, Grabiński, Zeliaś, 1989].

The theory and practice of creating composite indexes is widely documented, and composite indexes are used by organisations such as the European Union (Eurostat), OECD and WIPO. One of the first composite indexes to be developed in this way was the Human Development Index (HDI). Owing to its wide application in the study of various complex economic processes, the construction of composite indexes is a structured procedure based on a recognised methodological approach [Nardo et al., 2008].

A standard five-step procedure was used to develop the composite SCCI, which consisted of the following elements:

1) development of a conceptual framework,
2) identification of relevant variables and their standardisation,
3) selection of the weighing methods for groups of variables,
4) selection of aggregation and standardisation techniques,
5) sensitivity tests.

In the first two steps, including the development of a conceptual framework and the identification of variables, methods such as desk research, brainstorming sessions with the research team and focus groups with invited experts were used. Step 3, i.e. assigning weights to the aggregates of variables, is an important stage but also one of the most contentious ones in the process of constructing a composite index because the weights assigned to specific variables included in the model affect the values of the actual index. In the subsequent two steps, i.e. aggregation and standardisation of variables and testing their sensitivity, taxonomic methods were used [cf. Visvizi et al., 2025].

Based on previous research, the result of Step 1 of the SCCI construction process was the identification of factors/dimensions affecting the competitiveness of a smart city. On the basis of a detailed literature review, including scientific papers, reports by research and consulting firms and studies by international institutions, five important dimensions of the competitiveness of smart cities were identified, namely:

- economic and financial factors;
- built environment;
- ICT infrastructure;
- institutions and e-government;
- skills, digitalisation and market sophistication.

Step 2, in which the variables were selected, was an important stage in the development of the index. Initially, aggregate variables from the EU Digital Agenda database [Eurostat, 2024] were used. It is a comprehensive set of indicators and data representing developments in areas such as science, technology, digital society, digital economy and households. From these resources, based on further research and brainstorming, 51 variables were selected, grouped into five main dimensions of smart city competitiveness, identified in Step 1 of the study. This was followed by two four-hour focus group sessions with experts representing the private (business), public (municipalities) and non-governmental (associations) sectors, as well as academia. The experts were selected taking into account their knowledge and professional experience in the field of smart cities. 14 experts took part in both focus sessions. The selection process identified a total of 39 variables believed by the experts to have an impact on the competitiveness of smart cities, and their initial assignment to the respective dimensions of the competitiveness of smart cities was verified. Thus, to construct the index, 39 variables were selected, grouped into five dimensions of smart city competitiveness.

The moderated discussions during the focus group sessions included Step 3 of the SCCI construction process, i.e. assigning weights to variable aggregates. The focus group participants pointed out, among other things, that initially the lower weight they assigned to economic and financial factors, as well as skills, digital capability and sophistication, reflected their positive assessment of the digital or ICT component, most often associated with the smart city concept. In the course of the discussion, it was agreed that all groups of variables, i.e. dimensions of the competitiveness of smart cities, should be assigned equal weights. This methodological approach is in line with the practice of building composite indexes [Shi, Land, 2021], e.g. the Global Competitiveness Index (GCI) and others.

In Steps 4 and 5, mathematical and taxonomic methods were used to aggregate and standardise variables and test their sensitivity. The mathematical procedures involved:
1) construction of a data matrix containing the diagnostic features of a smart city (its stimulants and de-stimulants);
2) standardisation of the variables to derive a "processed" matrix;
3) calculation of the values of three indicators using the processed matrix: the composite index (the average arithmetic value of the standardised features of an object); the distance indicators (based on the classical Euclidean metric and the function defining the original object); and the similarity indicator (based on the cosine of vectors derived from the processed matrix).

The use of the taxonomic method to identify and select diagnostic features yielded results with a higher level of accuracy, as the risk of repeating the information load attached to the component indicators was reduced [cf. Visvizi et al., 2025].

One of the key questions that need to be posed is how to interpret the results of the SCCI. It is generally accepted that there is a positive correlation between the set of variables that make up the index, which means that improvements in areas such as:
a) economy and finance,
b) built environment,
c) ICT infrastructure,

d) institutions and e-government,
e) skills, digitalisation and market sophistication,

leads to an increase in the value of the SCCI. In other words, these variables are treated as stimulants because their higher values contribute to an increase in the final index value. However, a particular variable may work as a de-stimulant and therefore show a negative correlation with the final index value. In practice, this means that the higher the value of a variable, the lower the final value of the index will turn out to be. For example, if the built environment variable carries a negative value, e.g. a low level of infrastructure quality or high density of buildings without adequate urban planning, it may operate as a factor that weakens the competitiveness of the city, which will consequently translate into a lower index value.

Assessment of urban centres in Poland using the SCCI

The smart city competitiveness index was used to examine selected urban centres in Poland to determine their level of competitiveness, analyse changes in their competitive position and prepare recommendations on the directions of development. The study covered eight cities: Gdańsk, Katowice, Kraków, Lublin, Łódź, Poznań, Rzeszów and Warsaw. The aim was to identify key factors affecting the competitiveness of these cities and to develop strategies to improve their position compared to other urban centres. In order to carry out the analysis, data from the Eurostat and Statistics Poland (GUS) databases were used, and statistical methods, including the taxonomic methods described in the previous section, were employed. This made it possible to calculate the index value for selected urban centres in Poland, and thus to accurately compare their competitive position. In addition, the analysis takes into account five dimensions of the competitiveness of smart cities in order to refine their comparison. The findings of the study provide a basis for recommendations for local authorities and policymakers that can contribute to more competitive and sustainable urban environments.

As a result of the calculations, four sets of insights were obtained:

1) a competitiveness ranking of selected Polish cities;
2) an analysis of changes in the competitiveness of selected Polish cities;
3) a static comparison of selected Polish cities in specific dimensions of smart city competitiveness;
4) an analysis of a specific dimension of smart city competitiveness over a time interval.

The results below offer only a snapshot of the analytical potential of the SCCI, which means that it is possible to carry out a much larger number of comparative analyses for different urban centres. The results of the application of the SCCI in the study of the level of competitiveness of selected cities in Poland in 2015–2022 are presented in Table 1.

Table 1. Smart city competitiveness index for selected cities in Poland in 2015–2022

	2015	2016	2017	2018	2019	2020	2021	2022
Lublin	−0.344	−0.322	−0.333	−0.328	−0.322	−0.325	−0.319	−0.316
Łódź	−0.335	−0.321	−0.332	−0.328	−0.320	−0.323	−0.320	−0.318
Kraków	0.306	0.067	0.315	0.321	0.287	0.320	0.340	0.361
Warsaw	0.338	0.287	0.327	0.326	0.324	0.325	0.326	0.327
Rzeszów	−0.340	−0.324	−0.330	−0.332	−0.321	−0.323	−0.319	−0.316
Gdańsk	−0.331	0.187	0.268	−0.320	−0.092	0.310	0.180	0.233
Katowice	−0.334	−0.139	−0.321	−0.321	−0.311	−0.319	−0.331	−0.342
Poznań	−0.330	−0.318	−0.323	−0.322	−0.317	−0.320	−0.316	−0.313

Source: Local Data Bank [2025].

The values in Table 1 allow conclusions to be drawn on the level of competitiveness of smart cities in Poland and its evolution between 2015 and 2022. In analysing the results obtained, the SCCI is used as the baseline value against which individual areas are evaluated. The data included in the index work as both stimulants and destimulants, which means that they can increase or decrease the value of the composite index, respectively. Consequently, the interpretation of the SCCI value is unambiguous, i.e. the higher its value, the higher the level of competitiveness of the smart city it represents, and the lower the index value, the weaker the competitive position of the city will be. With this approach, it is possible not only to compare the competitiveness of individual cities but also to track the dynamics of their development and identify areas for improvement.

The results of the SCCI analysis of selected Polish cities between 2015 and 2022 lead to several important observations. Firstly, in static terms, it can be noticed that, when ranked for the overall level of competitiveness, Warsaw and Kraków stood out consistently as the most competitive cities among all urban centres included in the survey. In 2022, these two cities achieved the highest SCCI score, which testifies to their highest position in the competitiveness ranking of smart cities in Poland. Secondly, Lublin and Rzeszów, ranked lowest among selected urban centres in 2015, and their position changed only slightly in 2022, when Katowice tailed the list. This suggests that structural challenges, probably related to the geographical location and economic history of these cities, have a significant impact on their performance. Thirdly, Poznań and Łódź maintained stable levels of competitiveness, although lower than Warsaw and Kraków. In 2022, the SCCI indicated a relatively high competitive position of Gdańsk (third place).

Analysing the changes in the index value between 2015 and 2022, it can be seen that the results for Warsaw display a decrease in its competitiveness from 0.338 in 2015 to 0.287 in 2016, followed by a gradual recovery to a high level of up to 0.325 in 2020 and a slight increase in the subsequent two years, to 0.327. These fluctuations are due to shifts in key factors affecting the overall competitiveness of Warsaw. At the same time, Kraków maintained an upward trend over the analysed period, with the competitiveness index increasing from 0.306 in 2015 to 0.320 in 2020. Finally, the competitiveness performance of Gdańsk was highly volatile, as the city's competitiveness increased sharply in 2016 (0.187) and 2017 (0.268), before decreasing markedly in 2018 (– 0.320) and rising again in 2020 (0.310), to then fall in 2022 (0.233). Consequently, the city moved to third place in the group of analysed Polish cities according to the 2022 figures.

Economic and political implications for the development of competitiveness of smart cities in the CEE region, including the Visegrad Group

The above conclusions on the development of the competitiveness of selected cities in Poland, including the factors behind their development, can be transposed to other cities. This applies in particular to cities located in countries that, like Poland, have undergone comparable processes of transition and transformation, share common cultural roots and historical background, and a similar geographical location. Undoubtedly, these conditions are satisfied by the Visegrad Group (Poland, Czechia, Slovakia, Hungary) and hence cities such as Warsaw, Prague, Bratislava or Budapest.

The combination of various variables and the resulting coincidence of various qualitative and quantitative factors is a necessary condition for the sustainable development of these cities and the increase in their competitive potential in the local, national and international environment. As established in the study, these are primarily: economic and financial factors determining the development and functioning of a smart city; transport infrastructure for residents represented by the accessibility and quality of the transport network; natural and ecological environment; public health infrastructure; ICT infrastructure; the performance of institutions, including the quality and availability of e-government services; and skills, digitalisation, size and sophistication of the market. The effects of the implementation of local, national and international policy, directly or indirectly affecting all dimensions of the functioning of a smart city, are also important.

Moving from the general level of considerations concerning the pillars that determine the competitive potential of a smart city to the specific level, it is worth pointing out those factors that are crucial from the perspective of shaping the capabilities and competitive position of a smart city. Firstly, in the budget category, the balance of assets and liabilities and the profit and loss account, as well as the balance of income and expenditure, which determine the current competitive position of a city, are of significant importance for the functioning of urban centres. On the other hand, the level of its competitiveness in the future is determined by capital expenditure in relative terms, i.e. per capita, and its cumulative value. Economic factors in the labour market category from the point of view of the employee and the employer, such as the unemployment rate, on the one hand, and the average salary on the other, are also important for the development of a smart city.

Secondly, it should be emphasised that the following dimensions of the functioning of smart cities or, more broadly, urban centres, are important for the quality of life of residents:

1) public health, including the quality and accessibility of medical services;
2) the built environment, which is represented by urban and residential green areas (walking and recreational parks, woodland areas, garden squares) and recreational and sports facilities;
3) transport, including the length of bicycle paths, bus lanes, number of parking spaces and the indicator of access to public transport (tram, trolleybus, bus, rapid urban railway, subway);
4) education and science, represented by the number of schools and universities;
5) institutions and e-government services.

Thirdly, ICT technologies importantly contribute to the competitiveness of smart cities. Not only do they support the process of managing the city itself or the functioning of the city, but they also improve the quality of life of residents through the impact of modern ICT technologies on communication, media, transport and services. In particular, it is necessary to take into account the expenditure on broadly-defined ICT both in public services and in businesses, as well as in relation to the financing of R&D activities in this sector. The components of the competitive position of a smart city also included the employment rate in the ICT sector, the percentage of businesses with broadband Internet access, the percentage of businesses using the Internet in contacts with government administration or those placing orders online.

It is also worth noting that the list of factors that can affect the competitiveness of a smart city is very extensive, multidimensional, and its content dynamically evolves over time and across economic, political and geographical space. Thus, there is no universal, i.e. international, set of elements that could form the basis for creating a model for the development of a smart city. What is more, these factors affect the final outcome, i.e. the level of competitiveness of a smart city, with varying intensity. The value of this intensity changes over time, i.e. some of the determinants in the process lose their importance and other important elements appear in their place. Nevertheless, a certain common denominator can be identified in the development of the competitiveness of smart cities, where, in addition to the built environment variables, there are variables that are by no means obvious. Among them, according to the survey, ICT is in the foreground, including its accessibility, use and dissemination among residents, in the public administration sector and at the enterprise level.

Conclusions and recommendations

The study aimed to conceptualise the relationship between smart cities and competitiveness, to develop the SCCI and to use this index to analyse the competitiveness of smart cities in Poland. By referring to the methods and standards developed and used by international organisations (e.g. UN, WIPO), a holistic theoretical and analytical concept for assessing the competitiveness of smart cities was proposed. The SCCI developed covers five dimensions of smart city competitiveness, i.e. economic and financial dimensions, built environment, ICT infrastructure, institutions and e-government, as well as skills, digitalisation and market sophistication. The results of this study are an important contribution to the development of scientific reflection on smart cities, and their practical application can be helpful in making informed and effective decisions to increase the competitiveness of urban centres.

By using the SCCI to analyse eight selected Polish cities, interesting results were obtained concerning their position and competitive capacity in the years 2015–2022. Warsaw and Kraków topped the ranking, with their competitiveness remaining stable in both 2015 and 2022. It is worth noting that the competitive position of Kraków was growing steadily; thus, it was continuously closing the gap with the leader of the ranking, i.e. Warsaw. Gdańsk came third in the ranking; however, the results achieved by this city showed significant fluctuations in particular years. This suggests substantial volatility of conditions affecting its competitiveness. An in-depth analysis of these fluctuations would provide a basis for a precise assessment of the factors underpinning Gdańsk's position in the ranking, and for finding out finding out which of the activities and strategies introduced by the authorities of the city had a positive (or negative) impact on its competitiveness.

Compared to the leading cities in the ranking, i.e. Warsaw, Kraków and Gdańsk, the position of the other analysed urban centres, i.e. Lublin, Łódź, Rzeszów, Katowice and Poznań, was lower, but the differences between them in 2022 were small. An analysis of the SCCI results for the 2015–2022 period confirms that the competitiveness changes for these five cities were relatively small and did not experience any sharp spikes or drops. This may be indicative of well-established structural factors underpinning their development.

This study also aimed to highlight the role of strategic planning and the public policy tools used at the urban level in building competitive and resilient urban environments. The results of the analysis indicate that the development of smart cities should be based on a sustainable approach taking into account economic, social as well as technological aspects.

Given the features of the SCCI, it is worth emphasising that it is a tool of significant practical value for decision-makers in other CEE countries, both in the field of politics and business. The value of the SCCI is that it is anchored in the local context, as it uses data reflecting the socio-economic reality in a particular urban centre in a specific country. This allows reasonable comparisons to be made between cities set in the same economic, political, social or even historical context. The use of the SCCI to assess and compare, for example, Warsaw and Prague is not justified, because – even in view of the similarities that distinguish the CEE region – the political and economic context in which these cities are anchored is changing. Hence, the SCCI is a very good tool for comparing e.g. Prague and Pardubice, etc.

Further research should focus on improving methodologies and expanding the scope of analysis, which will foster a more complete understanding of the mechanisms driving the competitiveness of cities. It seems particularly important to take into account a larger number of cities in Poland, which will enable a more accurate comparison of their competitive position. In addition, an extension of the timeframe would allow a more detailed analysis of the evolution of the competitiveness of smart cities and the identification of long-term trends. Another valuable line of research is the application of the SCCI to individual cities in selected CEE countries. Only on this basis, moving to the level of meta-analysis, would it be justified to start a discussion on specific tools of public policy implemented at the local, regional and national levels and their impact on the development and differences in the level of competitiveness of the cities covered by the analysis. In this context, the issue of the effectiveness of the use of EU funds should also be raised. This would allow both best practices and strategies to be identified and examples of failures to be shown. The latter would be a source of highly valuable insights for decision-makers across the region.

References

Angelidou, M. (2014). Smart City Policies: A Spatial Approach, *Cities*, 41, pp. 3–11. DOI: 10.1016/j.cities.2014.06.007.

Caragliu, A., Del Bo, C.F., Nijkamp, P. (2023). Smart Cities in Europe Revisited: A Meta-Analysis of Smart City Economic Impacts, *Journal of Urban Technology*, 30(4), pp. 51–69. DOI: 10.1080/10630732.2023.2220136.

Ferrara, R. (2015). The Smart City and the Green Economy in Europe: A Critical Approach, *Energies*, 8(6), pp. 4724–4734. DOI: 10.3390/en8064724.

Kashef, M., Visvizi, A., Troisi, O. (2021). Smart City as a Smart Service System: Human-Computer Interaction and Smart City Surveillance Systems, *Computers in Human Behavior*, 124. DOI: 10.1016/j.chb.2021.106923.

Khatoun, R., Zeadally, S. (2016). Smart Cities: Concepts, Architectures, Research Opportunities, *Communications of the ACM*, 59(8), pp. 46–57. DOI: 10.1145/2858789.

Local Data Bank (2025). *Database [2015–2025 data]*, https://bdl.stat.gov.pl/bdl/start (accessed: 12.04.2025).

Lytras, M.D., Visvizi, A. (2020). Information Management as a Dual-Purpose Process in the Smart City: Collecting, Managing and Utilizing Information, *International Journal of Information Management*, 56. DOI: 10.1016/j.ijinfomgt.2020.102224.

Malik, R., Visvizi, A., Troisi, O., Grimaldi, M. (2022). Smart Services in Smart Cities: Insights from Science Mapping Analysis, *Sustainability*, 14. DOI: 10.3390/su14116506.

Monfaredzadeh, T., Berardi, U. (2015). Beneath the Smart City: Dichotomy Between Sustainability and Competitiveness, *International Journal of Sustainable Building Technology and Urban Development*, 6(3), pp. 140–156. DOI: 10.1080/2093761X.2015.1057875.

Nardo, M., Saisanai, M., Saltellii, A., Tarantolai, S., Hoffmanii, A., Giovanniniii, E. (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. Paris: OECD Publishing.

Sáez, L., Heras-Saizarbitoria, I., Rodríguez-Núñez, E. (2020). Sustainable City Rankings, Benchmarking and Indexes: Looking into the Black Box, *Sustainable Cities and Society*, 53. DOI: 10.1016/j.scs.2019.101938.

Sharifi, A. (2020). A Typology of Smart City Assessment Tools and Indicator Sets, *Sustainable Cities and Society*, 53. DOI: 10.1016/j.scs.2019.101936.

Shi, C., Land, K.C. (2021). The Data Envelopment Analysis and Equal Weights/Minimax Methods of Composite Social Indicator Construction: A Methodological Study of Data Sensitivity and Robustness, *Applied Research in Quality of Life*, 16(4), pp. 1689–1716. DOI: 10.1007/s11482-020-09841-2.

Su, Y., Fan, D. (2023). Smart Cities and Sustainable Development, *Regional Studies*, 57(4), pp. 722–738. DOI: 10.1016/j.cities.2024.105663.

Visvizi, A., Lytras, M. (2018). Rescaling and Refocusing Smart Cities Research: From Mega Cities to Smart Villages, *Journal of Science and Technology Policy Management*, 9(3). DOI: 10.1108/JSTPM-02-2018-0020.

Visvizi, A., Abdel-Razek, S.A., Wosiek, R., Malik, R. (2021). Conceptualizing Walking and Walkability in the Smart City through a Model Composite w2 Smart City Utility Index, *Energies*, 14. DOI: 10.3390/en14238193.

Visvizi, A., Godlewska-Majkowska, H. (2024). Not Only Technology: From Smart City 1.0 Through Smart City 4.0 and Beyond (An Introduction). In: *Smart Cities. Lock-in, Path-Dependence and Non-Linearity of Digitalization and Smartification* (pp. 3–16), A. Visvizi, H. Godlewska-Majkowska (Eds.). London: Routledge. DOI: 10.1201/9781003415930.

Visvizi, A., Troisi, O., Wosiek, R., Grimaldi, M. (2024). The Role of ICT in the Development of Markets, Business, and the Society in the Smart City. In: *ICT, the Business Sector and Smart Cities* (1st ed., pp. 1–14), A. Visvizi, O. Troisi, M. Grimaldi (Eds.). (2024). London–New York: Routledge. DOI: 10.1201/9781003450610-3.

Visvizi, A., Wosiek, R., Malik, R. (2025). The Smart City Competitiveness Index (SMCI): Conceptualization, Modelling, Application – An Evidence-Based Insight, *Land Use Policy*, 148. DOI: 10.1016/j.landusepol.2024.107408.

Wosiek, R. (2019). Konkurencyjność technologiczna polskiej gospodarki. Stan obecny i perspektywy zmian, *Nierówności Społeczne a Wzrost Gospodarczy*, 57, pp. 230–242. DOI: 10.15584/nsawg.2019.1.15.

Wydmus, S., Grabiński, T., Zeliaś, A. (1989). *Metody taksonomii relatywnej w modelowaniu zjawisk społeczno-gospodarczych*. Warsaw: Państwowe Wydawnictwo Naukowe.

HEALTH AND MENTAL WELL-BEING OF CHILDREN AND YOUNG PEOPLE AS LABOUR MARKET CHALLENGES IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

Anita Abramowska-Kmon
Wiktoria Bąchorek
Milena Chełchowska
Izabela Grabowska
Magdalena Kocejko

DOI: 10.33119/978-83-8030-742-1.391_426

Abstract

The aim of the study is to analyse the situation of young people in the CEE countries, in particular their physical and mental health and their educational and employment as determinants of their participation in the labour market over the course of life, which is posing challenges to the labour market today and in the future as a result of the population ageing process. The study also discusses violence against children, which brings about many individual and social consequences and financial costs. These costs are discussed on the example of Poland. The results of the analyses show that the countries of Central and Eastern Europe differ significantly in the areas analysed. Three groups of countries have been identified: 1) the Baltic countries (Lithuania, Latvia and Estonia), which are characterised by the worst health and mental well-being of children and young people and, at the same time, the highest involvement in education and employment of young adults, with a relatively low intensity of the NEET phenomenon; 2) the countries of South Central Europe (Romania, Bulgaria, Croatia, Slovenia), which demonstrate the best physical and mental health, and at the same time low participation of young people in the labour market and in education, and a high intensity of the NEET phenomenon; 3) the remaining countries (Czechia, Poland, Slovakia, Hungary), which fall in between the two groups.

Authors

Anita Abramowska-Kmon – PhD, demographeress, Assistant Professoress, Institute of Statistics and Demography, SGH Warsaw School of Economics. Head of the Department of Demography since 2016. Her research interests include the process of population ageing and its socio-economic consequences, also health, family situation, quality of life of older people and intergenerational support.

Wiktoria Bąchorek – PhD student, SGH Warsaw School of Economics. Focuses on the analysis of mental well-being and quality of life as well as socio-economic inequalities.

Milena Chełchowska – MSc, Assistant, Department of Demography, SGH Warsaw School of Economics. Author of articles devoted to the issues of quality of life of the elderly, people living in couples and dyadic analyses. Graduate of the European Doctoral School of Demography (2021).

Izabela Grabowska – PhD, Assistant Professoress, Institute of Statistics and Demography, SGH Warsaw School of Economics and Institute of Applied Social Sciences, University of Warsaw. Demographer, statistician, social politician dealing with issues related to the activity of various population groups, combining family and professional responsibilities of women and the quality of life of people with disabilities. Expert in many projects related to the evaluation of social programmes and disability. Author of scientific publications on this issue.

Magdalena Kocejko – PhD, Assistant Professoress, Department of Social Policy, SGH Warsaw School of Economics, graduate of sociology and social psychology. Her main areas of academic interest include intersectional approach in public policy analysis, equal treatment and non-discrimination policy, human rights, gender-based violence and disability, and qualitative research methodology, with particular emphasis on sensitive and participatory research.

The process of population ageing, defined as the increase in the number and share of older people in the population, is global and irreversible. It is also strongly regionally differentiated with regard to the degree of advancement and pace of change. Well-developed countries, including European countries, are the oldest in terms of demographics. It should be noted that until recently, changes in this region of the world were the fastest in the countries of Northern, Western and Southern Europe, now (and in the future) it is Central and Eastern Europe (CEE) that is to show the highest pace. The increase in the share of older people is also accompanied by a decrease in the percentage of the youngest people in the population.

Estimates show that people up to 29 years of age make up a significant part of the population of CEE countries, to be more precise – about 29.5% of the total population of the region. At the same time, Central and Eastern Europe is experiencing a rapid pace of demographic change, which includes a decline in fertility, resulting in a decreasing number of young people in the population and an increase in the life expectancy of newborns, contributing to a higher number of older people and, as a result, a faster ageing population. Forecasts indicate that by 2060 the share of young people in the population will have stabilised at about 28%.

Demographic changes have far-reaching socio-economic consequences, also in relation to the public policy of the region. The decreasing number of young people affects the performance of the labour market and education systems as well as the ability of countries to maintain dynamic economic growth [Bloom, Canning, 2008; Börsch-Supan, 2002; European Commission, 2024; Légaré, 2006; Lewandowski, Rutkowski, 2017; Sharpe, 2011]. At the same time, an ageing population increases pressure on pension and healthcare systems. In the literature, a lot of coverage is given to the socio-economic consequences of this process and proposals for various solutions in social policy aimed at mitigating negative effects of these changes. In general, the consequences of population ageing are discussed from the point of view of older people (e.g. provision of long-term health care or pensions) and adults (to provide support for older people and sustainability of public finance in view of increased spending on age-related benefits) [European Commission, 2024; Łątkowski, 2024; Chan et al., 2019; Grundy, 2006; Huisman et al., 2013; Marshall, Nazroo, Tampubolon, Vanhoutte, 2015; OECD, 2015]. It should be emphasised, however, that these changes affect people of all ages, including the youngest people – children, adolescents and young adults, who are treated marginally in the literature and analyses, especially with regard to the relationship between the ageing of the population and the well-being of the youngest people [OECD, 2008; Uhlenberg, 2009]. In addition, the socio-cultural changes that accompany them have a significant impact on the situation of children and young people, which can have long-term effects on both individuals and society. The available data and analyses devoted to children and young people show quite unfavourable trends in this group of people, including changes in their health (both physical and mental), mental well-being, risk of poverty or educational and professional activity.

Young people face many threats that can adversely affect their physical, mental and social behaviour, limiting their potential in various spheres of life, including professional activity. This means that young people are a group particularly sensitive to professional, behavioural, environmental and lifestyle factors. Working in unstable conditions, peer pressure, lack of physical activity, exposure to psychoactive substances or living in health unfriendly environments exemplify the factors that increase the risk of deterioration of young people's health and mental well-being. The scale of these phenomena is often difficult to grasp and it is not always sufficiently monitored by public statistics.

There are also concerns that higher public spending on benefits for the elderly may result in a reduction in its availability for children and young people [Uhlenberg, 2009]. This subject is extremely important in the context of counteracting adverse consequences of demographic changes, which consists, on the one hand, in more professional activity of people who are less present on the labour market, and on the other hand, in higher labour productivity, which is strongly related to the human capital of the individual (health condition, level of education, etc.). Moreover, economic and social inequalities emerging in the early stages of life, which, without adequate support from public entities, may deepen in the further course of life and can also adversely affect individuals and the society. It should also be noted that in the conditions of an ageing population, it is the young people who are under double impact, resulting, for example, from the pressure to increase activity in the labour market as a result of the anticipated significant reduction in the potential labour force (with rapidly changing working conditions), on the one hand and postulated increase in fertility on the other. They will also have caring responsibilities for older family members in the future, and growing uncertainty about the future and risk of many crises (resulting from climate change, for example) make the need to support young people and their mental resilience increasingly important. It is therefore important to take action to reduce inequalities in the health and well-being of young people.

In this connection, the aim of the study is to analyse the current situation of young people in the CEE countries from the perspective of their physical and mental health as well as educational and professional activity as challenges facing the labour market now and in the future. The presented analyses include people up to 29 years of age (not as usual people up to 24 years of age), because with regard to the analysed topic, it is also worth presenting the situation of young adults (aged 25–29) who experience various challenges in the individual, social or economic dimension, which may determine their participation in the labour market and other activities. The second part of the study presents the changes in the age structure of the population in the CEE countries in relation to context of changes in the share of young people. It also presents the results of analysis of mental health and well-being of children, adolescents and young adults in selected countries of the region. The next part of the study is devoted to violence experienced by children and young people, which has far-reaching health, psychological, educational and occupational consequences, and due to the complexity of this problem, especially in the face of the lack of reliable data, poses a huge social challenge. Next, the educational and professional activity of young adults is discussed. The conclusions include recommendations relating to social policy, aimed at improving the situation of young people in some areas. The literature and Eurostat data were used in the analyses.

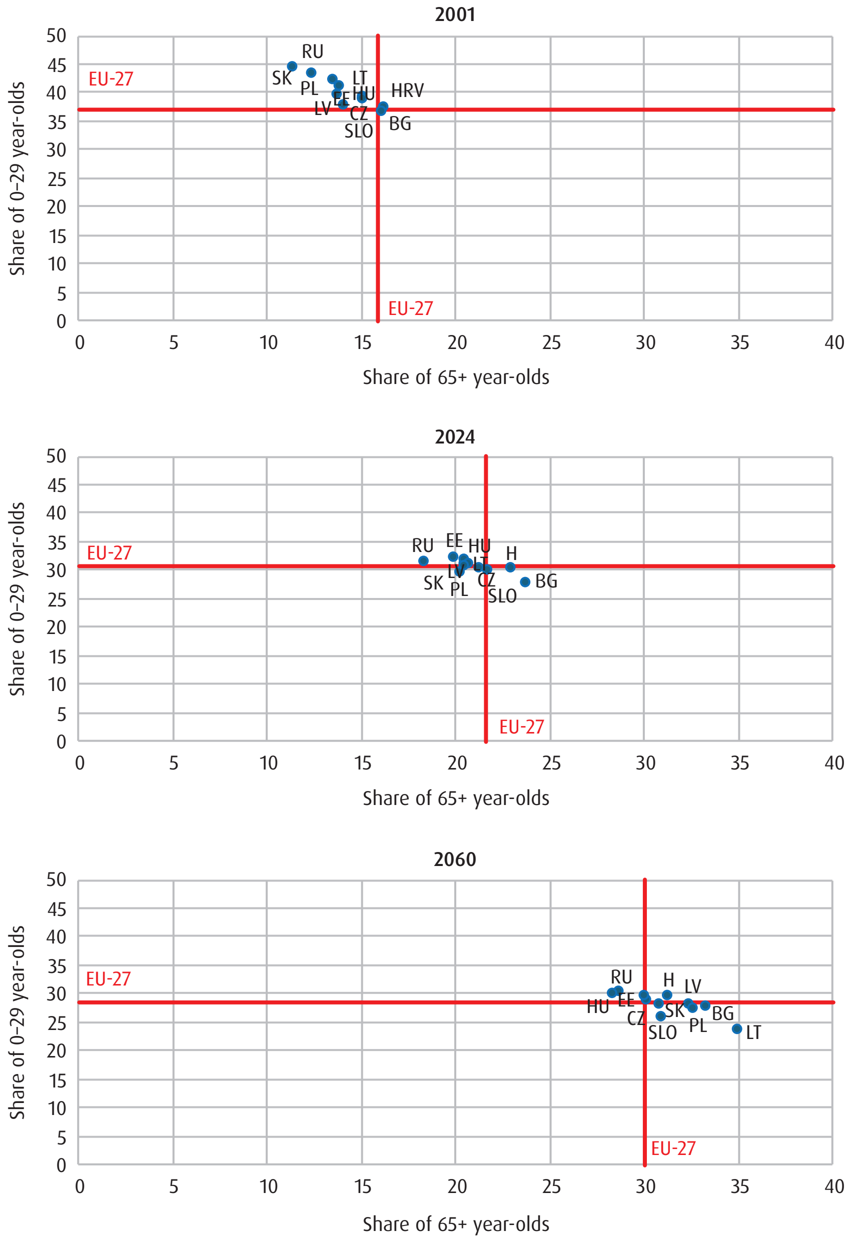
Changes in the age structure and the youth population in CEE countries

Population ageing is defined as an increase in the number and share of older people in the population, but this change implies changes in the overall population structure by age, including a decrease in the proportion of young people (up to 29 years of age; Figure 1). This process is most advanced in highly developed regions, including the European Union countries. It should be noted, however, that the degree of its advancement and pace is strongly differentiated regionally, also among the CEE countries. Until recently, these countries were younger demographically, but a faster rate of population ageing in this region, both observed and forecast, makes the region become the oldest demographically. In 2001, the share of people aged 65 or over in the CEE countries ranged from 11.4% (Slovakia) to 16.3% (Bulgaria), and in 2024 from 18.4% (Slovakia) to 23.8% (Bulgaria), with the rate for the EU27 amounting to 15.8% and 21.6% respectively in the same years. According to the Eurostat population projection, the proportion of older people in all EU countries, including CEE, will grow steadily and in 2060 will range from 28.4% in Hungary and 28.7% in Czechia to 32.6% in Poland, 33.3% in Latvia and 35% in Lithuania.

The decline in share of young people in the population is due to the incerased number of older people and decrease in the population up to 29 years of age, which varies significantly in terms of size, share in the population and age structure (Table 1). In 2001, the total number of people under 29 years of age in the 11 CEE countries analysed was 44.6 million, and in 2024 it fell to nearly 29.6 million (by more than a third), while their share fell from 41.2% to 29.5%. According to the Eurostat population projection (EUROPOP2023), this population will keep decreasing to almost 28.3 million by 2040 (more than 4% compared to 2024) and by more than 2.9 million in 2060 (more than 14% compared to 2024). On the other hand, its share will stabilise at about 29.5% by 2040, and then it will decrease slightly to 28% in 2060.

The pace of these changes is strongly territorially differentiated in the analysed region. Between 2001 and 2024, the largest decrease in the number of people aged 0–29 was recorded in Bulgaria (from over 3 million to 1.07 million, i.e. by over 43%), in Lithuania (from 1.4 million to 0.55 million, i.e. by almost 42%). It should be noted that in Poland, Romania and Slovakia this number decreased by more than a third at this time. On the other hand, the smallest decrease in the number of people under 29 years of age was observed in Czechia (from 4.5 million to 3.26 million – by 19.5%) and Slovenia (from 0.75 million to 0.61 million – by 18.6%). It is worth noting that in the same period, the number of people aged 0–29 in the EU-27 as a whole (Table 1) decreased by 15.9% in total (from 158.9 million to 133.7 million).

Figure 1. Share of older and young people in the population of CEE countries in 2001, 2024 and 2060 (%)



Source: Authors' own compilation based on Eurostat data and population projection EUROPOP2023.

In 2001, the highest share of young people up to 29 years of age was observed in Slovakia (44.4%), Poland (43.5%) and Romania (41.9%), while the lowest in Croatia (36.4%), Bulgaria (37%) and Slovenia (37.6%). In all CEE countries, the share of people in this age group decreased significantly by 2024 – most in Slovakia (to 30.1%, i.e. by 14.3 pp), Poland (to 29.3% – by 14.2 pp) and Lithuania (to 28.4% – by 12.1 pp), and least in Croatia (to 28.4% – by 7.5 pp), Estonia (to 30.4% – by 8.4 pp) and Slovenia (to 28.7% – by 8.9 pp). In the population projection EUROPOP2023, this downward trend is expected to slow down in all the analysed countries by 2040, with some of them (Bulgaria, Czechia, Latvia, Slovakia and Hungary) seeing a slight increase in the percentage of people aged 0–29. In 2060, their share will be slightly lower compared to 2024 in most CEE countries (mainly Lithuania – by 4.9 pp, and in Croatia – by 3.3 pp), with the exception of Bulgaria, Czechia and Hungary, where a slight increase is expected.

The decline in the number of people aged up to 29 in the CEE countries was due to a decrease, both in absolute and relative terms, in a greater proportion of young adults (aged 20–29) than in the youngest (up to 19 years of age). In 2001–2024, the number of people under 20 in these countries decreased from 27.7 million to almost 20.5 million (by 7.22 million, or 26.1%), and for people aged 20–29 from 16.9 million to 9 million (by 7.8 million, or 46.1%). It is worth noting that in this period in the entire EU27 this decrease amounted to 9.8 million (from over 99.4 million to almost 89.7 million, i.e. by 9.8%) and 15.5 million (from 59.5 million to almost 44.1 million, i.e. by 26%). It means that the decline in the number of children and young adults in the EU countries was mainly caused by the changes observed in the CEE countries. The largest decreases in the number of people under 19 years of age were recorded in Lithuania (by 41.4%), Latvia (by 33.1%) and Bulgaria (by 32.8%), while the smallest in Slovenia (by 7.4%) and Czechia (by 1.1%). By contrast, the number of young adults (20–29 years old) decreased most in Bulgaria (by almost 59%), Slovakia (by 45.6%), Czechia (44.9%) and Poland (by 44%), while the least (although still quite significantly) decreased in Slovenia (by 35.5%) and Estonia (by 38.1%). The downward trend in the number of children and adolescents in the analysed CEE countries is expected to continue until 2060. The largest loss in these age groups can be expected especially in Lithuania (by 39.4%), Latvia (by 36.2%) and Croatia (by 30.3%), while the smallest in Hungary (by 5.9%) and Czechia (by 7.8%). Changes in the number of young adults will not go one-way – in the case of five countries, a further decrease in this group of people can be expected: the largest in Lithuania (by 34.2%), Croatia (by 22.5%) and Latvia (by 19%). In other countries, it is expected to increase – the most in Czechia (by 16.7%), Bulgaria (by 10.3%) and Slovenia (by 5.9%). It should be noted, however, that these changes will be largely caused by a positive net migration balance in this age group assumed in the projection.

Table 1. Changes in the number and share of people up to 29 years of age in CEE countries in 2001–2060 (selected years)

	People aged 0–19										
	Number				Change (%)			Share (%)			
	2001	2024	2040	2060	2024/2001	2040/2024	2060/2024	2001	2024	2040	2060
EU-27	99.42	89.65	82.95	79.98	−9.83	−7.46	−10.79	23.16	19.95	18.37	18.17
Bulgaria	1.82	1.22	1.10	1.02	−32.75	−9.86	−16.92	22.34	18.99	17.93	18.24
Croatia	1.00	0.74	0.60	0.51	−26.64	−19.08	−30.31	23.34	19.05	17.03	16.28
Czechia	2.35	2.32	2.10	2.14	−1.13	−9.37	−7.79	22.94	21.29	19.63	19.98
Estonia	0.34	0.30	0.25	0.25	−13.81	−15.38	−15.02	24.72	21.59	18.71	18.96
Lithuania	0.95	0.56	0.41	0.34	−41.37	−26.31	−39.44	27.27	19.32	16.29	15.58
Latvia	0.59	0.39	0.28	0.25	−33.12	−28.12	−36.16	25.03	21.05	17.85	18.54
Poland	10.64	7.36	6.34	5.96	−30.80	−13.85	−19.10	27.81	20.10	17.69	17.84
Romania	5.69	4.13	3.37	3.02	−27.42	−18.27	−26.83	25.36	21.66	19.58	19.26
Slovakia	1.48	1.14	1.02	0.98	−23.11	−10.33	−13.48	27.50	20.97	19.24	19.56
Slovenia	0.45	0.42	0.36	0.37	−7.40	−12.95	−11.42	22.62	19.63	17.20	18.01
Hungary	2.36	1.88	1.83	1.77	−20.46	−2.72	−5.91	23.14	19.59	19.55	19.31
	People aged 20–29										
	Number				Change (%)			Share (%)			
	2001	2024	2040	2060	2024/2001	2040/2024	2060/2024	2001	2024	2040	2060
EU-27	59.52	44.05	49.36	44.74	−25.99	12.04	1.54	13.87	9.81	10.93	10.17
Bulgaria	1.19	0.49	0.67	0.54	−58.94	36.17	10.34	14.66	7.61	10.85	9.70
Croatia	0.56	0.38	0.36	0.30	−32.09	−5.31	−22.48	13.10	9.90	10.35	9.41
Czechia	1.70	0.94	1.22	1.10	−44.86	29.94	16.87	16.66	8.62	11.40	10.25
Estonia	0.20	0.12	0.15	0.13	−38.09	26.78	7.78	14.03	8.80	11.43	9.81
Lithuania	0.46	0.26	0.25	0.17	−43.20	−3.40	−34.23	13.23	9.08	10.04	7.95
Latvia	0.32	0.15	0.18	0.12	−51.91	20.51	−18.96	13.53	8.18	11.63	9.15
Poland	6.01	3.37	3.97	3.11	−43.97	18.08	−7.52	15.71	9.19	11.09	9.33
Romania	3.70	1.76	1.92	1.59	−52.51	9.08	−9.55	16.51	9.22	11.13	10.14
Slovakia	0.91	0.50	0.60	0.50	−45.57	21.35	0.08	16.94	9.14	11.35	9.87
Slovenia	0.30	0.19	0.24	0.20	−35.47	25.06	5.86	14.94	9.03	11.37	9.91
Hungary	1.58	0.95	1.01	0.97	−39.67	6.25	1.79	15.48	9.94	10.84	10.60

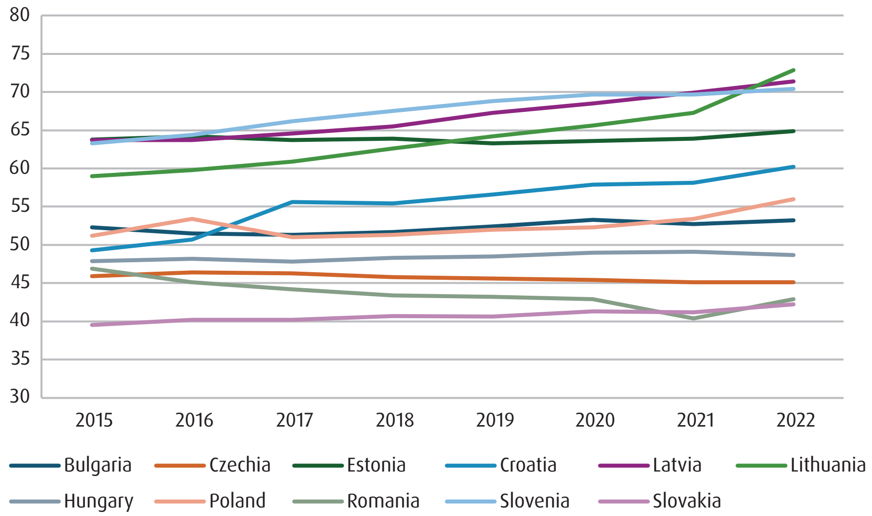
	People aged 0–29									
	Number				Change (%)			Share (%)			
	2001	2024	2040	2060	2024/ 2001	2040/ 2024	2060/ 2024	2001	2024	2040	2060
EU-27	158.94	133.70	132.31	124.71	−15.88	−1.04	−6.72	37.03	29.76	29.30	28.34
Bulgaria	3.02	1.71	1.77	1.56	−43.13	3.30	−9.12	37.00	26.60	28.78	27.94
Croatia	1.57	1.12	0.96	0.81	−28.60	−14.37	−27.63	36.44	28.94	27.38	25.69
Czechia	4.05	3.26	3.32	3.24	−19.52	1.96	−0.68	39.60	29.91	31.02	30.23
Estonia	0.54	0.42	0.40	0.38	−22.60	−3.17	−8.41	38.75	30.39	30.13	28.77
Lithuania	1.41	0.82	0.66	0.51	−41.97	−18.98	−37.77	40.50	28.40	26.32	23.53
Latvia	0.91	0.55	0.47	0.38	−39.71	−14.51	−31.34	38.57	29.23	29.48	27.68
Poland	16.65	10.73	10.32	9.07	−35.55	−3.83	−15.46	43.51	29.29	28.78	27.17
Romania	9.39	5.89	5.29	4.61	−37.31	−10.10	−21.67	41.88	30.88	30.72	29.40
Slovakia	2.39	1.63	1.62	1.48	−31.67	−0.71	−9.36	44.44	30.11	30.59	29.43
Slovenia	0.75	0.61	0.60	0.57	−18.56	−0.97	−5.98	37.56	28.66	28.57	27.92
Hungary	3.94	2.83	2.84	2.74	−28.16	0.30	−3.32	38.62	29.53	30.39	29.91

Source: Authors' own compilation based on Eurostat data and population projection EUROPOP2023.

Educational and professional activity of young people in CEE countries

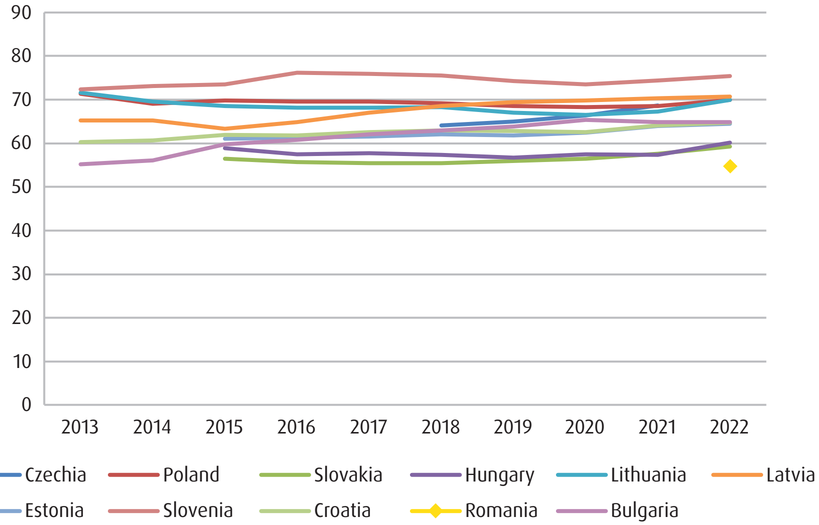
The analysed countries also differ in terms of educational activity of children and young people, as illustrated in Figure 2 showing the percentage of children enrolled in pre-primary education (before beginning compulsory schooling). The highest participation rates were recorded in 2022 in Slovenia, Lithuania, Latvia and Estonia, where more than 70% of children attended early childhood education institutions. These data indicate a high level of availability of pre-school facilities and developed support systems for the care of the youngest in these countries. The lowest rate of participation in pre-school education was observed in Romania and Slovakia, where it did not exceed 45%, while in Poland its value was 55%. Low values of this indicator in some countries may result, on the one hand, from limited availability of educational and care services for pre-school children, and on the other hand, from different social attitudes towards the institutional form of childcare. In the years 2015–2022, the gap between countries widened: in 2015, the gap between the highest and lowest share of children in pre-primary education was around 24 pp, and it increased to 31 pp in 2022.

Figure 2. Share of children in pre-primary education before beginning compulsory primary education in 2015–2022 (%)



Source: Authors' own compilation based on Eurostat data.

Figure 3. Percentage of 15–24 year-olds in secondary or tertiary education in CEE countries in 2013–2022 (%)

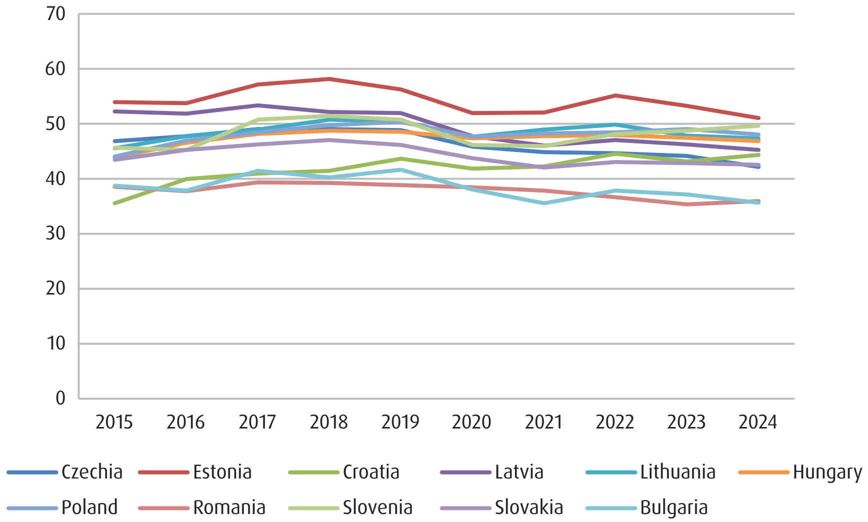


Source: Authors' own compilation based on Eurostat data.

The CEE countries also vary in terms of the percentage of students aged 15–24 (Figure 3). In 2022, the highest share of young people and young adults in the secondary or tertiary education system was observed in Slovenia (75%) and Latvia (almost 71%), while the lowest in Romania (54.8%), Croatia (64.7%) and Bulgaria (64.9%). In the years 2014–2022, most countries (except for Lithuania and Poland) recorded an increase of this indicator, particularly dynamic in the case of Bulgaria and Latvia after 2015. Trend analysis suggests an overall improvement in youth and young adult participation rates in education in the region, while significant differences between countries continue.

Educational activity in the course of life is extremely important due to the impact of preschool, school and higher education on the social-emotional and mental development of children and adolescents [Sylva, Melhuish, Sammons, Siraj-Blatchford, Taggart, 2011; Vandell, Belsky, Burchinal, Steinberg, Vandergrift, 2010]. Moreover, the availability of public education services can contribute to reduced economic and social inequalities among children, young people and young adults and to their increased professional competences and activity on the labour market [OECD, 2018].

Figure 4. Employment rate of 15–29 year-olds in CEE countries in 2015–2024 (%)

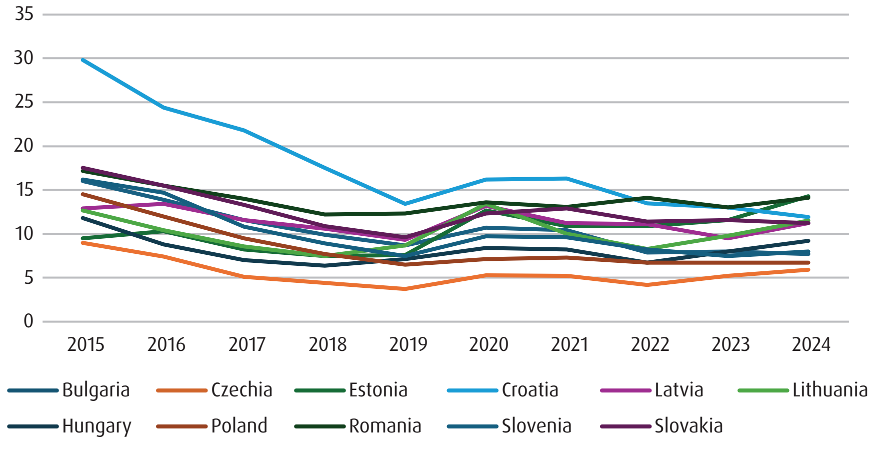


Source: Authors' own compilation based on Eurostat data.

The CEE countries also record significant differences in employment rates among 15–29 year-olds (Figure 4). In 2015, it ranged from 36% in Croatia and 39% in Bulgaria to 52% in Latvia and 54% in Estonia. In 2015–2019, most countries recorded an increased employment rate, but after 2019 it declined, which may be related to the negative effects of the COVID-19 pandemic on the labour market. A particular decrease in the level of employment was recorded in Estonia, Slovenia and Slovakia. Estonia had the highest young adult employment rate in the analysed period, with a peak of 58% in 2018 and a gradual decline to 51% in 2024. Countries such as Poland, Hungary, Czechia and Slovenia had relatively stable youth employment rates during this period, despite some short-term fluctuations. After a clear decline in 2020–2021, the value of this indicator is growing again in these countries. Bulgaria and Romania maintained the lowest employment rates in this age group, oscillating around 40% throughout the analysed period.

The unemployment rate among young people (aged 15–29) is also characterised by a large variation in the analysed CEE countries (Figure 5). In 2015, the lowest unemployment rates were observed in Czechia (9%) and Estonia (9.5%), and the highest in Croatia (30%). By 2019, it had decreased in most countries and then fluctuated in various ways, it was higher during the COVID-19 pandemic (2020–2021) and rose again after decreasing in 2022. In 2024, the unemployment rate in this age group was between 5.9% in Czechia and 14.1% in Romania, while in Poland it was 6.7%.

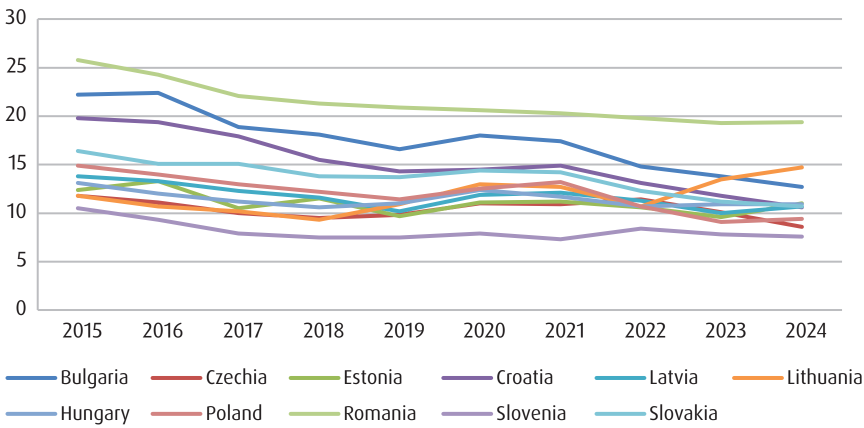
Figure 5. Unemployment rate among 15–29 year-olds in CEE countries in 2015–2024 (%)



Source: Authors' own compilation based on Eurostat data.

An important aspect of the educational and professional activity of young people is the phenomenon of NEET (not in employment, education or training), which includes young people who are outside education and employment and who do not prepare for a job at any courses. This group also includes the unemployed and economically inactive people who, for various reasons (e.g. disability or failure to complete education), are dependent on their parents. The share of the population aged 15–29 meeting this condition means that the potential of young people is untapped. Figure 6 illustrates the scale of this phenomenon in the analysed CEE countries in the years 2015–2024. In 2014, the lowest values of this indicator were observed in Slovenia (10.5%), Czechia (11.8%) and Lithuania (11.8%), while the highest values were observed in Bulgaria (22.2%) and Romania (25.8%). In the last decade, a decrease in the NEET rate could be seen in most of the analysed countries, which suggests an improvement in the situation of young people on the labour market and in the education system. The highest values of the indicator throughout the analysed period were maintained in Bulgaria and Romania, although in both cases a downward trend could be seen – especially in Bulgaria, where it decreased to 13% in 2024. The case of Lithuania is noteworthy due to an unfavourable change recorded, i.e. an increase in the NEET rate after 2022, in Poland it amounted to 14.9% in 2014 and 9.4% in 2022.

Figure 6. NEET indicators among 15–29 year-olds in CEE countries in 2015–2024 (%)



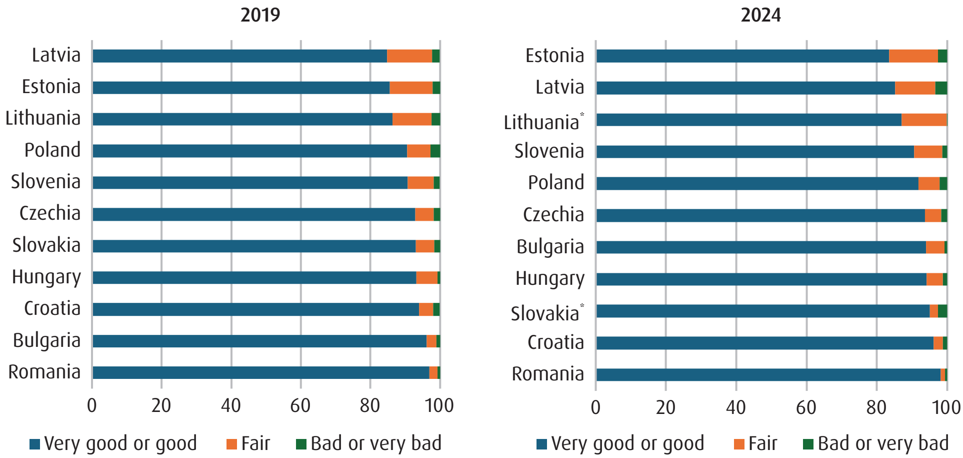
Source: Authors' own compilation based on Eurostat data.

Health status of young people in the analysed CEE countries

In this part of the study, the health status of young people in the CEE countries has been described by means of self-reported assessment of health, the prevalence of disabilities and limitations in daily life, chronic diseases as well as obesity and overweight. In addition, unhealthy behaviours (smoking and alcohol consumption) among young people, which are also a predictor of later health and mortality, are also considered.

The CEE countries differ significantly in terms of health self-assessment of young people (Figure 7). In 2024, the lowest share of people assessing their health as "very good or good" was recorded in Estonia (83.5%), Latvia (85.1%) and Lithuania (87%), while the highest in Romania (98.2%), Croatia (96.2%) and Slovakia (95.1%). Slight changes – both positive and negative – in the CEE countries can be seen compared to 2019. Nevertheless, it should be emphasised that it is the Baltic States in particular that face a serious challenge in the need to improve the quality of health care services for the youngest.

Figure 7. Self-reported heath assessment of 15–29 year-olds in CEE countries in 2019 and 2024 (%)



* Data for 2023.

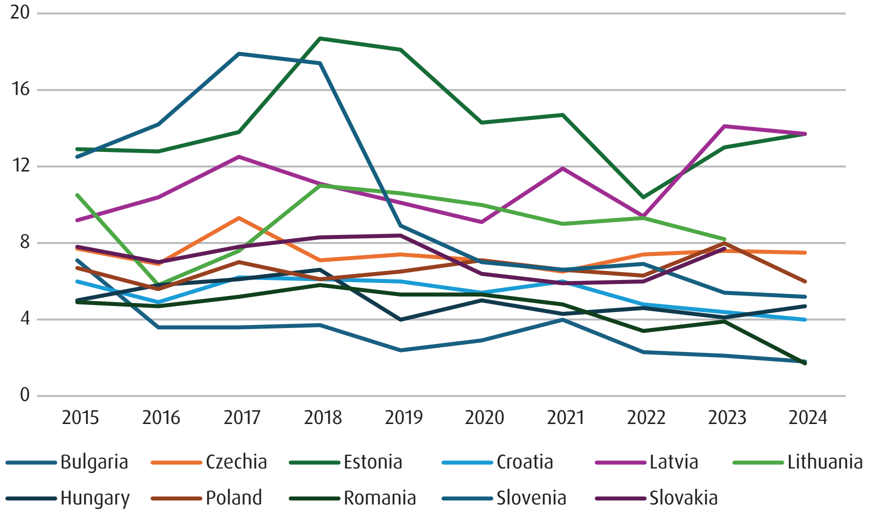
Source: Authors' own compilation based on Eurostat data.

Another health describing variable is the prevalence of disability among people aged 16–29. The years 2015–2024 saw quite significant differences between CEE countries in this regard. In 2024, the highest percentage of people with disabilities was recorded in Latvia and Estonia (13.7%), while the lowest in Romania (1.7%) and Bulgaria (1.8%). In 2015–2024, their share decreased markedly in Bulgaria (from 7.1% to 1.8%), indicating a significant improvement in the health of young people. A similar situation was also observed in Romania, where this percentage fell from 4.9% to 1.7% in the analysed period. In other countries, the share of persons with disabilities among the population aged 16–29 years mainly ranged between 4% and 8%, and its changes were insignificant over time. The exception was Estonia, where this indicator increased to 18.7% in 2018 and then decreased to 13.7% in 2024.[1] It

[1] This could be due to a change in the way data are collected as well as to improvement in health among young people.

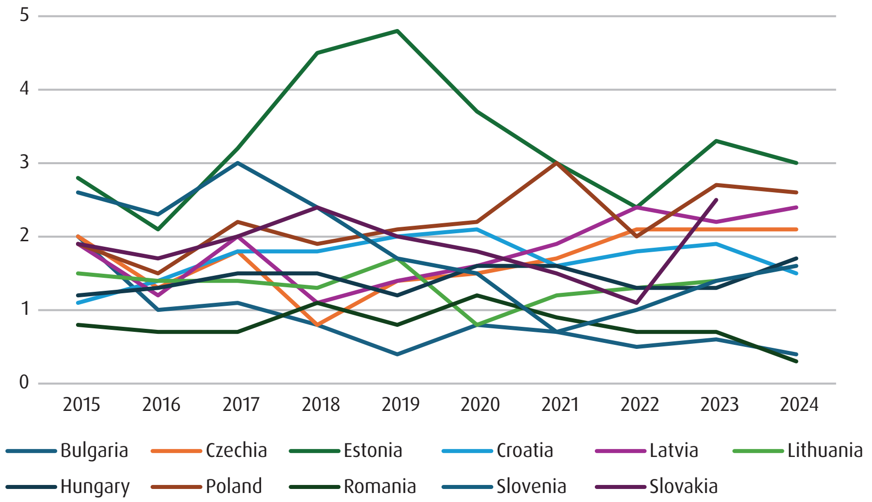
is worth noting that among people with disabilities there are also those reporting a severe degree of disability and in 2024 their share was between 0.3% and 3% in the analysed countries (Figure 9).

Figure 8. Scope of disability in 16–29 year-olds in CEE countries in 2015–2024 (%)



Source: Authors' own compilation based on Eurostat data.

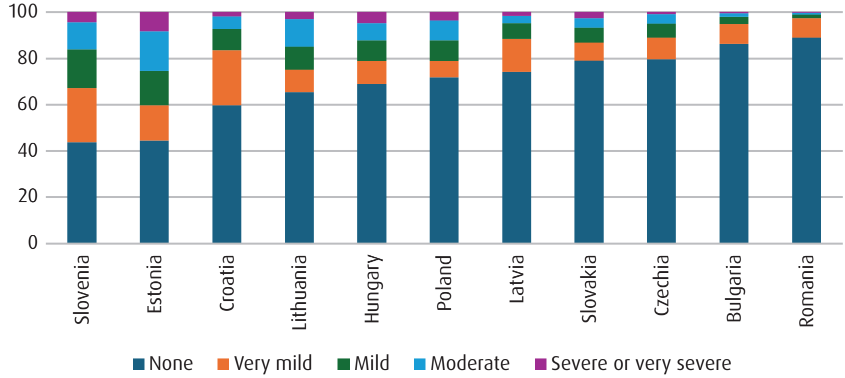
Figure 9. Scope of severe disability among 16–29 year-olds in CEE countries in 2015–2024 (%)



Source: Authors' own compilation based on Eurostat data.

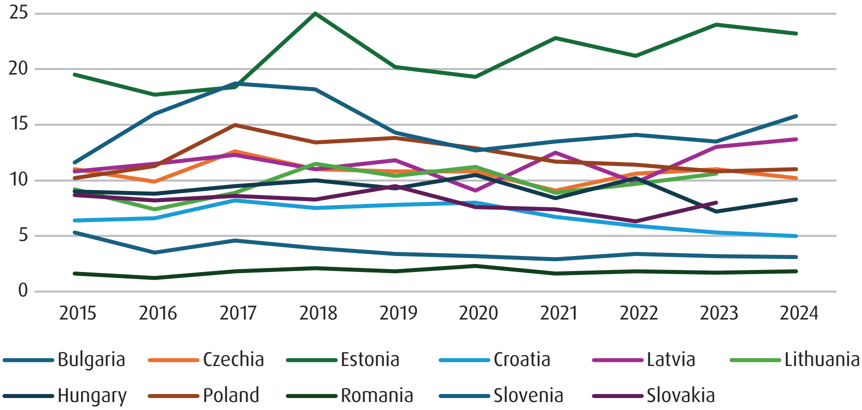
Similar differences between the analysed countries can be seen with regard to the share of young people experiencing limitations in their daily performance, which in 2019 ranged between 5.1% in Bulgaria and 32.1% in Slovenia. Compared to 2014, there was a slight improvement in this respect in the CEE countries. A similar pattern also applies to the proportion of 15–29 year-olds experiencing pain – in 2019, Bulgaria, Romania and Czechia had the best, while Slovenia, Estonia and Croatia the worst situation here (Figure 10). Compared to 2014, the proportion of young people experiencing any degree of pain increased in several countries (Poland, Estonia, Lithuania, Hungary and Croatia).

Figure 10. Structure of 15–29 year olds by intensity of pain in CEE countries in 2019 (%)



Source: Authors' own compilation based on Eurostat data.

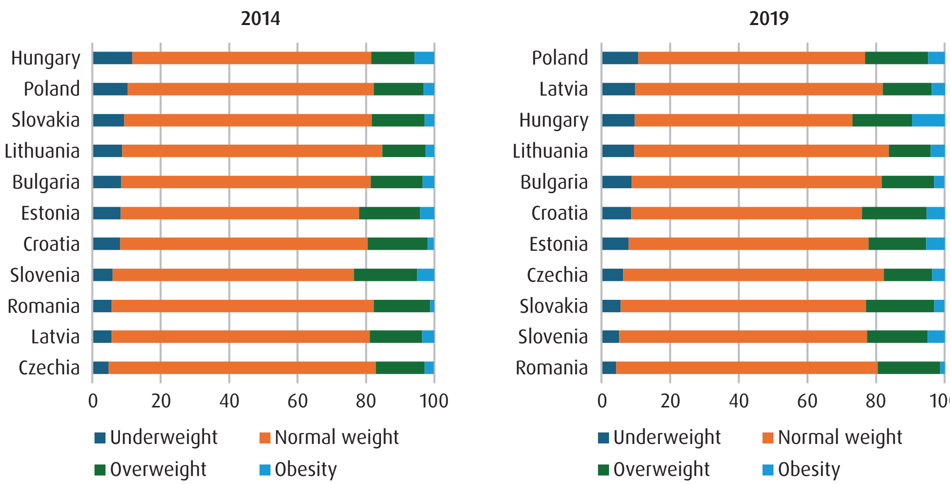
Figure 11. Proportion of people self-reporting chronic diseases in 16–29 year-olds in 2015–2024 (%)



Source: Authors' own compilation based on Eurostat data.

The analysis of proportion of young people with chronic diseases in CEE between 2015 and 2024 also shows significant differences between countries in the region (Figure 11). Despite positive changes in this area and a decline in the share of this group of people recorded in some countries, in 2024 it ranged from 1.8% in Romania to 23.2% in Estonia, with only two countries below 5%.

Figure 12. Structure of 16–29 year olds by BMI in 2014 and 2019 (%)

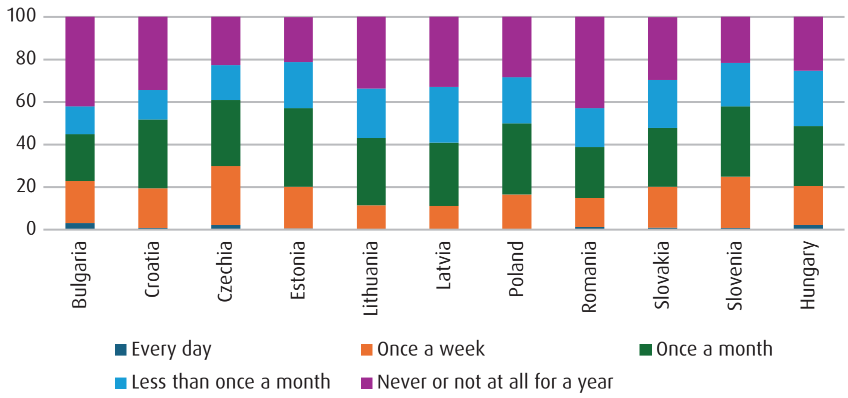


Source: Authors' own compilation based on Eurostat data.

Another important aspect of the health state of young people affecting their further physical and mental health is overweight and obesity. Figure 12 shows the structure of young population according to the Body Mass Index (BMI) in the CEE region. The proportion of people with normal weight varied between the analysed countries and ranged from 63.5% in Hungary to 66.1% in Poland to 75.8% in Czechia to 76.2% in Romania. It is worth noting that compared to 2014, in most of the analysed countries, the share of people with normal body weight declined, and at the same time the percentage of overweight and obese people increased. This adverse change may translate into the occurrence of a variety of health problems among young adults in the future and determine the quality of their human capital, which is important from the perspective the potential labour force. Overweight and obesity among children in CEE reached crisis levels, which poses a major public policy challenge. The COVID-19 pandemic further exacerbated these problems, significantly limiting children's physical activity and developing unhealthy eating habits. The WHO research [2024] indicates that during the pandemic, as many as 36% of children spent more time in front of screens and 28% reduced outdoor activities, which contributed to increased obesity rates. In many countries in the region, poor regulation of marketing of highly processed products, rich in sugars, fats and salt, which are aggressively promoted among children, remains an additional challenge [European Heart Network, 2023]. Childhood obesity has far-reaching health consequences, such as increased risk of type II diabetes, hypertension or heart disease [WHO, 2024]. Experts point to the need to implement integrated measures, including limitations on marketing of unhealthy food targeted at children and promotion of a healthy lifestyle through social campaigns and introduction of taxes on highly processed products [SAFE, 2025].

It is also worth looking at unhealthy behaviours, in particular the frequency of consumption of alcohol and smoking tobacco by young people. There are significant differences between the CEE countries in terms of the frequency of alcohol consumption among young people (Figure 13). In 2019, the share of 15–19 year-olds who had never drunk alcohol or for more than a year ranged between 21.1% in Estonia or 22.8% in Czechia, and 42.1% in Bulgaria or 42.9% in Romania. In Poland, it amounted to 28.4%. The percentage of daily drinkers ranged from 11% in Latvia and 11.4% in Lithuania to 24.3% in Slovenia and 27.5% in Czechia. On the other hand, young people smoked tobacco products least frequently in Poland (14.2%), Lithuania (15.1%) and Romania (15.8%). It should be noted, however, that compared to 2014, in almost all CEE countries (except Croatia), the share of non-smokers increased.

Figure 13. Frequency of alcohol consumption in 15–29 year-olds in 2019 (%)



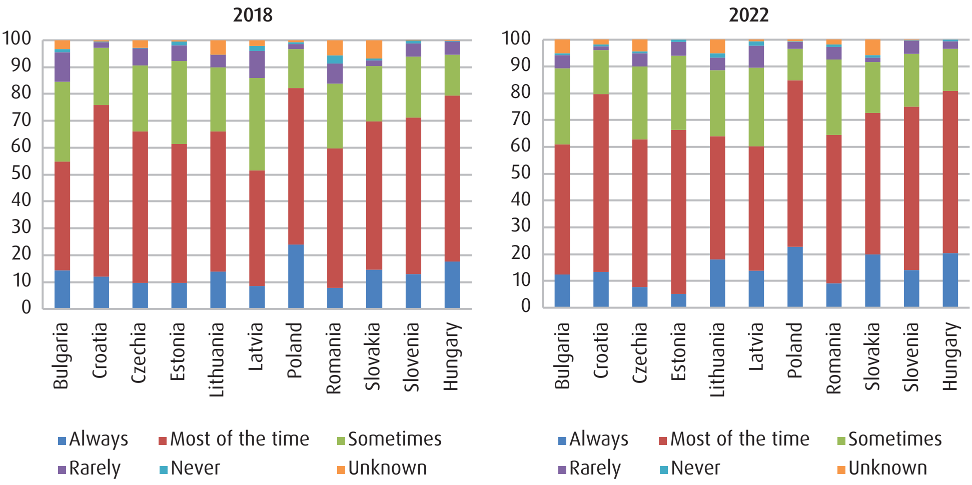
Source: Authors' own compilation based on Eurostat data.

To sum up this part of considerations, it should be stated that the health of young people in the CEE countries varies greatly. Especially countries with an unfavourable health situation and a high tendency to unhealthy behaviours among young people face great challenges both in terms of prevention and building awareness of individual responsibility for health and expenditure on health care. It is extremely important from the perspective of socioeconomic inequalities in health, which can worsen in the course of life and generate significant individual, social and economic costs in the following years [Greer et al., 2021; Chan et al., 2019; Grundy, 2006; Huisman et al., 2013; Marshall et al., 2015].

Mental well-being of young people in CEE countries

Subjective quality of life is a very important determinant of the proper development of children, adolescents and young people as well as their different educational and professional activities, which also have a significant impact, for example, on their productivity [DiMaria, Peroni, Sarracino, 2020]. In this subchapter, the description of the psychological well-being of young people is made on the basis of the sense of happiness and the severity of depressive symptoms, which are strongly related to health and tendency to attempt suicide [Orsolini et al., 2020].

Figure 14. Sense of happiness in the last four weeks in 16–29 year-olds in CEE countries in 2018 and 2022 (%)



Source: Authors' own compilation based on Eurostat data.

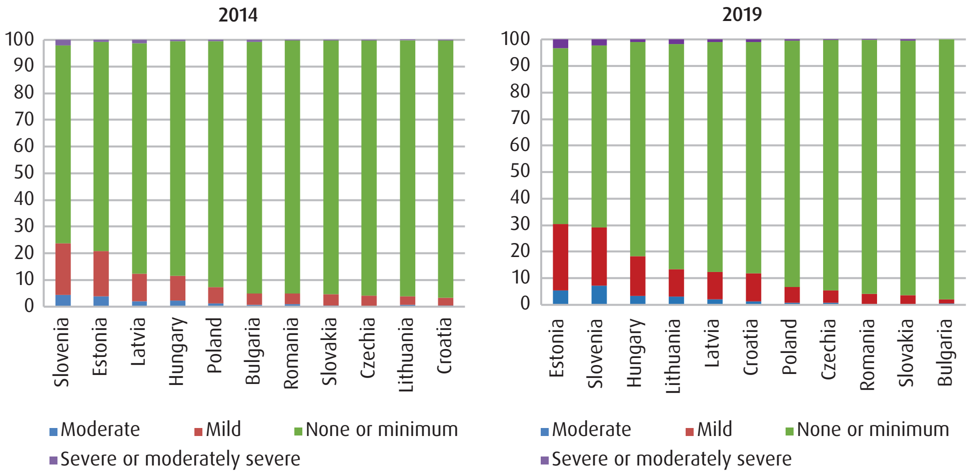
The CEE countries vary greatly in terms of happiness among youth and young adults. In 2022, the share of people reporting sense of happiness always or most of the time ranged from 60.3% in Latvia, 60.9% in Bulgaria and 62.8% in Czechia to 80.7% in Hungary and 84.8% in Poland (Figure 14). Compared to 2018, this situation improved in most countries in the region, except for Czechia and Lithuania. The largest increases in the share of people who feel happy always or most of the time were recorded in Latvia (9 pp) and Bulgaria (6 pp). At the same time, the proportion of negative responses, such as "rarely" and "never", decreased in most countries, although in some cases (e.g. Croatia) it remained relatively stable. Young people were more likely to declare positive feelings in 2022 than in 2018.

An important issue when it comes to the mental well-being of young people is their exposure to experiencing various types of mental disorders related to the influence of their closer and more distant environment. Mental disorders such as depression, anxiety disorders or post-traumatic stress affect about 20% of young people in the region [WHO, 2024]. Of particular concern is the fact that suicide remains the leading cause of death among people aged 15–29 [UNICEF, 2022]. This problem is exacerbated by digitalisation-related phenomena, such as cyberbullying, which is experienced by about 15% of adolescents [Mental Health Europe, 2023]. Activities like sending offensive messages or publishing compromising photos without the consent of the person concerned have an extremely destructive impact on the mental health of young people. WHO research [2024] indicates that victims of cyberbullying are more likely to suffer from depression, social isolation and suicidal thoughts [see also: Mental Health Europe, 2023].

In years 2014–2019, the proportion of young people aged 15–29 experiencing mild, moderate and severe symptoms of depression increased in the CEE countries (Figure 2). In particular, Estonia and Lithuania saw an increase in the proportion of people reporting moderate or severe symptoms of depression. In addition, Lithuania also recorded the highest decrease (by more than 11 pp) in the proportion of people with only minimal or no symptoms. Similar changes occurred in Croatia and Hungary, where in 2014 the percentage of people with minimal or no symptoms was 97% and 88%, respectively, and in 2019 it was 9 and 7 pp lower, respectively. On the other hand, in Poland, Romania, Bulgaria and Slovakia, the share of young people declaring no or only minimum symptoms of depression in the analysed period increased, which may indicate an improvement in the mental condition of young people in these countries.

It should be emphasised that despite the growing scale of the problem, access to specialised health services remains limited. A shortage of qualified staff and insufficient funding for the mental health sector make it impossible to effectively address these challenges [WHO, 2024]. In addition, the COVID-19 pandemic significantly exacerbated the situation, with the number of cases of depression among young people in some countries doubling and almost half of young people in the EU reporting not having access to the psychological support they needed [European Commission, 2023; OECD, 2022]. International organisations emphasise the need to invest in prevention and promotion rather than focusing solely on treatment. The implementation of comprehensive programmes to support youth mental health and the development of cross-sectoral collaboration can have long-term benefits for individuals as well as the society as a whole [WHO, 2024].

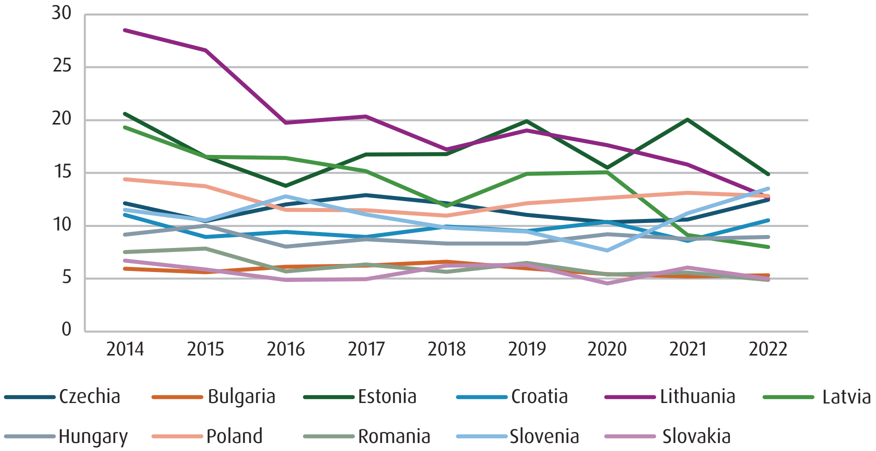
Figure 15. Severity of current depressive symptoms in 15–29 year-olds in 2014 and 2019 (%)



Source: Authors' own compilation based on Eurostat data.

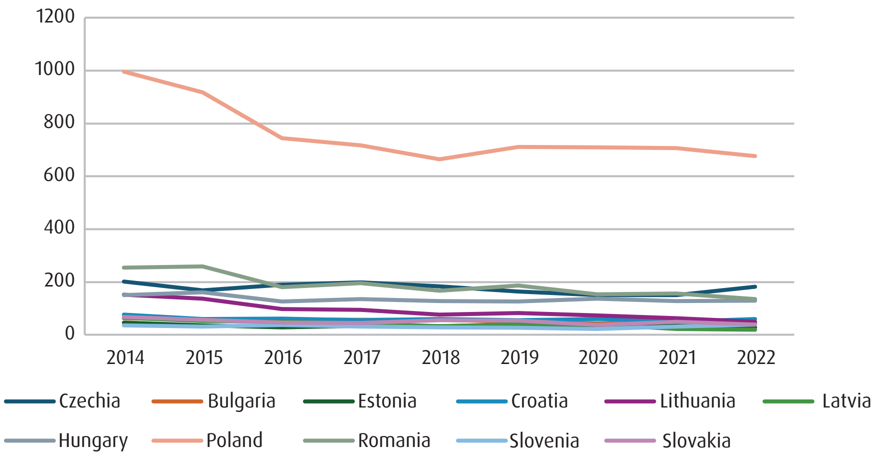
The occurrence of severe symptoms of depression is connected with a tendency to attempt suicide and, as a result, a higher risk of committing suicide [Orsolini et al., 2020]. Figure 17 shows suicide rates per 100,000 people aged 15–29 years in the CEE countries analysed. In 2014, there were significant differences between these countries: from 5.9 suicides per 100,000 people in Bulgaria and 6.7 in Slovakia to 20.6 in Estonia and 28.5 in Lithuania. In Poland, this rate was 14.4 suicides. In the period 2014–2022, some countries recorded an increase in this indicator, while others (such as Czechia and Slovenia) recorded an increase. In 2022, the suicide rate per 100,000 people aged 15–29 ranged from 4.9 in Romania, 5.0 in Slovakia and 5.3 in Bulgaria to 13.5 in Slovenia and 14.9 in Estonia. It is worth noting that during the COVID-19 pandemic (2020–2021) in almost all countries (except Bulgaria), this indicator increased compared to 2019. The values of this rate translate into specific numbers – for example, in 2022, nearly 680 suicides of people aged 15–29 were recorded in Poland, over 180 in Czechia, 136 in Romania and 130 in Hungary. In total, more than 1400 suicides have been registered in these countries. These alarming data do not include suicide deaths among the youngest people (up to 15 years of age), which means that the scale of the phenomenon is underestimated. In addition, data on non-fatal suicide attempts are not available, making the mental health of young people in the CEE countries a huge public health challenge, requiring action to be taken as soon as possible.

Figure 16. Suicide rates among 15–29 year-olds in CEE countries in 2014–2022 (per 100,000 people of a given age)



Source: Authors' own compilation based on Eurostat data.

Figure 17. Number of deaths by suicide among 15–29 year-olds in CEE countries in 2014–2022



Source: Authors' own compilation based on Eurostat data.

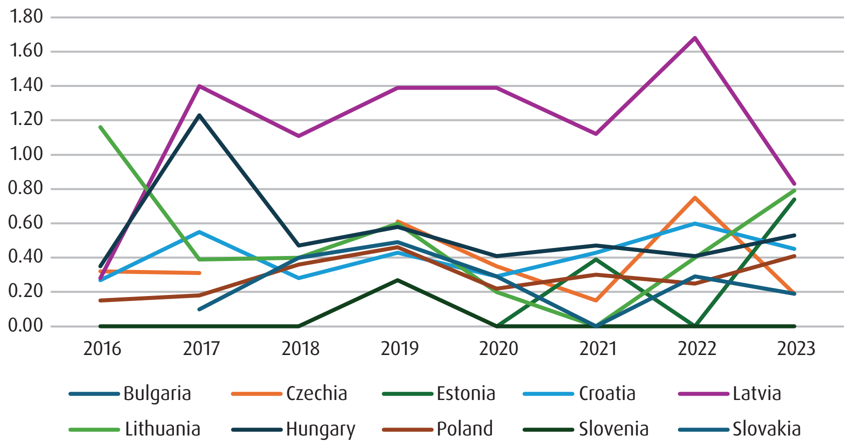
Violence against children and adolescents in CEE countries

At this point, in the context of the emotional development of children, adolescents and young adults, their mental well-being and educational and professional achievements, one more important issue should be raised, which also has serious economic consequences – violence against children and young people. The lack of complete data in this area, not only in the CEE countries, as well as the frequent undetectability of this phenomenon in families and the immediate environment, make it poorly examined, which also hinders estimation of its financial consequences. And violence against children and adolescents remains a serious social, health and educational problem with far-reaching consequences for the development of individuals and entire societies [Perpich, Eichhorn, 2024]. It is estimated that at least 55 million children in the region experience physical, sexual, emotional and psychological violence, during their lifetime [WHO, 2024]. Experiencing violence by children has a significant impact on their development as it includes educational, psychological and social aspects. Exposure to violence among children increases the risk of dropping out of school, absenteeism and achieving lower scores in standardised tests [Fry et al., 2018]. Childhood violence contributes to educational inequalities, highlighting the need for investment in prevention. Educational inequalities, on the other hand, translate into inequalities in health or labour market. Exposure to domestic or community-based violence is associated with aggression, depression, post-traumatic stress symptoms and cognitive difficulties among those having experienced it [Margolin, Gordis, 2004; Lynch, 2003]. In addition, violence against children generates huge financial costs for health, educational and social care systems (an estimate of these costs in Poland follows below).

The available statistical data cover only a small part of all cases of violence against the youngest, which is why the analysis of this phenomenon in the CEE countries is difficult. Eurostat databases provide data on victims of intentional homicide and sexual exploitation Figure 18 shows the number of victims under the age of 18 (per 100,000 people of this age) in the CEE countries in 2016–2022. The highest value of this indicator was recorded in Latvia. However, all the analysed countries experience fluctuations in this indicator over time. It is worth noting that, in general, it assumes higher values for people under 15 years of age than for people under 18 years of age, which may be associated with greater defencelessness and susceptibility to injury among children.

Despite the awareness of the scale of the problem among experts and people professionally involved in supporting children and young people, many cases of violence remain unreported and undetected. The lack of adequate reporting systems and limited access to safe support services are significant barriers to effective violence prevention [Council of Europe, 2025a–b]. Children experiencing violence often struggle with health problems such as obesity, addictions or chronic diseases [Ferrara, Franceschini, Villani, Corsello, 2019], as well as difficulties in establishing healthy relationships with peers [Margolin, Gordis, 2000]. Some children show resilience to the negative effects of violence thanks to protective factors such as self-regulation or support from family or school [Yule, Houston, Grych, 2019]. Strong relationships with caring adults can protect children from negative effects of violence [Osofsky, 1999]. In the face of these challenges, it is necessary to implement comprehensive prevention and intervention strategies. Key activities in this area include the development of support programmes for parents and carers, training for professionals working with children and reinforcement of violence reporting systems.

Figure 18. Victims of intentional homicide and sexual abuse under the age of 18 in CEE countries in 2016–2023 (per 100,000 people of this age)



Notes: data for Romania were not available, hence the country is not shown in the chart.
Source: Authors' own compilation based on Eurostat data.

Costs of domestic violence against children in Poland

As mentioned above, violence against children and adolescents not only entails many consequences for individuals and the society but also generates financial costs. The aim of this part of the study is to provide an initial, estimated approximation of the categories of costs related to domestic violence against children in Poland as an example of economic quantification of one of the key threats to which young people are exposed [see: Grabowska, Dyszyńska-Przystal, Felczak, Kocejko, Kubicki, 2025]. The area of domestic violence against children was chosen for detailed analysis because it combines different types of risks experienced by young people, including mental and physical health problems, addictions, difficulties in establishing and maintaining relationships with other people, educational problems, etc. Domestic violence focuses like a lens on the key problems faced by young people. The calculations presented below are an approximation of the possible costs that may occur when taking into account various variants of the intensity of expenditures incurred, which are a derivative of various events and situations experienced by victims of violence (ODP). The presented estimate is preliminary.

The analyses carried out below concern various types of violence (psychological, physical, sexual, financial, neglect), and also include situations of witnessing violence – in accordance with the Act of 29 July 2005 on counteracting domestic violence [Journal of Laws of 2024, items 424, 834]. The costs associated with violence against children cover many different areas and can be analysed from two perspectives: systemic (macro) and individual, relating to the course of the child's life (micro), hereinafter referred to as the life trajectory of the individual. In this study, we focus on the costs directly related to the support provided to children in situations where violence has been identified by external institutions. Therefore, the preliminary analysis does not include the costs of legal and criminal response or the costs related to the handling of the "Blue Card" procedure.

It is also important to be aware of the so-called grey area, referring to cases in which violence is not formally identified by institutions, even though its effects generate certain social and individual costs. The presented calculations concern cases of domestic violence occurring in families with children. The estimated cost calculation in relation to the life trajectory of an individual was based on data from various sources:

- questionnaires (20 pieces) completed by specialists working with victims of violence, in particular by specialists from the Blue Line of the Health Psychology Institute (IPZ), constituting case studies of households in which there are victims of violence;
- data from registers collected as part of the survey, including in particular data from the Ministry of Health (National Health Fund – NFZ), data on social assistance provided by the Ministry of Family, Labour and Social Policy – the total amount of benefits provided by social assistance as part of municipalities' own tasks divided by the number of families receiving support, and data from the Ministry of Justice for 2023 on cash support for victims of violence,
- data from other sources, including various studies.

The results of the analyses (detailed information is provided in Appendix 2) show that domestic violence against children is associated with significant economic costs, and failure to effectively counteract it leads to losses at both the individual and systemic level. It should be emphasised that early intervention shortens the duration of assistance processes, which in turn may contribute to reducing long-term social and financial costs. The effects of domestic violence are not limited to the physical, psychological or social dimensions – they also have a clear economic aspect that affects the life course of people having experienced violence and puts a strain on institutional resources.

Although the level of costs depends on the intensity and duration of the experience of violence, its consequences are permanent and affect the economic situation of the individual throughout the entire life. At the same time, they are a significant burden on public finances. The spending incurred by the system concerns many sectors, including the operation of prevention systems, the justice system (judiciary and prosecution), the execution of sentences as well as therapy and support addressed to both perpetrators and victims of violence. These costs also include expenses related to the protection of physical and mental health, social assistance – both immediate and long-term – and activities for the social and educational activation of people affected by violence.

Analogous to the real multidimensional consequences of violence, which affect many aspects of the victims' lives, the costs connected with counteracting violence and minimising its effects in terms of public policy are also spread over many areas, showing the complexity and multifaceted nature of this phenomenon.

Conclusions and recommendations

The aim of the study is to analyse the situation of young people in the CEE countries, in particular the state of their physical and mental health as well as educational and professional activity as a determinant of professional activity in the course of life, generating challenges facing the labour market now and in the future, resulting from the process of population ageing. The analyses showed that the CEE countries differ significantly with regard to the areas considered. In general, they can be divided into three groups:

- the Baltic States (Lithuania, Latvia and Estonia), where we observe the worst health and well-being of children and young people on the one hand, and the highest educational and professional activity of young adults with a relatively low NEET rate on the other;
- South Central European countries (Romania, Bulgaria, Croatia, Slovenia), where children and young people had the best physical and mental health, with low involvement in the labour market and educational activities and a high prevalence of NEET;
- other countries (Czechia, Poland, Slovakia, Hungary), which can be placed in between the two above groups.

These differences have slightly different consequences for the selected countries and generate different challenges for governments, society and individuals. Nevertheless, many directions of development and individual solutions in the field of public policy towards children and young people should be introduced in all the countries in order to improve their quality of life and health, and consequently to increase the human capital of individuals and meet the challenges facing the contemporary and future labour market.

Taking into account the findings presented in this study, we may formulate the following recommendations regarding the directions of creating and implementing public policy relating to children and young people:

- in the area of health care, it is necessary to increase spending, in particular for the development of prevention and early detection of potential disorders in the physical and mental health of children and adolescents, as well as for prevention and promotion of pro-health behaviour;
- in the area of educational activity, the availability of quality education services at all levels of education should be improved in order to increase the chances of young people in a dynamically changing labour market and reduce socio-economic inequalities among children and young people, and as a result, in the long term also among older people, which will have a positive impact on public spending related to the ageing of population;
- in the area of youth employment, solutions should be introduced to facilitate the combination of work, study and family responsibilities (e.g. flexible forms of employment, part-time work, etc.), as well as to activate people who, for various reasons, are not involved in any educational and professional activity (NEET);
- support for families with young and older children to let them properly perform their care and educational functions (e.g. training/workshops for parents to increase their competences in this area);
- development of mechanisms for cooperation, coordination and effective cooperation between the various actors responsible for the implementation of public policies relating to children and young people (in the areas of health, education, social policy, labour market and justice);
- improvement of the quality and availability of data on children and young people in different areas in order to monitor their situation and quickly detect irregularities;
- pursuit of policies based on children's rights, enabling children and young people to fully exercise their rights and providing opportunities for development, protection and participation in decisions concerning their lives as well as translating into strengthening their position in the society through education about their rights and creating space for expressing opinions;

- development and implementation of participatory ways of creating and evaluating policies relating to children and young people;
- improvement of accessibility and responsiveness of services aimed at children and young people;
- development of specialist staff supporting children and young people in crisis situations.

It should be noted that the challenges in the areas of physical and mental health, educational and professional activity as well as violence against young people are, generally speaking, common to all CEE countries. An appropriate response to individual phenomena will increase the resilience of young generations to crisis situations in the future, which is crucial in the face of possible polycrises (e.g. destabilisation of the external situation, climate and economic challenges). Although there are similar challenges in all countries, their intensity may vary, which necessitates adjustments of general recommendations in the field of public policy supporting young people in different countries.

Finally, it should be emphasised that the ageing population is accompanied by significant socio-economic and cultural changes, the consequences of which affect people of all ages, including children, young people and young adults. We are all living in a dynamically changing environment, but young people (up to 29 years of age) are particularly exposed to factors that adversely affect their mental well-being and broadly understood social and emotional development, especially in the perspective of unprecedented life expectancy and the need to counteract the negative effects of population ageing. These circumstances can exert enormous pressure on young people, resulting from the need to ensure the sustainability of public finance and to support the growing number of elderly and aged people. And that is why it should be a duty of mature society to ensure adequate development and support for younger generations and to build resilience in them.

ANNEX

Appendix 1. Estimation of the costs of domestic violence against children in Poland – assumptions

Basic assumptions used for calculations:

- based on questionnaires completed by professionals supporting survivors of violence, there are on average 2.5 victims of violence per case of domestic violence (ODP), including an average of 1.5 children;
- the percentages (weights) used in the calculations relating to the percentage of cases affected by a given cost have been estimated on the basis of case study descriptions; This information cannot be generalised by relating it to the entire population, but it is an important guide when calculating individual categories of costs;
- the costs of legal assistance/services mainly include systemic costs, based on official rates, and not the costs of private, commercial support (except in some explicitly indicated cases);
- extreme situations ending in the death of victims of violence or using violence as well as the costs of placing children in foster care were excluded from the analysis.

Appendix 2. Cost valuation

Cost Type	Valuation method	Annual cost	Cost implementation time
Psychological and psychiatric support following domestic violence (treatment of depression and other mental health problems)	**variant I:** ▪ temporary problems, lower psychological support ▪ 12 hours of psychological therapy per year (on average once a month) **variant II:** ▪ serious mental problems, advanced psychological and psychiatric support ▪ 50 hours of psychological therapy per year (on average once a week) ▪ 2 psychiatric appointments per year ▪ cost of medication ▪ support group once a week **rates[1]:** ▪ average cost of one hour of therapy by a psychologist: PLN 200 ▪ average cost of a visit to a psychiatrist: 300 PLN ▪ cost of medication: PLN 100 monthly ▪ average cost of support group (1 meeting) per person: PLN 30	**variant I:** 12 hours of therapy x PLN 200 = PLN 2400 **total:** PLN 2400 **variant II:** 50 hours therapy x PLN 200 = PLN 10 000 ▪ 2 psychiatric appointments x PLN 300 = PLN 600 ▪ 12 months x PLN 100 (medicines) [2] = PLN 1200 **total:** PLN 10 000 + PLN 600 + PLN 1200 = PLN 11 800	variant I: 5 years variant II: 2 years
Addictions (potentially – ODP; in the future – also OSP	▪ on average, 4 rehab stays of 4 weeks each in the course of the addicted person's life ▪ we assume a 40-year period of adulthood for people experiencing violence in childhood, during which addiction therapies will take place (4 stays) [2] ▪ 19.2% of children living in families with alcohol problems will experience it in adulthood[3] ▪ 25% of families experiencing violence face the problem of addiction on the part of the person inflicting violence – estimate based on case studies (questionnaires) ▪ we assume the full cost of rehab stays ▪ cost of the stay: PLN 10 000	conversion to rehab stays in the entire period: 1.5 persons (children) x 0.25 x 0.192 x 4 stays x PLN 10 000 = PLN 2850, i.e. PLN 71.25 annually	40 years

Cost Type	Valuation method	Annual cost	Cost implementation time
Legal costs (family and alimony proceedings)	▪ costs of family proceedings (care, limitation of parental authority, securing contact) – minimum rates for attorneys' services in the field of limitation of parental responsibility: PLN 240, however, the regulations allow for a double rate, so the rate in the real variant is PLN 480[4], with the possibility of increasing it up to six times this rate[5] – average rates for attorneys' services in the field of limitation of parental responsibility: PLN 4500[6] – cost of the court (judge and reporter): 0.5 days of work = PLN 480[8] ▪ Costs of alimony proceedings[7] – minimum rates for attorneys' services in the field of alimony: PLN 240, the regulations allow for a double rate, so the rate in the real variant is PLN 4808 – average rates: 4500 PLN[9] – cost of the court (judge and reporter): 0.5 days of work = PLN 480 **rates:** ▪ cost of a day of work of a judge and a reporter: PLN 960[10] ▪ 20% of case studies raised the issue of alimony ▪ 53% of case studies resulted in a OSP conviction ▪ 37% proceedings are concluded with a final and binding sentence to any penalty; we assume that the convicts have been sued for restriction of parental rights in this case	**variant I – minimum (real):** 0.53 x 0.37 x (PLN 480 + PLN 480) + 0.2 x (PLN 480 + PLN 480) = about PLN 380 **variant II – medium (real):** 0.53 x 0.37 x (PLN 4500 + PLN 480) + 0.2 x (PLN 4500 + PLN 480) = about PLN 1973	one-time costs
Housing costs	▪ 33% of ODPs move to a support facility (mainly to a specialist support centre) and then rent an apartment – based on case studies ▪ 50% of ODPs immediately move into a rented apartment – based on case studies ▪ support facility: PLN 5000 per person per month (full cost of living in the facility, including day stay, meals, accommodation) ▪ cost of renting an apartment (including fees) PLN 3000[11] for 1.5 ODPs ▪ in the first year, we assume the full cost, and in the second year already 50%	**first 3 months:** ▪ support centre: 0.33 x 3 months x 1.5 people x PLN 5000 = PLN 7425 ▪ rent: 0.5 x 3 months x PLN 3000 = PLN 4500 **remaining 9 months in the first year:** ▪ 0.83 x 9 months x PLN 3000 = PLN 22 410 **second year:** ▪ 0.83 x 12 months x 50% rental cost x PLN 3000 = PLN 14 940	2 years

cont. Appendix 2

Cost Type	Valuation method	Annual cost	Cost implementation time
Other costs of ODP medical treatment that may result from the domestic violence (PD)[12]	▪ **direct costs:** medical costs directly related to domestic violence, i.e. those that in medical reporting to the National Health Fund have been marked with codes referring to violence occurring at home or in an housing institution[13] ▪ **indirect costs:** average annual difference in all medical costs between victims of violence in the base year (2013) and non-victims of violence in the base year[14] ▪ costs include the valuation of services provided by the National Health Fund, so only public costs	▪ **direct costs – annual:** – **variant minimum:** PLN 1992,1 for 1.5 ODPs – **variant maximum:** 24 228.9 PLN dla 1.5 ODPs ▪ **indirect costs – calculated for a total of 10 years:** – accounting for the probability of being included in this group, we obtain costs per one person covered by the Blue Card (NK) procedure in the amount of PLN 10 728.16 over 10 years after the occurrence of violence and PLN 16 092.24 for 1.5 ODPs included in this list	direct costs: 1 year indirect costs: 10 years
Difficulties in career and on the labour market	annual wage x unemployment rate (2012–2023 average 8.8%) x increase in unemployment risk due to PD (based on UK data – 25%) = loss of annual output due to PD[15] **variant I:** minimum remuneration: PLN 4300 gross (data for 2024) **variant II:** average remuneration: approx. PLN 8100 gross (data for 2024)	**variant I for one person – annual:** PLN 4300 x 12 months x 0.088 x 1.25 = PLN 5675 **variant II for one person – annual:** PLN 8100 x 12 months x 0.088 x 1.25 = PLN 10 692	30–40 years
Cash benefits	▪ social welfare: PLN 3 436 412 619 / 657 720 families = PLN 5224 per family yearly[16] ▪ Justice Fund: PLN 3 316 232 / 10 550 people covered by PD assistance = PLN 314.33 PLN[17] ▪ 50% of families experiencing violence receive financial assistance – based on the analysed case studies	0.5 x (PLN 5224 + PLN 315) = about PLN 2770	social welfare: 5 years Justice Fund: 2 years
Educational support (e.g. tutoring – in the event of deterioration in school performance), approximate costs of deteriorated learning performance	▪ 72 hours per year ▪ price per hour is PLN 80 (average) ▪ 2 hours per week per school year (36 weeks of study on average) ▪ number of children: on average 1.5	1.5 children x 72 hours x PLN 80 = PLN 8640	4 years

Cost Type	Valuation method	Annual cost	Cost implementation time
Therapeutic support for low social skills with diagnosis	▪ cost based on valuation of social skills training ▪ 40 hours annually ▪ Annual training cost: PLN 5000 ▪ Cost of diagnosis: PLN 1861 (one-time)[18]	PLN 5000 + PLN 1861 = PLN 6861	2 years

[1] According to Siesicka-Osiak [2023]. [2] According to the Rare Disease Day [2024] portal. [3] According to Norton [2012]. [4] Pursuant to the Regulation of the Minister of Justice of 22 October 2015 on fees for attorneys' services [Journal of Laws of 2015, item 1800]. [5] Pursuant to §15(3) of the Regulation of the Minister of Justice of 22 October 2015 on fees for attorneys' services [Journal of Laws of 2015, item 1800]. [6] According to the data of the Ciesielski & Oczachowska Law Firm [2023]. [7] It is worth noting that these costs also include alimony recovery and bailiff costs, which is not indicated in this list. We also assume that the complexity of the case is significant, which is why these costs have been added separately to the costs of standard divorce proceedings. [8] Pursuant to the Regulation of the Minister of Justice of 22 October 2015 on fees for attorneys' services (Journal of Laws of 2015, item 1800). [9] According to the data of the Ciesielski & Oczachowska Law Firm [2023]. [10] Pursuant to Article 91 of the Law on the System of Common Courts [Journal of Laws of 2001 No. 98, item 107]; in practice, the average rates were determined on the basis of information from the Sedlak & Sedlak website [2025] and an article by Jakubowska [2025]. [11] Based on data from Monet [2025] and Loranta-Chrobok [2024]. [12] Estimates based on benefits settled outside the lump sum, unless otherwise stated. [13] A list of ICD-10 codes concerning violence that occurred in a home or residential institution is included in the description of data from the Ministry of Health (data from the National Health Fund). [14] In the present case, it is a question of indicating the difference in costs by type of benefit for persons who have suffered violence in the base year (in a home or a residential institution) as compared with persons who have not suffered violence. These issues have been described in detail in the part concerning data from the Ministry of Health (data from the National Health Fund). [15] Calculation according to the formula proposed by Oliver, Alexander, Roe and Własny [2019]. We do not know the exact structure of the DOP and OSP according to labour market activity and economic potential – the situation in this area may vary. The share of DOPs and DOPs with a high socio-economic status, for which the costs of losing potential on the labour market are low, is growing. However, we are not able to precisely determine the scale of the phenomenon itself. For this reason, the method of calculating this cost was based on the British method [see Oliver, Alexander, Roe, Own, 2019]. [16] Cost per family, estimated on the basis of data for 2023 from the Ministry of Labour and Social Policy – the total amount of benefits provided by social assistance as part of the communes' own tasks divided by the number of families receiving support. [17] Data from the Ministry of Justice for 2023 on financial support for victims of violence. [18] According to the Bankier.pl portal [2024].

Source: Authors' own compilation based on the cited literature.

References

Act of 27 July 2001 on the System of Common Courts (Journal of Laws of 2001 No. 98, item 107).

Act of 29 July 2005 on Counteracting Domestic Violence (Journal of Laws of 2024, items 424, 834).

Bankier.pl (2024). *Diagnoza spektrum autyzmu kosztuje blisko 2 tys. zł. NFZ wycenia ją na 10 razy mniej*, https://www.bankier.pl/wiadomosc/Diagnoza-spektrum-autyzmu-kosztuje-blisko-2-tys-zl-NFZ-wycenia-ja-na-10-razy-mniej-8693739.html#:~:text=AOTMiT%20por%C3%B3wna%C5%82a%20ceny%20komercyjne%2C%20z,%2C%20natomiast%20najwy%C5%BCsza%20%2D%203150%20z%C5%82 (accessed: 15.03.2025).

Bloom, D.E., Canning, D. (2008). Global Demographic Change: Dimension and Economic Significance, *Population and Development Review*, 34, pp. 17–51.

Börsch-Supan, A. (2002). Labor Market Effects of Population Aging, *MEA Discussion Papers*, 11.

Chan, M.S., Hout, A. van den, Pujades-Rodriguez, M., Jones, M.M., Matthews, F.E., Jagger, C., Raine, R., Bajekal, M. (2019). Socio-Economic Inequalities in Life Expectancy of Older Adults with and without Multimorbidity: A Record Linkage Study of 1.1 Million People in England, *International Journal of Epidemiology*, 48(4), pp. 1340–1351. DOI: 10.1093/ije/dyz052.

Council of Europe (2025a). *New Recommendation to Strengthen National Reporting Systems for Violence Against Children*, https://www.coe.int/en/web/portal/-/new-recommendation-to-strengthen-national-reporting-systems-for-professionals-on-violence-against-children (accessed: 16.03.2025).

Council of Europe (2025b). *Right to the Highest Attainable Standard of Health and Access to Healthcare for LGBTI People in Europe*, https://rm.coe.int/1680ab0e99 (accessed: 15.03.2025).

DiMaria, C.H., Peroni, C., Sarracino, F. (2020). Happiness Matters: Productivity Gains from Subjective Well-Being, *Journal of Happiness Studies*, 21(1), pp. 139–160.

Dzień Chorób Rzadkich (2024). *Ile kosztuje leczenie depresji?*, https://www.dzienchorobrzadkich.pl/ile-kosztuje-leczenie-depresji/#:~:text=Przeci%C4%99tnie%20miesi%C4%99czny%20koszt%20lek%C3%B3w%20przeciwdepresyjnych%20w%20Polsce%20wynosi,pacjent%20wymaga%20specjalistycznego%20leczenia%20lub%20stosowania%20nowoczesnych%20preparat%C3%B3w (accessed: 17.03.2025).

European Commission (2023). *Advancing Youth Mental Wellbeing – How Can the EU Promote and Safeguard It?*, https://reform-support.ec.europa.eu/what-we-do/labour-market-and-social-protection/supporting-mental-health-and-care-wellbeing-vulnerable-children-and-young-people_en (accessed: 16.03.2025).

European Commission (2024). The 2024 Ageing Report. Economic and Budgetary Projections for the EU Member States (2022–2070), *European Economy Institutional Paper*, 279.

European Heart Network (2023). *The Marketing of Unhealthy Food to Children in Europe*, https://ehnheart.org/wp-content/uploads/2023/08/CHOB_Phase1_summary-1.pdf (accessed: 18.03.2025).

Ferrara, P., Franceschini, G., Villani, A., Corsello, G. (2019). Physical, Psychological and Social Impact of School Violence on Children, *Italian Journal of Pediatrics*, 45(1). DOI: 10.1186/s13052-019-0669-z.

Fry, D., Fang, X., Elliott, S., Casey, T., Zheng, X., Li, J., Florian, L., McCluskey, G. (2018). The Relationships Between Violence Against Children and Economic Outcomes: A Global Study, *Child Abuse & Neglect*, 75, pp. 103–112. DOI: 10.1016/j.chiabu.2017.06.021.

Grabowska, I., Dyszyńska-Przystał, K., Felczak, J., Kocejko, M., Kubicki, P. (2025). *(Nie) widzialne koszty przemocy domowej w Polsce*. Warszawa: SGH i Niebieska Linia IPZ.

Greer, S.L., Lynch, J., Reeves, A., Falkenbach, M., Gingrich, J., Cylus, J., Bambra, C. (2021). Unequal Ageing: The Politics of Ageing As the Politics of Health Inequalities. In: *Ageing and Health: The Politics of Better Policies* (pp. 84–106). Cambridge: Cambridge University Press.

Grundy, E. (2006). Ageing and Vulnerable Elderly People: European Perspectives, *Ageing and Society*, 26, pp. 1–30.

Huisman, M., Kunst, A.E., Andersen, O., Bopp, M., Borgan, J.K., Borrell, C., Costa, G., Deboosere, P., Desplanques, G., Donkin, A., Gadeyne, S., Minder, C., Regidor, E., Spadea, T., Valkonen, T., Mackenbach, J.P. (2004). Socioeconomic Inequalities in Mortality Among Elderly People in 11 European Populations, *Journal of Epidemiology and Community Health*, 58(6), pp. 468–475. DOI: 10.1136/jech.2003.010496.

Jakubowska, A. (2025). *Ile zarabia sędzia? Zarobki sędziów w Polsce*, https://www.gowork.pl/poradnik/23/zarobki/ile-zarabia-sedzia-zarobki-sedziow-w-polsce/ (accessed: 17.03.2025).

Kancelaria Ciesielski & Oczachowska (2023). *Koszt wynajęcia adwokata w sprawie karnej*, https://ciesielski-oczachowska.pl/porady/koszt-wynajecia-adwokata-w-sprawie-karnej/ (accessed: 17.03.2025).

Lewandowski, P., Rutkowski, J. (ed.). (2017). *Starzenie się ludności, rynek pracy i finanse publiczne w Polsce*. Warszawa: Przedstawicielstwo Komisji Europejskiej w Polsce.

Légaré, J. (2006). Economic, Social, and Cultural Consequences of the Aging of the Population. W: *Demography: Analysis and Synthesis: A Treatise in Population Studies* (pp. 327–336), G. Casselli, J. Vallin, G. Wunsch (Eds.). Amsterdam: Elsevier.

Loranty-Chrobok, M. (2024). *Ile kosztuje wynajem mieszkania w 2024 roku?*, https://direct.money.pl/artykuly/porady/ile-kosztuje-wynajem-mieszkania (accessed: 17.03.2025).

Łątkowski, W. (2024). *Projections of Demand for Care among the Elderly in Poland*. Berlin: Peter Lang Verlag.

Margolin, G., Gordis, E. (2004). Children's Exposure to Violence in the Family and Community, *Current Directions in Psychological Science*, 13(4), pp. 152–155. DOI: 10.1111/j.0963-7214.2004.00296.x.

Marshall, A., Nazroo, J., Tampubolon, G., Vanhoutte, B. (2015). Cohort Differences in the Levels and Trajectories of Frailty Among Older People in England, *Journal of Epidemiology and Community Health*, 69(4), pp. 316–321. DOI: 10.1136/jech-2014-204655.

Mental Health Europe (2023). *Mental Health in the Digital Age: Applying a Human Rights-Based Psychosocial Approach as Compass*, https://www.mentalhealtheurope.org/wp-content/uploads/2023/04/Mental-health-in-the-digital-age-Applying-a-human-rights-based-psychosocial-approach-as-compass.pdf (accessed: 18.03.2025).

Moneta, M. (2025). *Koszt utrzymania mieszkania w 2025 roku: czynsz, media i inne opłaty za mieszkanie*, https://rynekpierwotny.pl/wiadomosci-mieszkaniowe/ile-kosztuje-utrzymanie-mieszkania-w-polsce/11570/ (accessed: 16.03.2025).

Norton, E. (2012). *Primed for Addiction*, https://www.science.org/content/article/primed-addiction (accessed: 19.03.2025).

OECD (2008). Ageing OECD Societies. In: *Trends Shaping Education* (pp. 13–20). Paris: OECD Publishing.

OECD (2015). *In It Together: Why Less Inequality Benefits All*. Paris: OECD Publishing.

OECD (2018). *Equity in Education: Breaking Down Barriers to Social Mobility*, https://www.oecd.org/en/publications/equity-in-education_9789264073234-en.html (accessed: 19.03.2025).

OECD (2022). *Health at a Glance: Europe 2022: State of Health in the EU Cycle*. Paris: OECD Publishing. DOI: 10.1787/507433b0-en.

Oliver, R., Alexander, B., Roe, S., Wlasny, M. (2019). *The Economic and Social Costs of Domestic Abuse*. London: Home Office.

Orsolini, L., Latini, R., Pompili, M., Serafini, G., Volpe, U., Vellante, F., Fornaro, M., Valchera, A., Tomasetti, C., Fraticelli, S., Alessandrini, M., La Rovere, R., Trotta, S., Martinotti, G., Di Giannantonio, M., De Berardis, D. (2020). Understanding the Complex of Suicide in Depression: From Research to Clinics, Psychiatry Investigation, 17(3), pp. 207–221. DOI: 10.30773/pi.2019.0171.

Osofsky, J. (1999). The Impact of Violence on Children, *The Future of Children*, 9(3), pp. 33–49. DOI: 10.2307/1602780.

Prpic, M., Eichhorn, M. (2024). *Violence Against Children in the European Union: Current Situation*, https://www.europarl.europa.eu/thinktank/en/document/EPRS_IDA (2024) 762472 (accessed: 17.03.2025).

Regulation of the Minister of Justice of 22 October 2015 on fees for attorneys' services (Journal of Laws of 2015, item 1800), https://sip.lex.pl/akty-prawne/dzu-dziennik-ustaw/oplaty-za-czynnosci-adwokackie-18236070 (accessed: 18.03.2025).

SAFE (2025). *Report on HFSS Food Marketing Targeting Children*, https://www.safefoodadvocacy.eu/safe-publishes-a-report-on-hfss-food-marketing-targeting-children/ (accessed: 17.03.2025).

Sedlak & Sedlak (2025). *Ile zarabia sędzia?*, https://wynagrodzenia.pl/moja-placa/ile-zarabia-sedzia (accessed: 19.03.2025).

Sharpe, A. (2011). Is Ageing a Drag on Productivity Growth? A Review Article on Ageing, Health and Productivity: The Economics of Increased Life Expectancy, *International Productivity Monitor*, 21, pp. 82–94.

Siesicka-Osiak, M. (2023). *Ile kosztuje wizyta u psychologa prywatnie? Cena za pierwsze spotkanie i kolejne konsultacje. Koszt leczenia dziecka i osoby uzależnionej*, https://stronazdrowia.pl/ile-kosztuje-wizyta-u-psychologa-prywatnie-cena-za-pierwsze-spotkanie-i-kolejne-konsultacje-koszt-leczenia-dziecka-i-osoby/ar/c14-16462693 (accessed: 19.12.2024).

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., Taggart, B. (2011). Pre-School Quality and Educational Outcomes at Age 11: Low Quality Has Little Benefit, *Journal of Early Childhood Research*, 9(2), pp. 109–124.

Uhlenberg, P. (2009). Children in an Aging Society, *Journals of Gerontology. Series B: Psychological Sciences and Social Sciences*, 64(4), pp. 489–496.

UNICEF (2022). *The Impact of the War in Ukraine and Subsequent Economic Downturn on Child Poverty in Eastern Europe and Central Asia*, https://www.unicef.org/eca/reports/impact-war-ukraine-and-subsequent-economic-downturn-child-poverty-eastern-europe (accessed: 18.03.2025).

Vandell, D.L., Belsky, J., Burchinal, M., Steinberg, L., Vandergrift, N. (2010). Do Effects of Early Child Care Extend to Age 15 Years? Results from the NICHD Study of Early Child Care and Youth Development, *Child Development*, 81(3), pp. 737–756.

WHO Regional Office for Europe (2024). *European Health Report 2024: Keeping Health High on the Agenda*, https://iris.who.int/handle/10665/380381 (accessed: 19.03.2025).

Yule, K., Houston, J., Grych, J. (2019). Resilience in Children Exposed to Violence: A Meta-Analysis of Protective Factors Across Ecological Contexts, *Clinical Child and Family Psychology Review*, 22, pp. 406–431. DOI: 10.1007/s10567-019-00293-1.

The Foundation Institute for Eastern Studies is an independent non-governmental organisation, whose mission is to enhance the dialogue among the European countries, especially with regard to Central and Eastern Europe.

Organised since the early 1990s, the Economic Forum is a milestone achievement of the Institute providing a space for debate on key economic, social and cultural issues relating to Central and Eastern Europe. The Forum has become a major, one of the most reputable economic events in the region over more than 34 years of its history. Each year, it hosts high-profile representatives of the world of politics, business, NGOs and media from Central and Eastern Europe, Western Europe as well as from the US and Asia. The Forum provides a unique platform for the exchange of ideas, establishment of international partnerships and promotion of innovative solutions to the challenges of the modern world. Each year, it brings together several thousand participants and features hundreds of discussion panels, expert report presentations and networking events.

The SGH Warsaw School of Economics is the oldest Polish economic university, which has been shaping leaders of social and economic life for almost 120 years. SGH ranks high in international university rankings. With being granted the AACSB accreditation in April 2025, it joined the elite group of universities (one percent globally) holding the triple crown of accreditations. In previous years, SGH received the AMBA and EQUIS accreditations, the BSIS certification, and the combined AMBA & BGA accreditation in May 2025.

The SGH Warsaw School of Economics cooperates closely with business as part of the SGH Partners Club, which currently associates 44 members.

Since 2018, SGH has been the main content partner of the Economic Forum. The presentation of the *Report of the SGH Warsaw School of Economics and the Economic Forum* is traditionally one of the highlights on every Economic Forum agenda.

www.forum-ekonomiczne.pl

ISBN 978-83-8030-742-1

Report co-financed by: QEMETICA BOŚ BANK ZUS SOCIAL INSURANCE INSTITUTION