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Still in the Fast Lane?

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Tomáš Slačík

The Vienna Institute for International Economic Studies
Wiener Institut für Internationale Wirtschaftsvergleiche

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Tomáš Slačík is Senior Economist in the Central, Eastern and Southeastern Europe Section of the Oesterreichische Nationalbank.

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Abstract

This report revisits the growth and convergence performance of the 11 EU member states in Central, East and Southeast Europe (EU-CEE11) over the past few decades, examining the underlying drivers, structural changes and the outlook. The review aims to assess the sustainability of the current economic model and identify areas for economic policy to focus on boosting growth. The findings show that convergence has significantly slowed since the global financial crisis, with value added growth declining in virtually all industries. This slowdown is attributed to structural rather than cyclical factors, with total factor productivity (TFP) being the main driver as well as the primary culprit behind the deceleration. Since medium-term growth projections for the region are not optimistic, the EU-CEE11 countries must make substantial efforts to improve their economic models. Key areas to focus on include energy, underutilised labour and improving human capital. While still very competitive, the manufacturing sector needs to move towards higher value added activities.

Keywords: growth, convergence, growth model, EU-CEE11

JEL classification: E61, F15, F43, O47

CONTENTS

TABLES AND FIGURES

1. Introduction

On 1 May 2004, 10 mostly former communist countries with centrally planned economies (except for Cyprus and Malta) joined the European Union (EU). European Commission's President von der Leyen recently described this rather unprecedented and unparalleled event as the 'birth of a new era'. This largest-ever EU enlargement cohort was later followed by further extensions towards three former communist countries: Bulgaria and Romania in 2007 and Croatia in 2013.

On the occasion of the 20th anniversary of the so-called 'Big Bang' enlargement of 2004, the Financial Times published an article about past economic achievements and future challenges in the countries that had enjoyed EU membership for two decades (Arnold and Bounds 2024). The title and subtitle of the article are already telling: *'Big Bang' EU countries risk losing competitive edge: Ten countries need new impetus after reaping early benefits of enlargement wave'.* Even though the set of countries addressed formally includes Malta and Cyprus, the article focused on countries in the former Eastern Bloc. Therefore, the messages can also be easily applied to Bulgaria, Croatia and Romania so as to encompass the entire region of the 11 EU member states in Central and Eastern Europe (EU-CEE11).[1] The following quote conveys not only the gist of the article but also succinctly captures the dichotomy of the economic situation in which the EU-CEE11 countries find themselves:

'*The spectacular economic growth of 10 countries that joined the EU two decades ago – most of which had been on the other side of the Iron Curtain during the cold war – makes them one of the continent's clearest success stories. But these countries now need to find new sources of growth to avoid losing their competitive edge (…) after the early gains from joining the EU start to fade and living standards catch up with their western neighbours.*'

Indeed, with the fall of the Iron Curtain, a long and thorny journey of transition began for the EU-CEE11 countries from centrally planned state socialism to market- and democracy-based economies. In contrast to a gradual transformation approach taken elsewhere (e.g. in Asia), many EU-CEE11 countries opted for a 'shock therapy' of rapid change. As a consequence, following the initial economic tremor – which had taken its toll in the 1990s in the form of deep recessions, soaring prices, currency depreciations, bank failures and mass unemployment – the EU-CEE11 countries' intrinsic strengths eventually came to the fore. The far-reaching reforms that the countries had implemented, the opening up to foreign investment, and the privatisation, modernisation and restructuring of the economies fostered productivity and competitiveness, which in turn boosted economic growth. This unprecedented social, political and economic metamorphosis took place in parallel with and was supported by the process of European reunification as well as significant inflow of EU funds.

The efforts eventually started to work. The EU-CEE11 economies established a record of robust economic expansion and convergence, rendering Central and Eastern Europe one of the world's fastest-growing regions in the first half of the 2000s. This success can be particularly attributed to the EU-CEE11 countries'

[1] The EU-CEE11 region comprises Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

integration into global value chains (GVCs). As a result, exported value added has been the main source of economic growth and convergence. Findings in the literature suggest that the lion's share of value added growth in the EU-CEE11 countries since the mid-1990s has been driven by exports, in particular exports of intermediate (i.e. not final) goods (Hagemejer and Muck 2019). This underlines the importance of the vertical specialisation and GVC integration of the EU-CEE11 economies amid increasingly fragmented global production processes. A particularly prominent case in point in this regard is the automotive industry. Benefitting vastly from the strong influx of foreign investment and integration into European and global value chains – not least in the wake of the eastward relocation of production of western car producers and suppliers – it has assumed a key role in many EU-CEE11 economies. For example, the automotive industry generates up to 20% of manufacturing value added in countries like Slovakia and Czechia, which have respectively become the No. 1 and No. 2 car producers per capita worldwide. The automotive industry in EU-CEE11 generates roughly 13% of total valued added in the EU and employs more than 1 million people, or nearly 40% of the total EU automotive workforce. The car sector has become one of the EU-CEE11 region's biggest exporters, with automotive exports accounting for up to a third of total exports in the case of Slovakia.

As a result of the transition efforts, real GDP per capita experienced roaring growth over the last three decades, with the increases ranging from about 100% (i.e. a doubling of the GDP) in Czechia to almost 300% (i.e. a quadrupling) in Lithuania. For the sake of comparison, the corresponding figure for Germany is less than 50% over the same time span. However, for roughly the last 15 years, these achievements have been overshadowed by some rather adverse cyclical and structural developments. Following the global financial crisis (GFC) in 2009 and the subsequent series of distress episodes (particularly the sovereign debt crisis, the pandemic, energy crises and inflation crises), foreign investment into EU-CEE11 has slowed, economic growth has become largely lacklustre, and economic convergence with advanced European countries has lost momentum. Moreover, the EU-CEE11 economies have developed a strong relative specialisation on production, while other value-chain functions with higher value added are underrepresented. As a result, EU-CEE11 countries tend to serve as 'factory economies' (Baldwin 2016) in the production networks. Their hitherto limited ability to advance along the value-chain functions towards those with higher value added (e.g. R&D, sales, logistics and marketing) suggests the imminent risk of getting stuck in the functional specialisation trap (Stöllinger 2021; Grieveson et al. 2021). The latter is closely related to the so-called middle-income trap, which suggests that it becomes increasingly difficult for a country to sustain high growth rates once its initial comparative advantages – particularly cheap labour and low hanging fruits with respect to productivity growth – start to languish. At that stage, the growth model based on technological imitation and production has to be substituted or at least complemented by (domestically based) innovation (Acemoglu et al. 2006).

2. Faltering economic convergence in EU-CEE11: Are the fat years over?

Since the fall of the Iron Curtain, the 11 EU new members states from EU-CEE11 have gone a long way when it comes to their economic transformation and convergence towards more advanced European countries. After the rapid transition from a planned to a market economy had initially triggered a massive economic upheaval – characterised by deep recessions, steep price hikes, currency devaluations, bank failures and high unemployment – the situation began to stabilise by the mid-1990s. In 1997, aggregated real GDP (measured in constant US dollars) of the EU-CEE11 countries amounted to just under 28% of Germany's real economic output, 43% of Italy's, and 87% of Spain's. Since then, the aggregated real GDP of the EU-CEE11 region has increased by 120%, (significantly) outpacing older EU member states. As a result, in 2022, the combined GDP of the EU-CEE11 region reached nearly 50% of Germany's GDP, 84% of Italy's, and 125% of Spain's.

The economic catch-up occurred against the headwinds of negative demographic trends, particularly with regard to the shrinking working-age populations. World Bank data suggest that, over the last 25 years, the EU-CEE11 region has lost 8% of its population due to net migration and aging, resulting in almost 900,000 fewer inhabitants. Population growth was only observed in Slovenia (6%), Czechia (2.2%) and Slovakia (0.9%). Conversely, most other countries in the region experienced population declines, most notably Bulgaria, Latvia and Lithuania, where the population decreased by more than one fifth. In contrast, the population of the comparison countries mentioned earlier markedly increased – by 2.5% in Germany, 3.5% in Italy, and 19% in Spain. The adverse demographic trend has been worse in terms of the working-age population. The population aged 15-64 declined in all countries except Slovakia and by more than 17% in the EU-CEE11 region as a whole. The shrinkage ranged from between 2.5% in Slovenia and to more than 27% in Latvia. It was only slightly smaller than the latter percentage in Bulgaria, Lithuania and Croatia. This contrasts with much slower declines in the working-age populations in Germany (-4.8%) and Italy (-3.4%) as well as an increase of nearly 15% in Spain. In this context, it has to be borne in mind that the population development in many countries of Western Europe would have been much worse without strong immigration.

Against this background, the economic rise of the EU-CEE11 region is emphasised even more in per capita terms. Figure 1 illustrates the development of real income per capita for each EU-CEE11 country compared to Germany. While the horizontal axis displays per capita income in 1997, the vertical axis shows it in 2023. The graph shows that real per capita income in all countries of the region has increased relative to the German income level, averaging 16 percentage points (pp), from 23% to 39%. The Baltic countries experienced the most significant rise (up to 25 pp in Lithuania). The lowest relative increases were seen in Bulgaria and Czechia, at around 11 pp. Bulgaria stands at about 22% of the German per capita income, making it the poorest of the EU-CEE11 countries, while Slovenia is the richest, at about 60%. In contrast to the EU-CEE11 countries, Spain and other emerging economies (e.g. India and Brazil) have (de facto) stagnated relative to Germany. In 20223, Italy even experienced a decline compared to Germany, to 79% of real per capita income, which is 15 pp less than in 1997. China, the growth tiger of the last decades, caught up in terms of the real per capita income, climbing

from 5% to 21% of the German level. In purchasing power parity (PPP) terms, the EU-CEE11 region's process of catching up has been even more pronounced. On average, the countries currently average just below 70% of Germany's real income level, which is almost 30 pp higher than in 1997. With a purchasing power of 80% of Germany's income, Slovenia and Czechia are therefore wealthier than Spain and at a level comparable with Italy.

Figure 1 / Convergence relative to Germany, 1997-2023

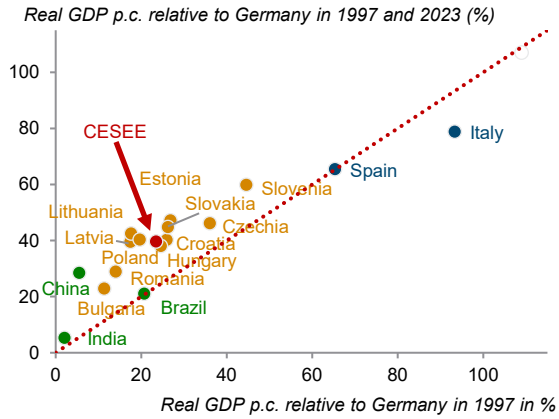
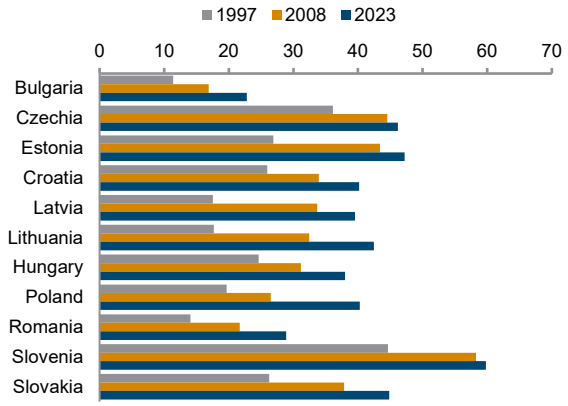


Figure 2 / Real GDP per capita in EU-CEE11 (% of Germany's)



Source: World Bank

However, the overall strong catch-up of the EU-CEE11 region over the last 25 years disguises to a certain extent the heterogeneous pace of convergence in this period. Figure 2 depicts the real GDP per capita in the EU-CEE11 countries relative to Germany at three points in time, namely, in 1997, 2008 and 2023. Before the GFC in 2008, real GDP per capita relative to Germany's increased by between 5 pp in Bulgaria and more than 16 pp in Estonia and Latvia. However, beginning in 2008, the pace of convergence slowed in eight of the 11 countries under study in comparison to before the GFC. Most notably, convergence nearly came to halt in Slovenia, with the result that the country's real GDP per capita relative to Germany's barely increased. While Hungary and Bulgaria only marginally increased their respective convergence pace after the GFC, Poland managed to double it.[2]

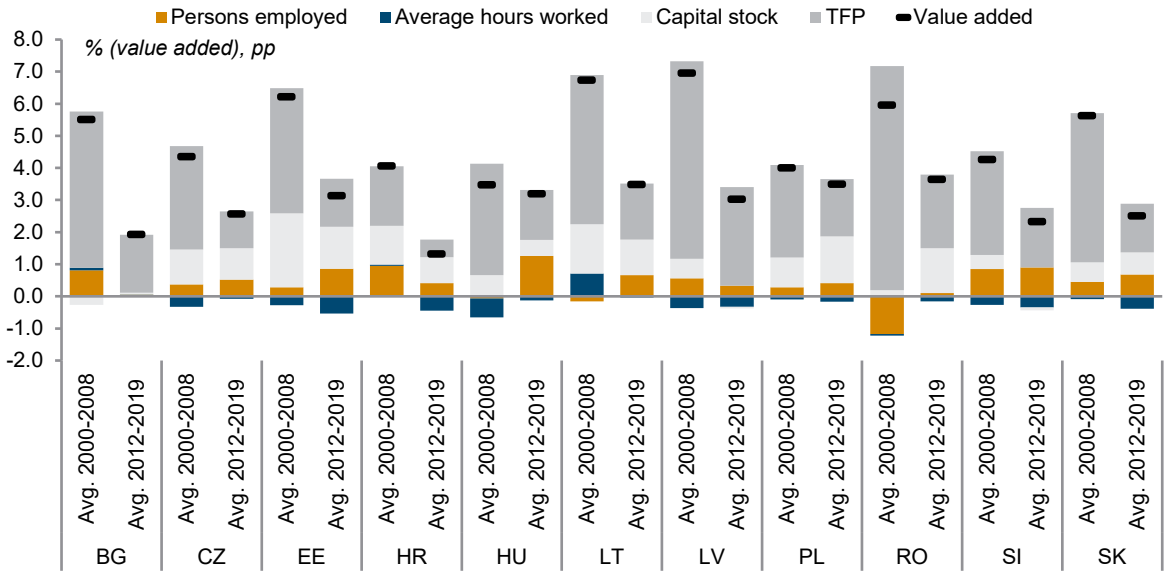
Thus, it seems that for a vast majority of the EU-CEE11 countries, the pace of convergence has slowed since the GFC (and in some cases significantly). However, Figure 2 (above) does not take into account the fact that, during several years since 2008, economic performance has been subject to various shocks and crises, which have hit several countries in the EU-CEE11 region – particularly the Baltic states – quite hard. After the GFC broke out in 2008, the economic situation in EU-CEE11 was massively affected in the subsequent years not only by the direct impact of the GFC but also by ensuing sub-crises, such as the sovereign debt crisis in Europe. Similarly, the 2020-2022 period was severely hampered by the COVID-19 pandemic and its economic and policy aftermaths. Therefore, in Figure 3, we compare the average value added growth in two periods before and after the GFC – namely, in the 2000-2008 and 2012-2019 periods – which were not biased by extraordinary events. The figure shows

[2] It is worth bearing in mind that Poland was one of the few countries worldwide – and the only one in the EU – that did not experience a recession in 2009. This provided the country with a massive boost (not only) compared to its peers in EU-CEE11.

that value added growth declined after the GFC in all EU-CEE11 countries. In the 2000-2008 period (i.e. before the GFC), annual value added growth of the total regional economy averaged between 3.5% in Hungary and nearly 7% in Latvia. In contrast, in the 2012-2019 period, value added growth ranged between 1.3% in Croatia and 3.6% in Romania. Hence, the greatest slowdown in value added growth after the GFC was experienced by Latvia (4 pp). In contrast, the declines in Hungary and Poland were relatively moderate, at 0.3 and 0.5 pp, respectively. While growth also slowed in benchmark western EU economies, it did so at a slower pace.

A sectoral decomposition suggests that, despite a noteworthy heterogeneity across sectors and countries, value added growth declined in virtually all industries after the GFC. Figure 4 plots on the horizontal axis the average change in value added growth across countries between the 2000-2008 and 2012-2019 periods, respectively. The vertical axis depicts the standard deviation of these changes across countries. The graph shows that the financial and insurance industry saw the greatest decline in value added growth on average in EU-CEE11 after the GFC (-5.5 pp). However, this slowdown was rather heterogeneously distributed across the region, ranging from -17 pp in Bulgaria to +5.8 pp in Slovakia. Similarly, in the construction sector, value added growth slowed by 5.3 pp on average across the region.[3] However, this was subject to a significant dispersion, ranging from a significant slump (-16.4 pp) in Romania to a (slight) increase in Poland (nearly 3 pp). The manufacturing sector experienced a marked slowdown in value added growth after the GFC in all EU-CEE11 countries, with the decline ranging from -8 pp in Bulgaria to -2 pp in Latvia. The accommodation and services sector is the only one in which value added growth marginally increased on average across the region, with (partially very large) positive and negative changes broadly and evenly distributed across the EU-CEE11 countries.[4]

Figure 3 / Average value added growth and its components

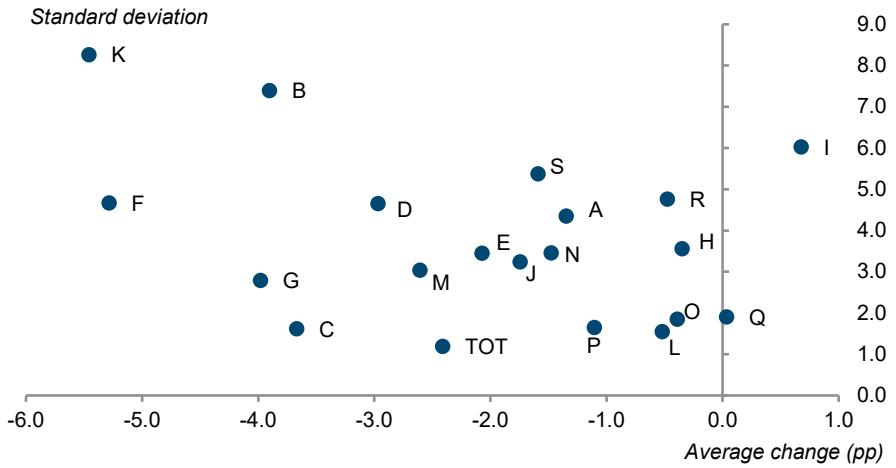


Source: wiiw EU KLEMS

[3] In many countries, the construction and financial sectors were among those with the largest increases before the GFC, which was partially due to overheating in the run-up to the crisis.

[4] It also catches the observer's eye that, on the level of the entire economies, the value added decline happened with the lowest cross-country heterogeneity, suggesting that heterogeneity cancels out across sectors.

Figure 4 / Average change in value added growth between 2000-2008 and 2012-2019 as well as standard deviation of the changes across countries, by sector



Note: TOT=Total economy; A=Agriculture, forestry and fishing; B=Mining and quarrying; C=Total manufacturing; D=Electricity, gas, steam and air conditioning supply; E=Water supply; sewerage; waste management; F=Construction; G=Wholesale and retail trade; repair of motor vehicles and motorcycles; H=Transportation and storage; I=Accommodation and food services; J=Information and communication; K=Financial and insurance activities; L=Real estate activities; M=Professional, scientific and technical activities; N=Administration and support; O=Public administration and defence; P=Education; Q=Health and social work; R=Arts, entertainment, recreation; S=Other services
Source: wiiw EU KLEMS

2.1. TOTAL FACTOR PRODUCTIVITY AS THE MAIN DRIVER OF CONVERGENCE (SLOWDOWN)

While TFP has been the main driver of economic growth, it has also been the main culprit behind the post-GFC slowdown. Figure 3 shows that TFP made by far the largest contribution to value added growth in all EU-CEE11 countries both before and after the GFC. In most of them, the second-strongest driver was capital deepening (i.e. an increase in the capital stock). In some cases, most notably in Slovenia and Hungary, higher employment also boosted economic growth after the GFC. In contrast, average working hours have tended to decline in the region, thereby putting a slight damper on value added growth. Figure 5 shows the decline in value added growth between the two respective periods as well as the factors that contributed to this decline. It suggests that the lion's share of the decline in value added growth is ascribable to a lower contribution by TFP. This holds true for all EU-CEE11 countries even though the extent is different, with the largest decline in Romania and the smallest in Poland. Moreover, especially in Poland, Romania and Hungary, the decline in TFP growth contribution was significantly counteracted by other factors – more specifically, employment in Hungary, an increase in the capital stock in Poland, and a combination of these factors in Romania. The capital deepening in Poland partially captures the infrastructure investment on the back of EU fund inflows and the European football championships However, the peak of this investment boom occurred in the 2009-2014 period, which is only partially covered in the figure.

In a majority of the EU-CEE11 countries, relatively lower TFP also determines the income gap vis-à-vis Germany. A similar approach to the factor decomposition of output over time can be pursued to disentangle the difference in economic development across countries in the so-called development

accounting framework detailed in Appendix II. The decomposition of the economic output per person employed shows that, in most EU-CEE11 countries, the main determinant of the gap between the respective country and Germany is a comparably low level of TFP.[5] In Bulgaria, Lithuania, Poland and Romania, additionally or alternatively, it is also a comparably weak endowment (with capital per unit of output) that drives the income gap relative to Germany. In contrast, human-capital quality provides the sugar coating, as that factor seems broadly comparable to (or even better than) the German level, so it cannot explain the relative income differences.

The fact that potential economic growth slowed in parallel to headline growth suggests structural rather than cyclical drivers in the background and puts a damper on the convergence process. Figure 6 shows estimates made by the European Commission of average potential GDP growth and the decomposition into its driving components. The graph substantiates the decline in potential GDP growth after the GFC, mainly on the back of a significantly lower TFP contribution. After potential growth in the nine years preceding the GFC had averaged between about 3% in Croatia and more than 6.5% in Latvia, it slowed in the crisis-free period after the GFC to a range between 1% in Croatia and 3.5% in Poland. In contrast, in Germany (which we referred to above as to the convergence benchmark), potential growth remained broadly stable before and after the GFC, at 1.3% and 1.5%, respectively. The fact that potential GDP growth – unlike in the benchmark country (Germany) – basically halved in the region allows for two corollaries. On the one hand, the convergence process in EU-CEE11 lost momentum over the last decade or in some instances came to a complete halt. On the other hand, this happened for structural rather than cyclical reasons. As in the case of the valued-added growth decline, the Baltic countries in general and Latvia (-4.7 pp) in particular experienced the strongest slowdown in potential output growth compared to the decade before the GFC. The most noteworthy driving factor behind this trend was TFP, although slower capital deepening (e.g. in Latvia, Slovenia, Estonia or Bulgaria) and/or lower labour supply (Bulgaria, Croatia) also contributed significantly in some cases.[6] In the case of Croatia, about 40% of the decline in labour supply was attributable to lower employment and 60% to fewer hours worked per employed person. In contrast, in Bulgaria, the dent in labour supply was almost entirely driven by fewer employed persons. Interestingly, in Hungary and Romania, a notable improvement in the contribution of labour counteracted the strong downward drag by TFP and capital accumulation. In both countries, it was mainly higher employment that was driving the increase in labour supply, accounting for about 70% in Hungary and for more than 100% in Romania. This implies that about 30% of the labour-supply increase was brought about by more working hours per person employed in Hungary, whereas working hours provided a negative contribution in Romania.

The decline in TFP growth is not a EU-CEE11-specific but rather a widespread phenomenon in both advanced and emerging economies. IMF (2023) finds that dimming growth prospects and an ensuing longer path to convergence are a global phenomenon. The analysis essentially suggests that the decline in per capita output growth relative to that of the early 2000s in both advanced and emerging economies can predominantly be attributed to lower TFP growth.[7] In advanced economies, this is particularly

[5] TFP level is calculated as the residual in the formula derived in Appendix II.

[6] IMF (2016) arrives at the same conclusion. The authors' growth accounting analysis points to lower TFP growth and slower capital accumulation (i.e. weak investment) as the main reasons behind the potential slowdown in growth in most EU-CEE11 countries following the GFC.

[7] More precisely, the analysis focuses on the fact that forecasters have steadily lowered their expectations for growth over the medium term since the GFC. However, forecasts were mostly aligned with actual growth outcomes before the GFC, and they tended to exhibit some upward bias after the GFC (i.e. realised growth outcomes were lower than medium-term projections). Therefore, the findings of the analysis are also applicable to actual growth outcomes.

ascribable to uneven technological progress across sectors (Acemoglu et al. 2023), frictions thwarting efficient resource allocation (Baqaee and Farhi 2020), or weakening returns from innovation (Bloom et al. 2020). In the case of emerging market and developing economies, the IMF sees the main drivers of falling TFP growth in fading effects of technological and educational improvement, in a slowdown in reform momentum, and – looking ahead – in rising fragmentation risks impairing world trade and global value chains. However, there are also significant differences across advanced countries, particularly between the EU and the US. Draghi (2024) asserts that around 70% of the gap in GDP per capita at purchasing power standards between the EU and US is explained by lower productivity growth. However, the difference in productivity growth between the two economic blocs is predominantly ascribable to digitalisation in general and the tech sector in particular. If the latter was excluded, productivity growth in the EU would be comparable to that in the US.

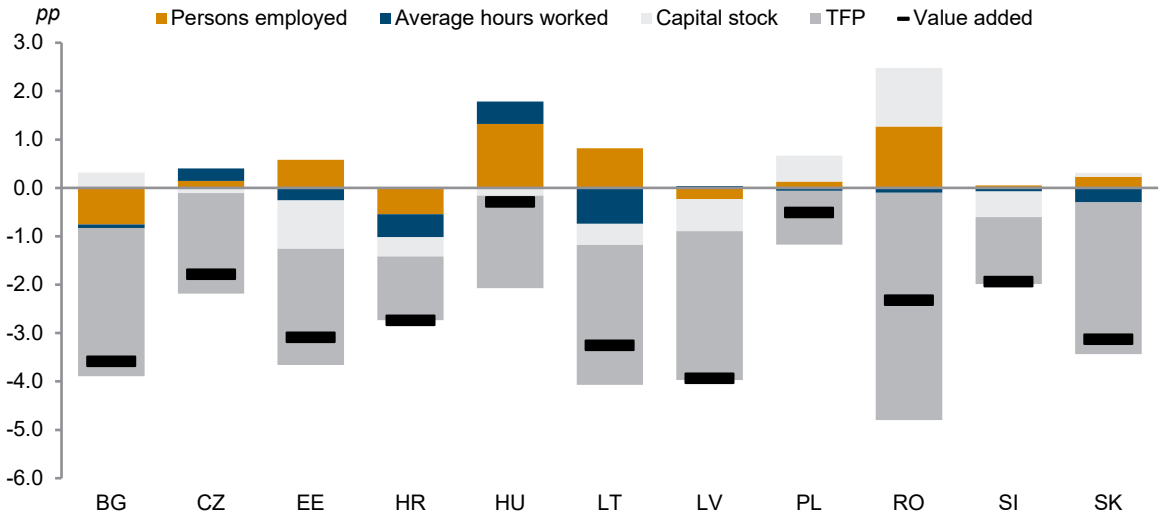
While the rise and fall in TFP growth in EU-CEE11 was mainly driven by external factors, the latter are unlikely to provide a boost in future, which therefore calls for substantial own efforts in EU-CEE11. IMF (2016) analysed in more detail the factors that drove the post-GFC TFP growth slowdown in EU-CEE11. In principle, the authors find that the roots of the decline in TFP growth are not necessarily to be found in the EU-CEE11 countries themselves but rather in advanced economies. On the one hand, there is some evidence that the decline in TFP growth is the result of lower potential output and aggregate demand of the EU-CEE11 economies' main trading partners. On the other hand, it also reflects slower technical progress and therefore TFP growth in frontier economies. At the same time, evidence on positive spill-over effects from foreign to domestic firms is mixed, as Ferrazzi et al. (2024) discuss in detail for the EU-CEE11 region. They find that even though foreign-owned firms appear to be more productive, they are not necessarily more innovative. This corroborates the academic consensus according to which spill-overs from foreign to domestic firms appear quite small and can even be negative (Gregori et al. 2024). Hence, overall, it seems that the buoyant productivity growth experienced in the EU-CEE11 region before the GFC was largely driven by favourable external or common factors. This implies that the (over the last years rather unfavourable) external environment would have to improve dramatically to provide a tailwind to the EU-CEE11's subdued TFP growth. Alternatively, the region will have to make a significant effort of its own to boost TFP growth. Much will depend, in particular, on advancements in digitalisation and the adoption of state-of-the-art technologies, such as artificial intelligence (AI).

2.2. NO CHEERFUL PROSPECTS FOR GROWTH AND CONVERGENCE WHEN LOOKING AHEAD

Potential growth projections for the medium term do not paint a rosy picture. Projections until 2028 expect potential GDP growth to decline further compared to the post GFC-period in a large majority of the EU-CEE11 countries (Figure 6). Hungary and Lithuania are projected to broadly maintain their potential output growth. The only notable exceptions for which potential growth is forecasted to speed up significantly compared to the subdued growth after the GFC are Croatia and Slovenia, though from rather low levels after the GFC. According to the European Commission, GDP growth in Slovenia is expected to accelerate progressively over the forecast horizon on the back of buoyant investment growth in machinery and equipment, among other factors. The stronger investment activity is likely to bring about productivity increases. Similarly, for Croatia, the European Commission forecasts an investment boost provided by EU funds and a further tightening of the labour market, with employment recording solid growth and the unemployment rate reaching record-low levels. The potential

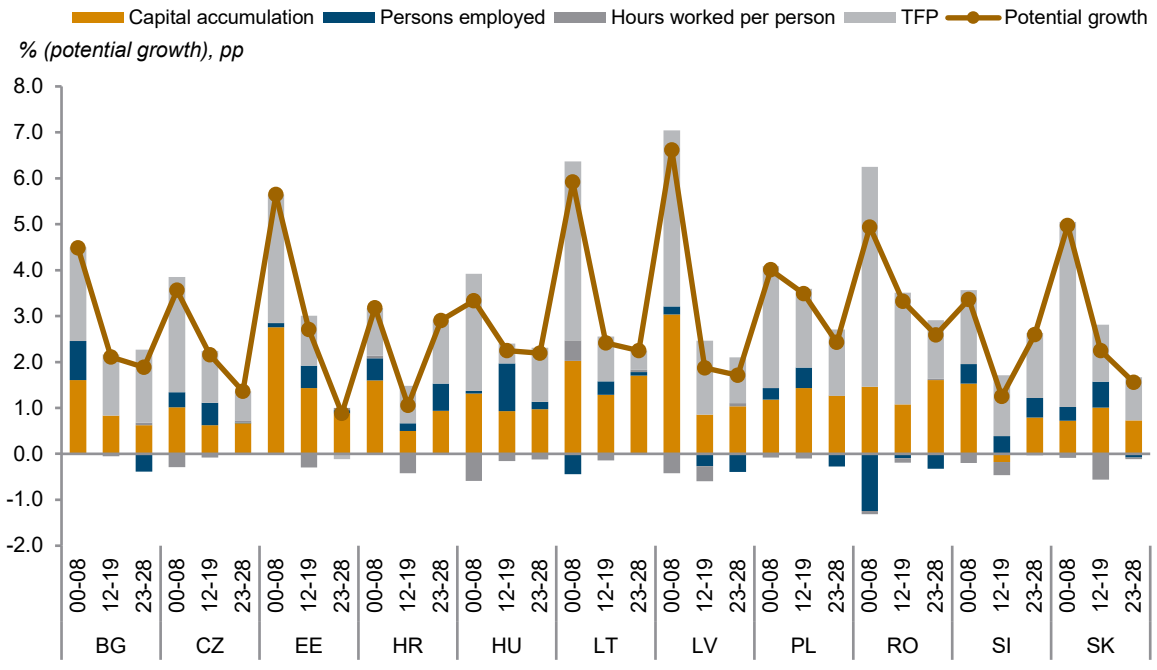
growth outlook in the region is thus projected to remain rather subdued, ranging from a low of 0.9% in Estonia to a high of 2.9% in Croatia, with the levels in Czechia, Slovakia and Latvia being only slightly higher than in Estonia. Since potential output growth in Germany is expected to average 0.8% between 2023 and 2028, the EU-CEE11 region will continue to catch up. Nevertheless, the convergence pace is likely to be subdued in most EU-CEE11 countries or – as in case of Estonia – be close to non-existent.

Figure 5 / Change in average value added growth in the 2000-2008 and 2012-2019 periods as well as its drivers



Source: wiiw EU KLEMS

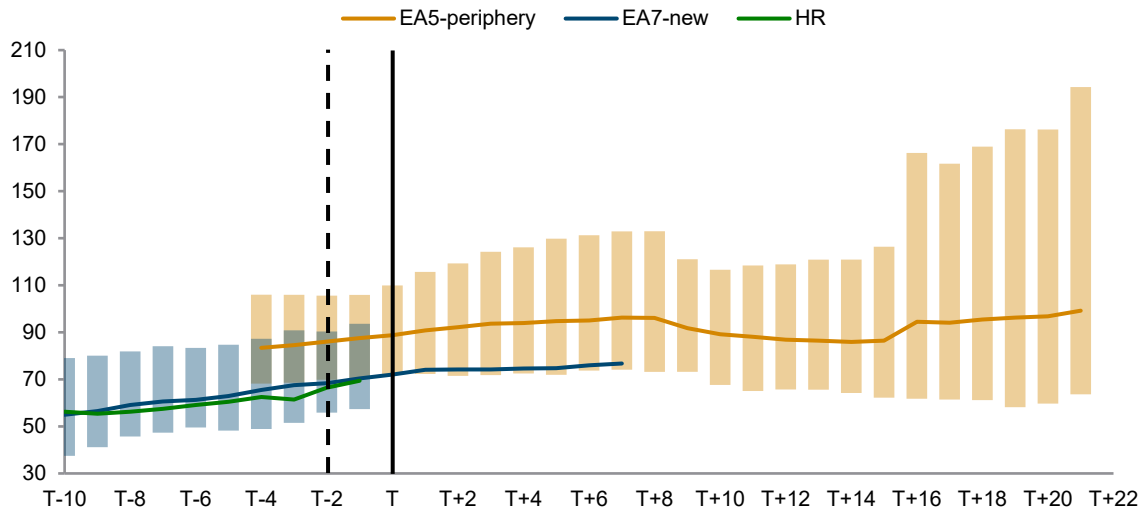
Figure 6 / Factor decomposition of potential GDP growth (estimates)



Source: European Commission

Potential substantial institutional changes (e.g. adoption of the euro) can also not be expected to bring about a boost to economic growth. While the (run-up to) EU accession contributed significantly to the acceleration of economic growth (not only) in the EU-CEE11 countries,[8] empirical evidence on the growth boost provided by the adoption of the single currency has been mixed if not negligible (e.g. Fernández and García Perea 2015; Schreiner 2022; Gros 2018; Franks et al. 2018).[9] Figure 7 visualises GDP per capita developments (in purchasing power standards) relative to the 12 older euro area (EA) members[10] before and after the euro introduction (in time T) in a given country or country group. The bars depict the min-max range in the respective country group. The figure shows that neither in case of the five older EA-periphery countries nor in the case of the seven new EA members[11] did adopting the euro in T or entry into the European Exchange Rate Mechanism (ERM II) in T-2 result in any discretionary growth effect. This is true despite some heterogeneity – especially in the EA5-periphery – as measured by the min-max interval bars for the respective country group. For Croatia, the most recent country to join the EA, the experience has still been too short to allow any reliable conclusions to be drawn.

Figure 7 / GDP per capita (current PPS) before and after euro adoption (in % of EA12)



Note: EA5-periphery defined as: Greece, Ireland, Italy, Portugal and Spain. EA7-new comprises Cyprus, Malta, Estonia, Latvia, Lithuania, Slovenia and Slovakia. The bars depict the min-max range in the respective country group. EA12 consists of EA5-periphery and the seven core EA countries, namely, Austria, Belgium, France, Finland, Germany, Luxembourg and the Netherlands.
Source: Ameco database

[8] See e.g. Crespo Cuaresma et al. (2002) for an empirical analysis of EU membership on older member states and Rapacki and Próchniak (2014) for the impact on the EU-CEE11 countries.

[9] This does not, of course, preclude other possible positive effects of euro adoption (e.g. on financial or price stability) and does not allow for any conclusions regarding the overall cost-benefit balance of euro adoption.

[10] The 12 old EA members consist of seven core countries (EA7-core), namely, Austria, Belgium, France, Finland, Germany, Luxembourg and the Netherlands, as well as five periphery EA countries (EA5-periphery), namely, Greece, Ireland, Italy, Portugal and Spain.

[11] EA-7-new comprises Cyprus, Malta, Estonia, Latvia, Lithuania, Slovenia and Slovakia.

3. A deeper look into individual drivers of past and future growth: production factors and economic structure

3.1. CAPITAL AND OBSTACLES TO INVESTMENT

Despite some improvement, there is still a significant gap in capital stock compared to the benchmarks in advanced economies. Despite the above-described fact that capital deepening did provide a significant contribution to growth in some instances over the last two decades, capital stock remains rather low compared to the benchmark (i.e. Germany). Net capital stock, both per unit of GDP (Figure 8) as well as per person employed (Figure 9), has been continuously rising.[12] Nonetheless, a large gap vis-à-vis Germany (or even larger relative to most other advanced EU countries) persists for all EU-CEE11 countries, especially when it comes to capital stock per person. However, some important caveats need to be borne in mind. To start with, the measurement and quantification of the capital stock is subject to quite a lot of variance, especially across different data sources. In EU-CEE11, in particular, capital stock measurements are heavily affected by the underlying assumption regarding the pre-transition stock of capital. In addition, the sheer amount of capital stock does not seem to be strongly correlated with the level of development, as Figure 8 and Figure 9 suggest. Countries with very similar levels of development in terms of GDP per capita (e.g. Austria and Germany or the Nordic countries) have substantially different capital stock endowments in some cases.

Figure 8 / Net capital stock per unit of GDP (Germany = 100%)

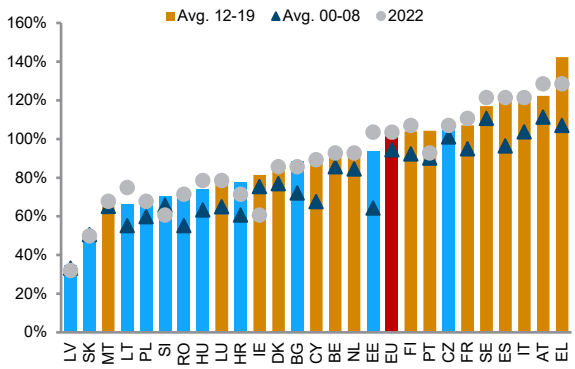
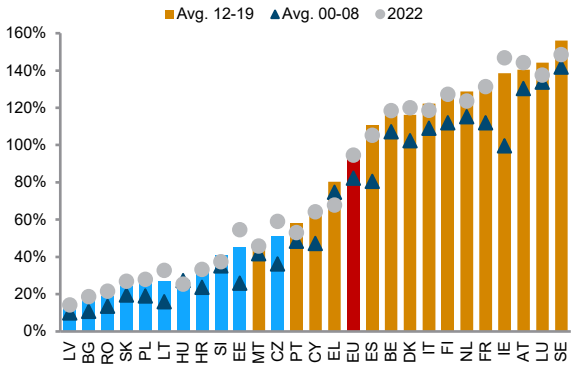


Figure 9 / Net capital stock per person employed (Germany = 100%)



Source: Eurostat

[12] Capital stock figures always need to be interpreted with a grain of salt, as they are subject to variations depending on the way capital stocks are constructed.

Has investment been too low to meet investment needs? Providing a conclusive answer to this question is an extremely challenging task, as any quantitative analysis is subject to a high degree of uncertainty with respect to data, measurement and methodology (Bubbico et al. 2017). In addition, assessing the investment gap is dependent on cyclical conditions. Regarding the methodology, there is a plethora of approaches to estimating the optimal pace of capital accumulation. These may range from some sort of historical experience of other countries (via benchmarks resulting from a steady-state investment-to-output ratio in a neoclassical growth model) to an empirical estimation that assumes some sort of long-run relationship between investment and growth.[13] It goes without saying that the choice of the method and data sources as well as the necessary assumptions and parameters strongly affect the outcome. To get a feeling for what can be interpreted as a lower bound for the investment rate (see IMF 2016), we apply a simple benchmark derived from the assumption of a constant capital-to-output ratio, which results from neoclassical growth models. Hence, under the assumption of a constant capital-to-output ratio (k^*) as well as a calibrated path for economic growth (g) and capital depreciation (δ), it is possible to derive the corresponding capital-preserving investment-to-output ratio (i^*) as follows:

$$k^* = \frac{K_0}{Y_0} = \frac{K_1}{Y_1} = \frac{K_0(1-\delta) + I_1}{Y_0(1+g)}$$

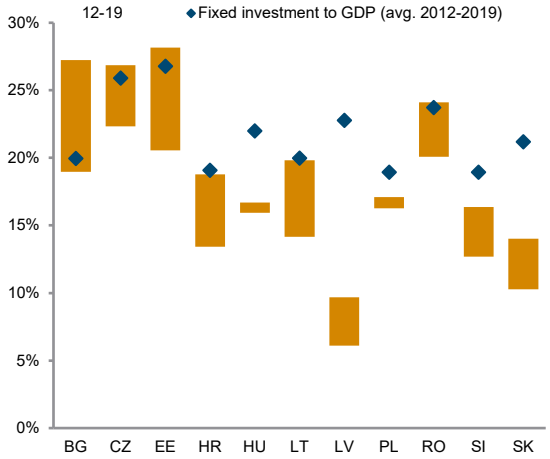
Here, K_t, Y_t and I_t denote, respectively, the capital stock, output and investment at time t in a given country. After some reshuffling, this results in the following formula for the steady-state investment ratio (Bubbico et al. 2017; Lewis 2014):

$$\frac{I_0}{Y_0} = \frac{I_1}{Y_1} = i^* = k^* \frac{(g+\delta)}{(1+g)}$$

Investments appear to have been mostly sufficient to preserve the capital-to-output ratio, at least if benchmarked against the lower bound for investment rate. To quantify the above-derived formula, we assumed k^* to equal the country-specific average capital-to-output ratio in the 2012-2019 period and, accordingly, δ to equal the average capital depreciation in the same period. For the steady-state economic growth (g), we assumed both the average growth in the 2012-2019 period and the (significantly) higher average growth in the 2000-2008 period in all EU-CEE11 countries. The two different parameters for g thus give a range for the capital-preserving investment ratio i^*. Of course, all of these parameter assumptions can be challenged. In particular, it is questionable whether the (as we have seen above) comparably low capital-to-output ratio, as it averaged in the 2012-2019 period, should plausibly be assumed to be the steady-state capital-to-output ratio. Similarly, it is uncertain which assumption should be made for the steady-state economic growth. Obviously, a higher capital-to-output ratio and/or steady-state growth would bring about higher capital-preserving investment ratios. This is also why the range presented in Figure 10 should not only be taken with a grain of salt but also as the very lower bound. The figure shows that actual average investment in the 2012-2019 period was either above or within the capital-preserving investment range in all EU-CEE11 countries. Hence, at least if compared to the lower bound, investment seems to have been sufficient after the GFC to preserve the capital stock-to-output ratio.

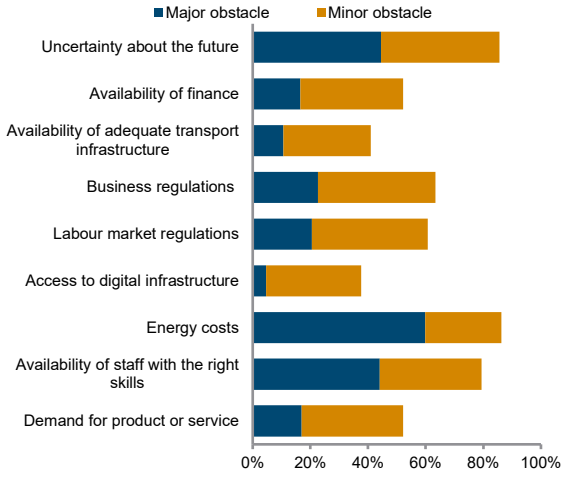
[13] See Bubbico et al. (2017) or IMF (2016) for a more detailed discussion and application of these methods in the EU-CEE11 context.

Figure 10 / Capital-preserving investment (range) vs. actual investment (% of GDP)



Source: authors' calculations based on Eurostat, Penn World tables

Figure 11 / Limiting factors to EU-CEE11 firms' investment (shares of firms reporting the respective obstacle category)



Source: EIB Investment Survey, 2023 wave

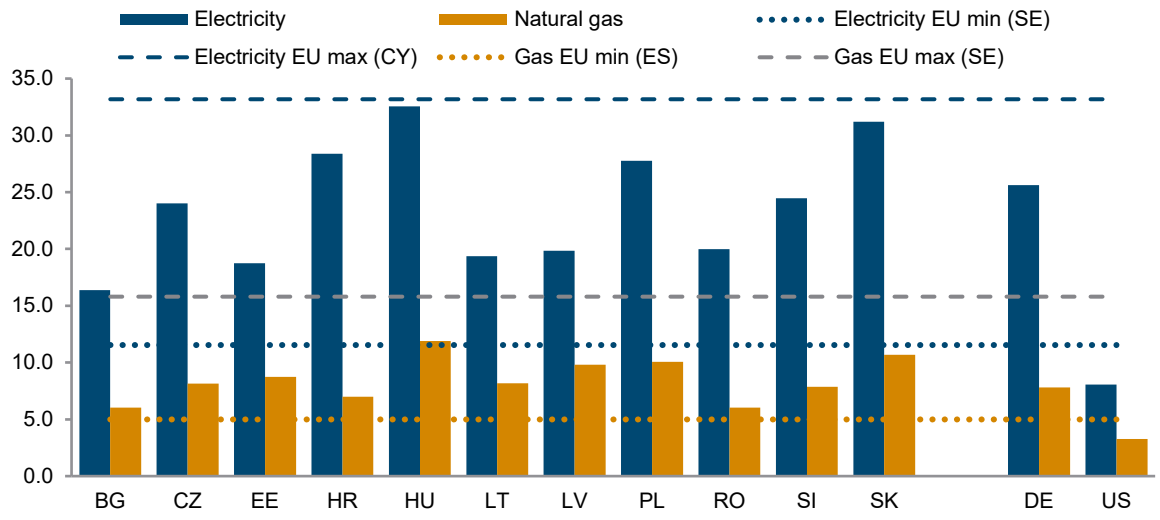
However, rather than just in terms of quantity of the capital stock, there might be an even more important gap with respect to the quality of capital. While quantifying the investment gap is a challenging task, there is some tangible evidence that the EU-CEE11 region is particularly lacking when it comes to the quality of capital. For example, Bubbico et al. (2018) find that a higher share of firms in EU-CEE11 than in other EU countries report comparably insufficient quality of machinery and equipment, energy-efficiency standards, and information and communication technology (ICT). A large number of firms do not perceive these sorts of capital stock to be state-of-the-art. This suggests significant needs for structural investment in EU-CEE11 with regard to the quality of capital (Bubbico et al. 2017).

Uncertainty, energy costs and the availability of skilled staff are the key factors preventing firms from making bigger investments. On the macroeconomic level, IMF (2016) investigated possible reasons for investments hovering rather on the low side both before and after the GFC. While there is limited evidence that investments might have been impaired by low savings and constrained external borrowing space in some instances as a result of sustainability concerns, the results are inconclusive and not very strong. Therefore, a microeconomic perspective might be more insightful. According to the 2023 wave of the Investment Survey of the European Investment Bank (EIBIS), nearly 60% of EU-CEE11 firms reported that energy costs pose a major obstacle to their investments, while it is only a minor obstacle for another 27%. For a similarly high number of firms, uncertainty about the future prevents them from making higher investments. The third-most-important factor that impedes capital formation in EU-CEE11 is a lack of skilled labour. This is a major obstacle for nearly half of the companies in EU-CEE11 and a minor one for another 35% of the responding companies (Figure 11). It is worth mentioning that not only in EU-CEE11 but also in the EU as a whole, these three factors pose the major obstacles to investment.

Recently, firms in EU-CEE11 have had to deal with rather expensive energy. Energy costs tend be on the high side in EU-wide let alone global comparison. In 2023, industrial prices of electricity in EU-CEE11 ranged from about 16 euro cents per kWH in Bulgaria to nearly 33 cents in Hungary, or (well)

above the EU minimum of 11.5 cents in Sweden. However, in six EU-CEE11 countries, electricity prices for industrial firms were roughly equal to or above the German level. Moreover, in Hungary and Slovakia, electricity prices come very close to the EU-wide maximum (33 cents in Cyprus). Even though the heterogeneity is rather large in the US as well, on average, industrial firms in the US paid some 8 euro cents per kWH in 2023, or roughly between 25% and 50% of what EU-CEE11 firms had to pay. Hence, while firms in the EU in general face (significantly) higher prices for electricity than their global competitors (e.g. those in the US), electricity prices in EU-CEE11 tend to be on the upper end even within the EU. Expensive electricity implies – in addition to several undesirable direct and indirect effects – much slower digital diffusion, as modern digital technologies, particularly AI, consumer large amounts of energy. The situation on the gas market is only slightly easier. Prices for firms in EU-CEE11 averaged some 6 cents per kWH in Romania and Bulgaria in 2023, which was close to the EU-wide minimum (5 cents in Spain). At 12 cents per kWH, Hungary had the highest gas prices in the EU-CEE11 region. However, the distance to the EU-wide peak (16 cents in Sweden) was more significant than in the case of electricity. Nonetheless, for firms in seven EU-CEE11 countries, gas was (in some cases significantly) more expensive than it was in Germany (7.8 cent) and, similarly to electricity, it cost 2-4 times more than in the US. Against this background, which sheds some light on energy efficiency and (dependence on) energy provision, it is obvious that firms in EU-CEE11 face comparative disadvantages with respect to energy prices not only in the EU-wide but particularly in global comparison. EU-CEE11 governments should therefore make every effort to render energy cheaper for firms in their countries. Among other things, this would entail investing in energy-generation and -distribution infrastructure, optimising tax and subsidy policies, and addressing deficiencies and inefficiencies of the (incomplete European) energy market (Draghi 2024).

Figure 12 / Industrial prices of electricity and gas in 2023 (in euro cents per kWH)



Note: Prices include all taxes and levies.
Source: Eurostat, U.S. Energy Information Administration

Moreover, firms are sensitive to (increases in) energy costs, as output in EU-CEE11 continues to be very energy-intensive despite substantial improvements in the last decades in some cases. As Table 1 shows, output in EU-CEE11 remains very energy-intensive as measured in terms of energy usage per unit of GDP. This holds true despite the fact that, except for Hungary and Romania, all EU-CEE11

countries managed to reduce – in some cases dramatically – the energy intensity of their output over the last two decades. These improvements notwithstanding, energy intensity in all EU-CEE11 countries is well above the EU average. Even Slovenia, the relative best performer in the region, uses 1.4 times more energy per unit of real GDP than the EU on average. In contrast, in the 2000s, Bulgaria managed to substantially reduce its energy usage per output after having one of the highest levels in the region. However, energy intensity has stagnated since then. As a result, Bulgaria has the largest room for improvement among its EU-CEE11 peers, as each unit of Bulgarian output requires 2.6 times more energy than in the EU.

Table 1 / Energy intensity (Energy usage per unit of real GDP)

BG		CZ		EE		HR		HU		LV		LT		PL		RO		SI		SK		EU27	
2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021	2000	2021
13.8	8.0	12.0	5.4	8.1	4.6	7.1	5.4	6.9	6.8	7.6	6.0	8.3	5.1	8.7	6.4	4.6	5.9	5.6	4.2	14.9	5.3	4.0	3.1
347%	258%	302%	175%	204%	148%	178%	176%	173%	221%	191%	195%	209%	167%	219%	206%	116%	190%	142%	136%	375%	173%	100%	100%

Note: Numbers in the top row as well as the spark line in the second row are expressed in PJ (petajoules) of energy usage per real GDP in bn EUR. The coloured third row expresses energy intensity relative to the EU27 in % (i.e. EU27=100%). The darker the red/green shade, the higher/lower the percentage relative to the EU27.
Source: Eurostat

While the chemical industry, the production of non-metallic minerals, and the food industry are large energy consumers across the board, specific industries stick out on top in some countries. A more granular view of relative energy consumption by industrial sectors (Table 2) suggests that the chemical and petrochemical sector is the highest or second-highest relative industrial energy consumer in a majority of countries. The sector uses up to 35% (in Lithuania) of all industrial energy consumption. In most countries, the mining and production of non-metallic minerals (e.g. sand, gravel, limestone, clay and marble) are also large relative energy consumers. So is the food industry in about half of the EU-CEE11 countries. In addition, specific industries stick out in some countries. For instance, in Slovakia, the iron and steel industry uses more than a quarter of all industrial energy consumption. A particular case in point is the wood industry in Latvia, which uses almost 60% of all industrial energy. Worthy of note is the fact that the automotive industry (i.e. transport equipment) is relatively frugal in terms of energy consumption even in countries where industry plays a particularly prominent role (e.g. Czechia, Hungary and Slovakia). The concentration of energy consumption is quite heterogenous across the EU-CEE11 region. Hence, the five most energy-consuming sectors in each country use between 66% (Czechia and Slovenia) and more than 92% (Latvia) of all industrial energy.

The largest industrial energy consumers rely heavily on fossil-based energy sources, whose relative costs are set to rise. Figure 13 shows relative shares of energy sources in the five most energy-consuming sectors for each EU-CEE11 country. Fossil-based sources (i.e. oil, gas and solid fossil fuels) provide between roughly 40% (in Slovakia) and almost 70% of energy in the five most energy-consuming sectors. Latvia is a notable exception, as the wood industry (which dominates energy consumption) largely relies on renewables. In all other countries, the share of renewable energy sources is comparatively small, ranging from 2% in Croatia to 12% in Slovakia. Hence, it is plausible to assume that the currently biggest industrial energy consumers are likely to face significant upward price pressures on their energy bills. This is because prices of fossil-based energy, which currently dominates

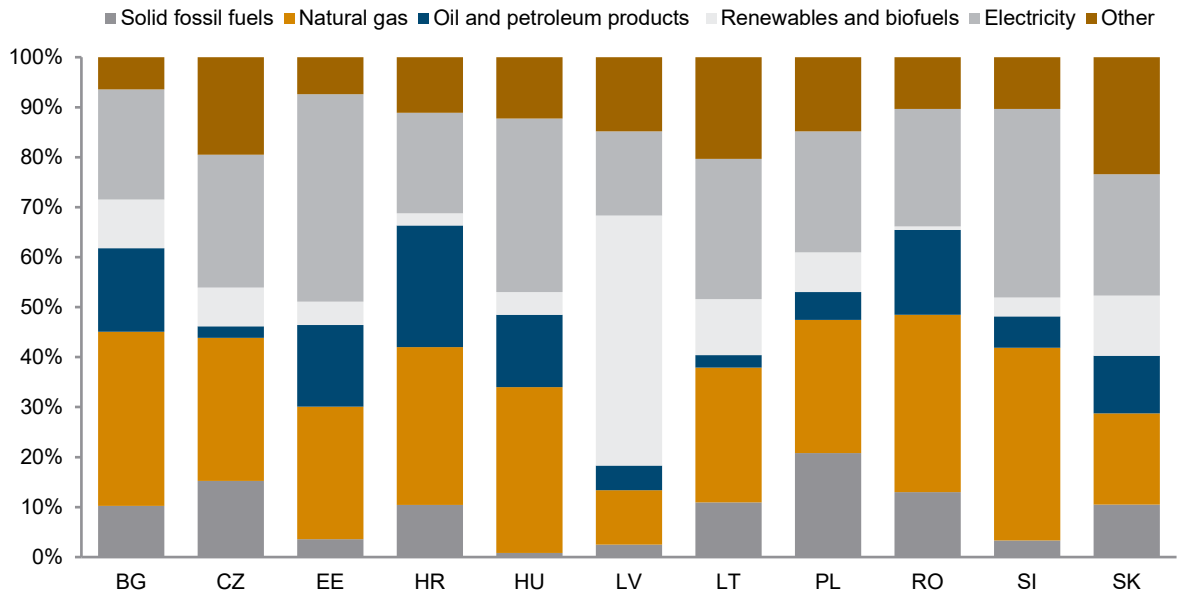
in all EU-CEE11 countries except Latvia, are set to increase relative to renewables in the course of the green transition.[14]

Table 2 / Relative energy consumption by sector (% of total industry energy consumption, average for the 2019-2021 period)

	BG	CZ	EE	HR	HU	LV	LT	PL	RO	SI	SK
Chemical and Petrochemical	29%	16%	8%	12%	26%	3%	35%	19%	23%	12%	14%
Construction	3%	2%	11%	10%	7%	3%	4%	1%	6%	3%	1%
Food, Beverages and Tobacco	9%	9%	16%	15%	15%	9%	17%	13%	9%	5%	5%
Iron and Steel	4%	14%	0%	2%	4%	0%	0%	9%	17%	12%	26%
Machinery	5%	10%	8%	5%	11%	2%	3%	5%	6%	14%	7%
Mining and Quarrying	6%	1%	1%	1%	1%	1%	1%	3%	1%	1%	2%
Non-Ferrous Metals	7%	1%	0%	2%	2%	0%	0%	3%	6%	10%	8%
Non-Metallic Minerals	21%	17%	13%	32%	13%	19%	15%	19%	18%	16%	13%
Not Elsewhere Specified	3%	5%	5%	4%	7%	3%	8%	5%	2%	6%	5%
Paper, Pulp and Printing	7%	11%	15%	7%	6%	1%	5%	11%	2%	12%	13%
Textile and Leather	2%	2%	2%	2%	1%	1%	3%	1%	2%	1%	1%
Transport Equipment	1%	8%	2%	1%	5%	1%	1%	3%	4%	3%	5%
Wood and Wood Products	3%	3%	18%	8%	3%	58%	9%	7%	4%	4%	1%

Note: The darker the red/green shade, the higher/lower the share of energy consumption of the given sector in total industry energy consumption within a given country.
Source: Eurostat

Figure 13 / Figure 13: Relative shares of energy sources in the five most energy-consuming sectors in a given country



Source: Eurostat

[14] This obviously also holds true for fossil-based electricity production, which is not disentangled in the figure.

3.2. LABOUR AND LABOUR PRODUCTIVITY

In terms of labour force participation, the labour supply in EU-CEE11 is broadly comparable to the relevant benchmarks. In most EU-CEE11 countries, the share of total labour force in the population increased over the last two decades, with Hungary being the most striking case in point (Figure 14). At the same time, the share of employed labour force also increased in all EU-CEE11 countries and by as much as 13 percentage points in Slovakia and Bulgaria. As a result, labour force participation has broadly kept up with the EU average in general and Germany in particular. Table 3 presents labour force participation in EU-CEE11 and the EU27 relative to Germany.[15] Overall, total labour force participation of men in EU-CEE11 is broadly in line with the one in Germany and the EU27 average, with Croatia being an outlier on the downside. This also generally holds true for the overall labour force participation of women, although the figure is relatively low in Croatia, Poland and Romania. Despite some shifts across the countries over the last two decades, labour force participation relative to Germany has not substantially changed for men in EU-CEE11 overall. For women, it has declined somewhat on average in EU-CEE11 relative to Germany, but it is still comparable to the EU average. Nonetheless, these relatively unremarkable developments of the EU-CEE11 aggregate mask some striking specific instances. For example, while the labour force participation of men in Bulgaria nearly caught up with that in Germany over the last 20 years, the labour force participation of women witnessed a significant drop relative to Germany in a few countries, most notably in Poland and Romania.

Nonetheless, there are pockets of underutilised labour potential that could be activated. In EU-CEE11 overall, labour force participation of the oldest cohort has remained broadly unchanged relative to Germany for men (Table 3). Nonetheless, in some countries – particularly Croatia, Lithuania, Romania and Slovenia – there is a significant gap vis-à-vis Germany. The gap is either bigger than in the past in some cases, or the gap used to not be there but has now emerged. Turning to labour force participation of women in the cohort 55-64 years, most EU-CEE11 countries have made a quantum leap relative to Germany over the last two decades. One particularly striking exception is Romania, whose position deteriorated dramatically relative to Germany. This is because labour force participation of women in the oldest cohort has more than doubled in Germany since 2000, while it has dropped from 44% to 37% in Romania. Despite improvements in most instances, in some countries (e.g. Croatia, Poland, Romania and Slovenia), there still seems to be unutilised labour potential in this cohort among women. However, a particularly outstanding gap in labour utilisation in EU-CEE11 relative to the EU average and, even more so, to Germany can be discerned in the youngest cohort. On average, young male labour force participation in EU-CEE11 amounts to about 63% of the German level and is as low as just 47% in Bulgaria. For women in the same age group, the underutilisation is even more pronounced, averaging about 56% in EU-CEE11 and standing at a mere 37% of the German level in Romania. In addition, the intertemporal developments between 2000 and 2022 reveal some striking (and mostly not very encouraging) trends. While labour force participation among the youth deteriorated over the last two decades in most EU-CEE11 countries, it plummeted in some of them (e.g. Czechia and Slovakia). To be sure, these figures have been brought about to a large extent by a significant (statistical) increase in tertiary education enrolment.[16] Nonetheless, as the readings might still signal a worrying downtrend in labour force engagement among young people (particularly women) and highlight a significant potential

[15] Labour force participation is defined as the share of the labor force (employed and unemployed) in the total working-age population. Germany in a given year and category is set to 100.

[16] In Czechia and Slovakia, tertiary education enrolment increased rapidly, from about 30% of the entire cohort in 2000 to roughly 70% and 52%, respectively, in 2022 – a much faster increase than in Germany.

for increased economic engagement, they deserve deeper analysis, which would go beyond the scope of this paper. Further pockets of underutilised labour are dormant among minorities (e.g. Roma), (Ukrainian) refugees and the structurally (long-term) unemployed. In addition, un(der)utilised labour potential could be activated by increasing inter-regional labour mobility within countries. According to the World Economic Forum's Global Competitiveness Index, internal labour mobility is especially weak in the Central European countries and Romania, which brings about large regional disparities in unemployment rates. Various structural factors – including regional differences in educational attainment, sectoral specialisation patterns and inflexible housing market structures – impair labour mobility (Schreiner 2022). Hence, this evidence calls for a deeper analysis of the drivers and socioeconomic factors at play to potentially prompt policy interventions aimed at bolstering employment.

Table 3 / Labour force participation relative to Germany

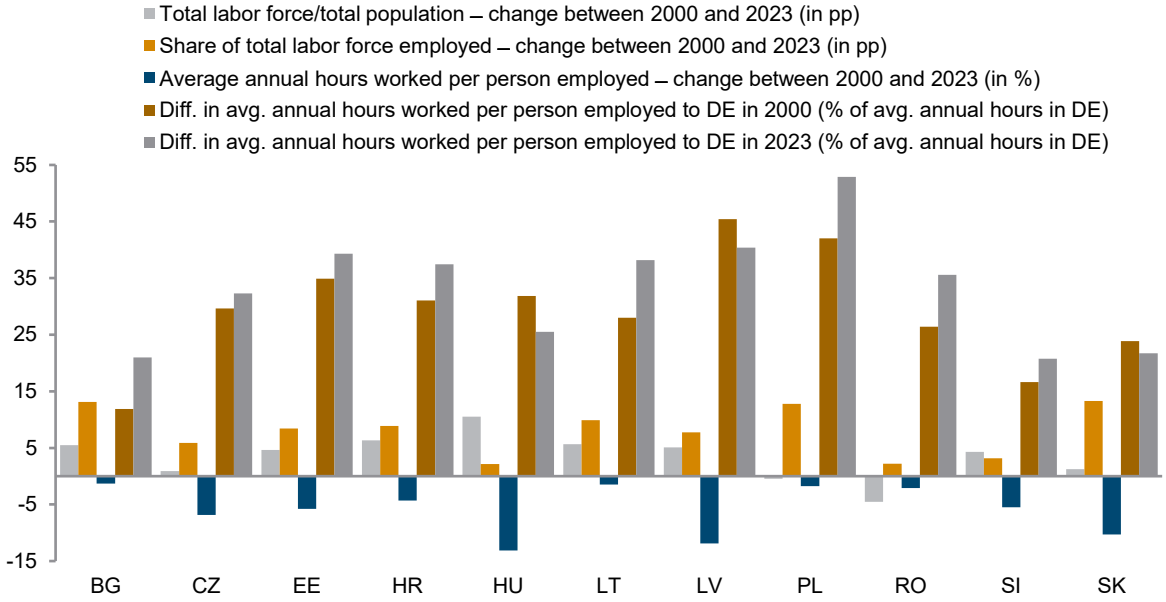
	Men						Women					
	15 to 24		55 to 64		Total		15 to 24		55 to 64		Total	
	2000	2022	2000	2022	2000	2022	2000	2022	2000	2022	2000	2022
BG	64	47	73	96	82	95	55	36	35	92	90	90
CZ	94	56	104	101	105	102	84	46	71	96	105	93
EE	95	73	114	95	106	107	77	95	118	111	119	108
HR	n.a.	71	n.a.	73	n.a.	87	n.a.	58	n.a.	67	n.a.	83
HU	76	61	65	100	92	109	67	54	40	81	93	108
LT	76	65	110	94	99	102	63	71	107	105	111	105
LV	79	69	103	92	97	102	65	65	87	104	101	99
PL	75	63	77	89	108	98	72	52	71	64	122	89
RO	84	56	109	76	105	93	76	37	131	52	115	75
SI	76	68	66	78	96	95	76	65	42	74	105	97
SK	90	58	78	88	102	101	88	40	32	91	107	100
EU27	88	78	93	91	100	96	84	75	83	83	99	93

Note: Germany in a given year and category=100. The colour formatting ranges from dark red for the lowest value across all categories to dark green for the highest value, while 100 (i.e. Germany) is highlighted in yellow.
Source: Eurostat

Stimulating latent labour supply appears even more essential in light of rather gloomy projections of working-age population developments in the decades to come. Figure 15 shows that most EU-CEE11 countries will be confronted with a significant decline in the working-age population. Relative to 2005, it is projected to decline by about 14% in Czechia and nearly 50% in Bulgaria, which reflects aging populations, emigration and a generally lower life expectancy than in advanced countries.[17] In addition, in some countries (e.g. Bulgaria and Croatia), the adverse structural long-term trends were noticeably exacerbated during the COVID-19 pandemic. Except for in Czechia, the shrinkage in working-age populations is forecasted to be much more dramatic in the entire EU-CEE11 region than in Germany or the EU on average. Against this background, the above-suggested measures to increase labour supply by activating underutilised labour sources appear particularly compelling.

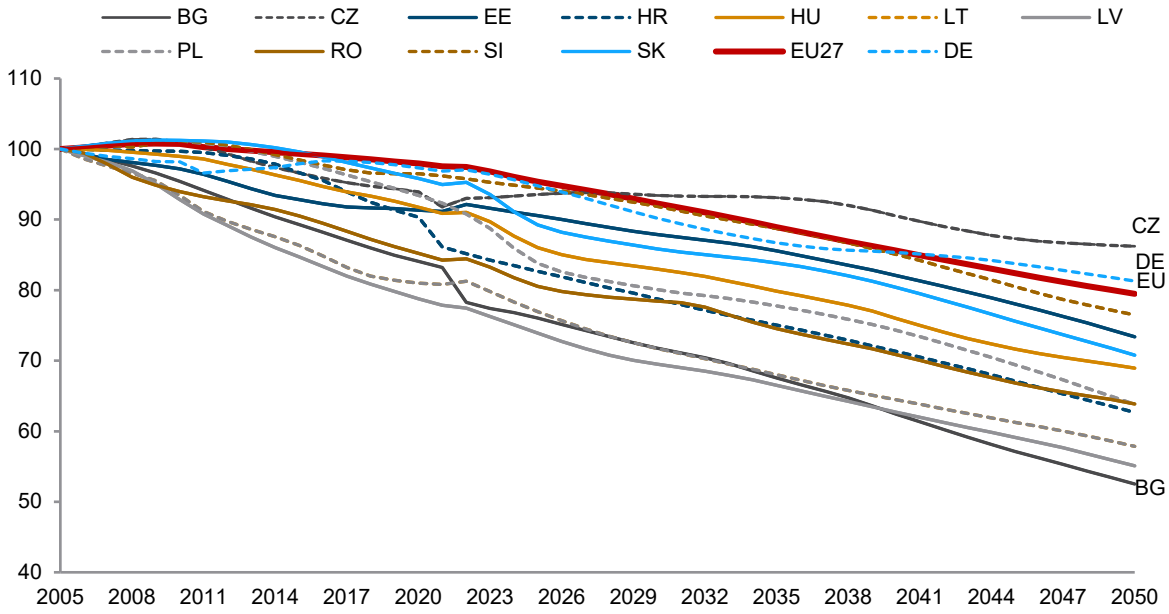
[17] While the World Bank projections shown here might look gloomier than those provided by other institutions (e.g. the UN or Eurostat), the trends are obvious and uncontroversial.

Figure 14 / Labour supply development (in % or pp, as indicated)



Source: AMECO

Figure 15 / Projection of developments in working-age populations (population aged 15-64, 2005=100)



Source: World Bank

Despite decreasing working hours, people in EU-CEE11 work significantly longer hours than their counterparts in Germany and the EU. Figure 14 shows that, in absolute terms, average annual hours worked per person employed declined in all EU-CEE11 countries between 2000 and 2023. The decline ranged between just above 1% in Bulgaria to 13% in Hungary, averaging roughly 6%. However, since average working hours per person also declined over the same time period in the EU (5.5%) and in

Germany (8.7%), employed persons in EU-CEE11 still work significantly longer hours relative to these benchmarks. Moreover, the difference in average hours worked relative to Germany increased over the last nearly quarter of a century. Hence, a person employed in EU-CEE11 clocks between roughly 20% (Bulgaria, Slovenia, Slovakia) and more than 50% (Poland) more hours per year than in Germany. In absolute numbers, with roughly 1,600 hours per year, workers in Bulgaria, Slovakia and Slovenia work roughly the same number of hours as the EU average, compared to about 1,340 hours in Germany. With 2,045 hours per year, Poland sticks out even among the EU-CEE11 countries.

The long-term trend to ever-shorter working hours across Europe has largely been driven by individual preferences, which intensified during the pandemic, rather than structural shifts in job profiles. Astinova et al. (2024) show that, in contrast to the recovery in overall employment across Europe since the pandemic, average hours worked have resumed their pre-COVID long-term declining trend. Country-specific regressions suggest that the latter has particularly been driven by young people, especially men and men with young children. This trend was exacerbated by the pandemic, as people have learned to place a higher emphasis on their work-life balance, particularly due to the increased need to share household duties during lockdowns. Against this background, the authors' further findings hit the same mark, as they show that actual hours worked have generally been falling in line with desired hours worked.[18] Hence, it is mostly a matter of individual preference rather than a necessity or consequence of external factors. Moreover, there is also no composition effect – in other words, workers tend to work fewer hours within the same jobs rather than switching to jobs with lower numbers of working hours.

Longer working hours in EU-CEE11 reflect, among other things, significantly lower labour productivity in EU-CEE11 relative to the benchmarks. In 2019, or before the pandemic, labour productivity – expressed in value added per hour worked – ranged from between about 22% of the EU average in Bulgaria to 67% in Slovenia. The gap vis-à-vis Germany was even larger. Bulgaria thus reached only 16.5% and Slovenia about 50% of German labour productivity (Figure 16). Despite these still relatively modest labour productivity levels compared to advanced EU benchmarks, the gap vis-à-vis the latter has been closing continuously. Over the 20 years before 2019, the gap in labour productivity relative to Germany narrowed by between 3.7 pp in Croatia and 15.4 pp in Estonia. Similarly, relative to the EU average, the gap closed by 4 pp and 20 pp, respectively, in the same two countries.

Moreover, growth in labour productivity has slowed in nearly all EU-CEE11 countries and in many of their sectors, even though it is not a EU-CEE11-specific phenomenon. As Figure 17 shows, in all EU-CEE11 countries except Poland, labour productivity growth has significantly slowed compared to the first decade of the century. This is not necessarily a EU-CEE11-specific or unique phenomenon, as labour productivity growth has also declined globally and in the EU, although the decline has been less pronounced. In fact, the continuous decline in labour productivity growth is a long-lived global (and somewhat puzzling) trend with a myriad of possible global as well as country- and sector-specific explanations. These include, for example, declining innovation and adoption activities in some sectors, decreased allocative efficiency, adverse demography, institutional and regulatory factors, and a relative loss of importance of the industrial sector.[19] A closer sectoral view at EU-CEE11 suggests that growth in manufacturing labour productivity decreased across the board in all EU-CEE11 countries, especially in Czechia, Hungary, Romania and Slovakia, where the decline ranged from roughly 5 pp to 7 pp between

[18] There are some groups – most importantly women with young children – that work shorter hours (e.g. part-time arrangements) involuntarily.

[19] See e.g Lopez-Garcia and Szörfi (2021) or Deutsche Bundesbank (2021).

the first decade of this century and the non-crisis years in the second decade (see Table A.2). As a result, it has been a major driver of the overall decline given its large weight in the overall value added. In contrast, developments in other sectors have been rather heterogeneous across the EU-CEE11 region in the two periods under study. Particularly striking is the massive decline in labour productivity growth in the ICT sector in Bulgaria (-11 pp) and Latvia (-7.6 pp) between the first and the second (non-crisis) decade of the 2000s. Similarly, the financial sectors in Bulgaria (-16 pp) and Latvia (-9 pp) also experienced a strong decline, contrasting with a relatively strong increase in Slovakia and, to a lesser extent, Czechia and Estonia.

Figure 16 / Labour productivity relative to EU and DE (%)

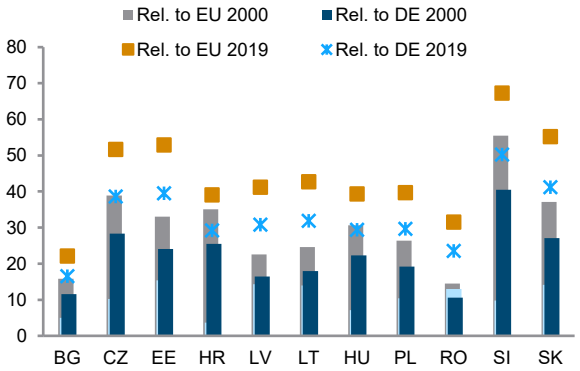
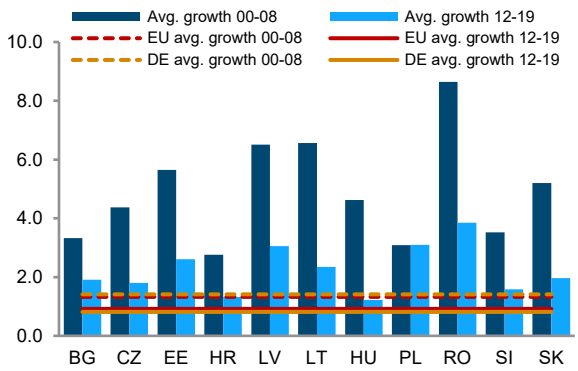


Figure 17 / Average annual growth in labour productivity in 2000-2008 vs. 2009-2019 (%)



Source: Eurostat

The decline in labour productivity growth has mainly been driven by lower TFP growth, followed by a lower contribution of tangible non-ICT capital. Subject to data availability, labour productivity growth can be decomposed into the contributions by TFP and capital deepening. The so-called Luiss EUKLEMS & INTANProd database allows for a further breakdown of capital deepening into intangible capital as well as into tangible capital in the ICT and non-ICT sectors, respectively. Figure 18 shows that a reduced contribution by TFP was the key driver of the decline in labour productivity in most EU-CEE11 countries. In some countries (e.g. Croatia, Estonia and Latvia), insufficient investment in tangible non-ICT capital seems to have also contributed noticeably to the decline in labour productivity growth. While this is broadly in line with the decomposition of valued added presented in Figure 5, it should also be noted that it does not necessarily contradict calculations of the capital-preserving investment levels in Figure 10. As was highlighted above, apart from the fact that those investment levels should be interpreted (with a pinch of salt) as the investment lower bound, the capital stock itself may not be sufficient to spur labour productivity even if these investment levels were sufficient to preserve the capital stock.

The decline in TFP can potentially be ascribed to fading innovative capacity, which tends to be further dampened in aging societies. As mentioned above, comprehensive analyses of the underlying driving forces in the literature particularly point to structural factors behind the decline in TFP. Deutsche Bundesbank (2021) finds evidence that one crucial element of those structural factors has been the diminishing ability of some economic sectors to innovate and adopt innovations. Moreover, the innovative ability of enterprises may be further weakened in the wake of the adverse demographic developments. Indeed, it is not only the fact that aging societies imply declining labour force growth, but also that they impair business dynamics and innovation capacity. Kaltenberg et al. (2023) find that

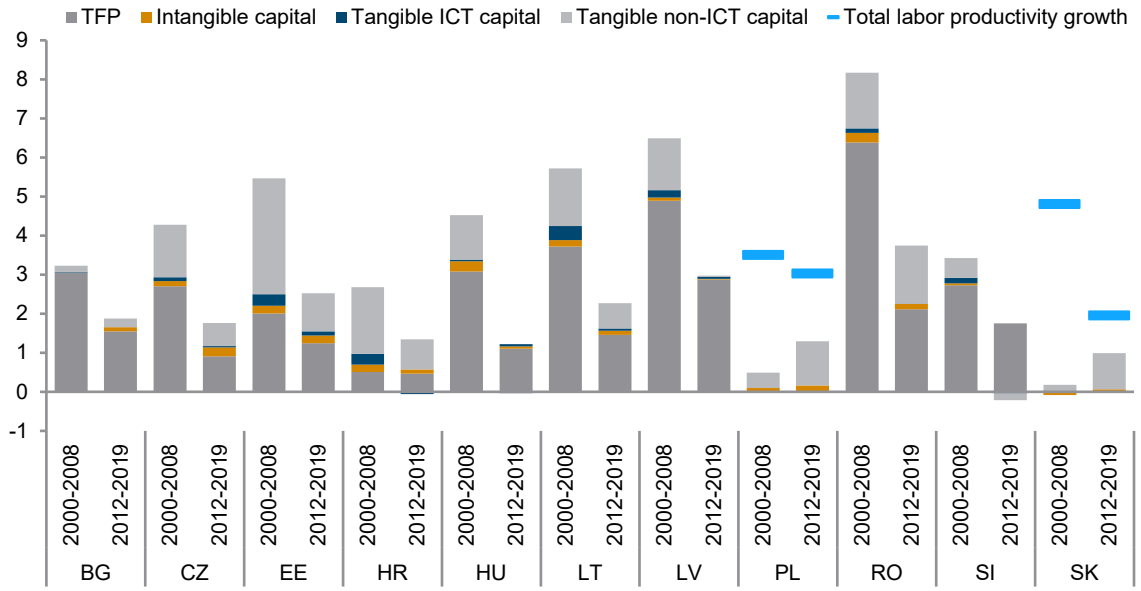
people's creative thinking peaks in the period between their late 30s and early 40s and that young people are much more likely to come up with 'disruptive inventions' (i.e. innovations that are completely novel and discipline-changing). In other words, Schumpeterian creative destruction seems much less likely in greying societies. Against this background, a thorough analysis of the innovative capacity and potentials in EU-CEE11 would be warranted. While it would go beyond the scope of the present paper, Ferrazzi et al. (2024) address the issue in depth.

A brief glimpse at the innovative performance of the EU-CEE11 region draws not only a rather heterogeneous picture, but also one that is not too bright overall. One possible metric that gives some initial insight into innovative capacities of countries is the so-called Global Innovation Index (GII), whose roughly 80 indicators are meant to capture as complete a picture of innovation as possible. Among the EU-CEE11 countries, only Estonia ranked among the top 30 countries (out of 132 evaluated worldwide) in the GII for 2023. The other EU-CEE11 countries' ranks ranged from 31 for Czechia to 47 for Romania (Figure 19). This can be interpreted as only a mediocre performance, as all remaining EU countries except Greece score within the top 30, ranging from second place for Sweden to 30th place for Portugal. Moreover, six of the EU-CEE11 countries saw their places in the global ranking deteriorate over the last 10 years, although the others saw their ranks improve (most significantly Estonia, from 25th to 16th place). However, the picture appears less encouraging when looking at the absolute GII score. The world's best innovators – including Germany, the particularly relevant benchmark for EU-CEE11 – have largely increased their innovation capacity (i.e. GII score) since 2013. In contrast, all EU-CEE11 countries except Estonia have seen their GII score deteriorate, although this was only very marginal in the case of Lithuania.

Furthermore, the decline in labour productivity growth is primarily explained by intra-sector dynamics rather than by the reallocation of resources across different sectors. The relative importance of sectors in terms of value added and/or employment in the economy may change over time in the wake of structural shifts or sector-specific shocks. Such changes may imply moves in labour productivity. Hence, given the decline in labour productivity growth between the period before the GFC (2000-2008) and the crisis-free years thereafter (2012-2019), the question arises as to what extent this decline was driven by cross-sector reallocation of resources (i.e. the so-called inter-industry effect) and factors within the given sectors (i.e. the so-called intra-industry effect). In other words, while the inter-industry effect is driven by the change in relative sectoral weights, labour productivity across sectors is (notionally) kept constant. In contrast, the intra-industry effect gauges the changes in labour productivity in a given sector while sectoral weights are kept constant.[20] Figure 20 presents the result of this so-called shift-share analysis, which decomposes the slowdown in labour productivity into the intra- and inter-industry effects. The graph shows rather unambiguously that the decline in labour productivity growth was almost exclusively due to intra-industry dynamics (i.e. declining labour productivity growth within the given sectoral structure). A possible corollary of this finding could be that, in the future, no major changes in labour productivity growth can be expected from potential structural shifts in the economy.

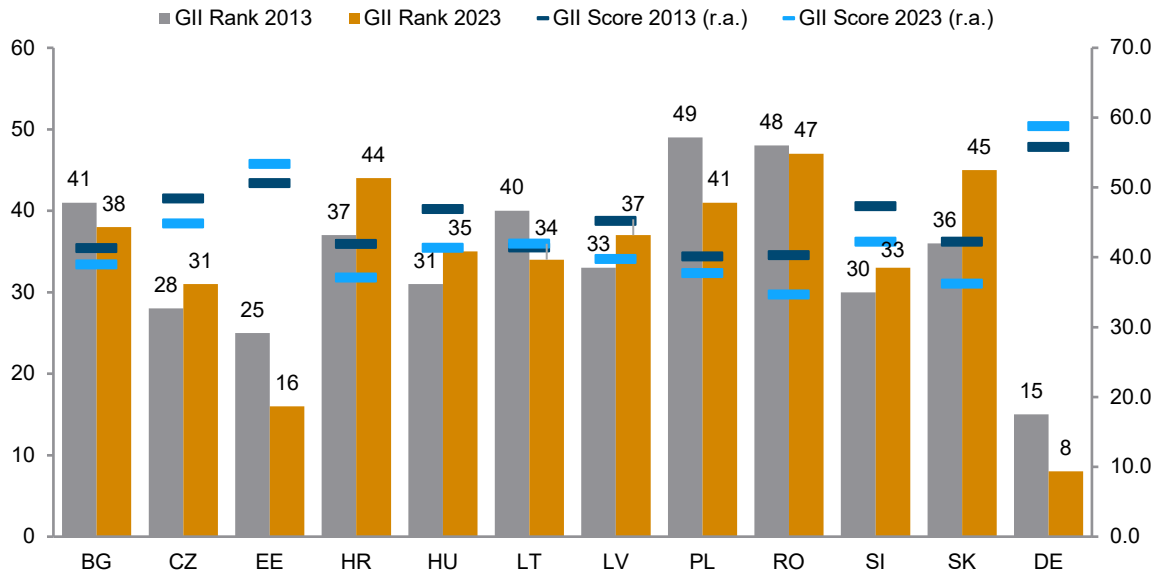
[20] For the sake of completeness, there is also a so-called interaction effect, which captures the interplay between sectoral productivity growth and changes in sectoral weights. However, the interaction effect is typically negligible.

Figure 18 / Decomposition of labour productivity growth (%)



Source: Luiss EUKLEMS & INTANProd database.

Figure 19 / Global Innovation Index – worldwide rank (left axis) and score (right axis) in 2013 and 2023

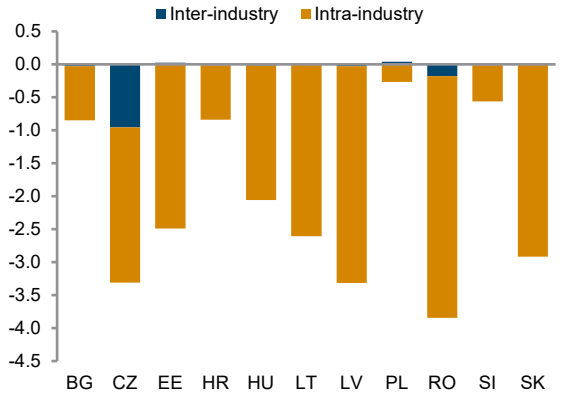


Source: Global Innovation Index Database, WIPO

Looking ahead, as EU-CEE11 will grow richer and continue catching up, working hours in the region are set to continue falling and to converge towards those in wealthier countries. Astinova et al. (2024) corroborate similar findings in the literature, according to which (a) workers in wealthier countries (i.e. those with higher GDP per capita) tend to clock fewer average working hours and (b) average hours worked converge across countries over time. Hence, countries with lower GDP-per-capita levels tend to

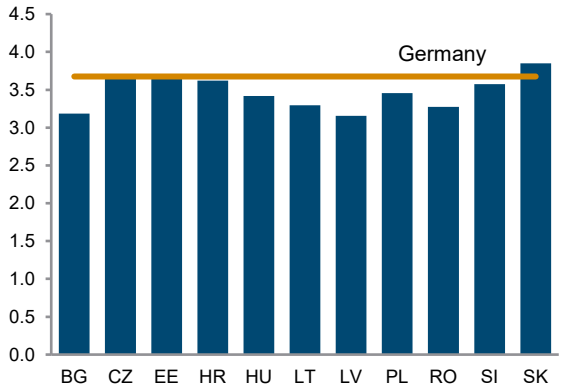
exhibit longer working hours but also experience larger declines of the latter as they catch up with richer countries. This is because, in line with results established in the literature, the income effect outweighs the substitution effect in determining workers' labour supply. As incomes rise, workers chose to work fewer hours and to prioritise leisure over additional income even though the opportunity costs of leisure increase with rising wages. Against this backdrop, the decline in average hours worked is likely to continue in the future in general and in (relatively poorer) EU-CEE11 countries in particular. The pace of decline in working hours relative to Germany and the EU average will particularly hinge on the economic convergence paths. Advanced European countries close to the technological frontier are projected to experience only modest reductions in working hours over the medium term, as their productivity gains are forecasted to be only moderate. In the longer term, their path of working hours will depend on the impact that large structural forces (e.g. climate change, demography and AI) will have on growth. In contrast, according to Astinova et al. (2024), EU-CEE11 countries, which are relatively poorer and farther away from the technological frontier, exhibit relatively stronger productivity growth prospects, as they will continue catching up with their more advanced European counterparts. As a result, they are likely to experience more significant declines in working hours.

Figure 20 / Shift-share analysis: inter- and intra-industry factors of the slowdown in labour productivity growth between the 2000-2008 and 2012-2019 periods



Source: wiiw

Figure 21 / Human Capital Index (scale 0-5), 2019



Source: PWT 10.01 (Feenstra et al. 2015)

On a positive note, by and large, the EU-CEE11 economies are still endowed with human capital that is comparable or even outperforming the benchmarks in advanced economies. The Human Capital Index, which captures years of schooling and returns on education, shows levels in most of the EU-CEE11 countries comparable to those in Germany (Figure 21). The EU-CEE11 countries also compare well with advanced European countries in many other indices measuring standard human capital and education (see Table A.3 in Appendix I). At comparably lower costs – relative to GDP and particularly in absolute terms – EU-CEE11 countries have fairly well-educated and skilled workforces. For the sake of illustration, in general, 15-year-old students perform on par with their average EU peers in the PISA tests gauging reading, mathematics and science skills. While there is some room to catch up in a few countries (e.g. Bulgaria and Romania), students in several other EU-CEE11 countries (especially in Estonia, Poland and Slovenia) outperform their EU counterparts. Similarly, tertiary education systems in most EU-CEE11 countries supply a significant number of young graduates with degrees in technical

STEM subjects (i.e. science, technology, engineering and mathematics) to the labour market. While workers with such skills have been in high demand on the labour market, looking ahead, occupations in STEM fields are projected to significantly outgrow those in the rest of the economy. Moreover, workers with STEM skills are particularly prone to migrate to more advanced countries.

Nevertheless, some countries need to intensify their efforts to keep up with the international competition when it comes to providing highly skilled labour. While Croatia and particularly Hungary have managed to strongly improve their competitive edge with respect to STEM graduates relative to the EU average in recent years, all other EU-CEE11 countries have lost ground – in some instances significantly. In particular, Bulgaria, Czechia, Latvia and Slovakia have experienced rather adverse developments, which have been exacerbated to varying extents by outward migration. Hence, looking ahead, some EU-CEE11 countries need to make sure that they stay on the ball to keep up with the international competition when it comes to their technical human capital endowment. Moreover, skill mismatches – in the sense that available skills are not employed in relevant occupations – have tended to be worse in EU-CEE11 than in advanced European countries, in part due to deficiencies in labour market policies and institutions (IMF 2016). The available evidence also suggests that the skills of Ukrainian refugees are also being sub-optimally allocated. In countries where they have found refuge in great numbers (particularly Poland and Czechia), they often work in low-skilled jobs and are thereby underutilising their potentials (Jirka et al. 2023).

3.3. ECONOMIC STRUCTURE AND THE MIDDLE-INCOME TRAP

Despite some loss of relative economic significance, manufacturing – and particularly in the automotive industry – remains the key sector in most EU-CEE11 countries. To shed more light on the established stylised fact that economic growth and the pace of convergence in EU-CEE11 got off the fast track following the GFC, we start by looking at changes in the structure of the EU-CEE11 economies. Table 4 shows the changes in industry shares in value added between 2000 and 2019. Some observations are striking. For example, in nearly all EU-CEE11 countries, relative economic importance (in terms of generated value added) shifted away from agriculture, mining and manufacturing (except for in Poland and Bulgaria). While Bulgaria and Romania saw the greatest decline in the relative significance of agriculture and forestry, the sector still maintains some of the highest value added shares among EU-CEE11 countries, at nearly 4% and 5% in 2019, respectively (Figure 22). This is more than twice as much as the lowest readings, in Czechia and Slovakia (both about 2%, which is broadly in line with the EU average). While mining and quarrying only plays a secondary role in EU-CEE11, as it does in the EU in general, manufacturing remains – despite some loss of relative importance over the last 20 years – the key sector in the region. Apart from in Croatia, Estonia and Latvia, manufacturing is the sector with the highest value added share. While it as high as 25% in Czechia, (more than) every fifth euro generated in the respective economy stems from the manufacturing sector in Hungary, Poland, Slovakia and Slovenia. Hence, in a majority of the EU-CEE11 countries, manufacturing plays a relatively much more important role than in the EU on average (17%), and it partially even outperforms Germany, the established manufacturing behemoth. Within the manufacturing sector, the food, textiles, wood and coke industries have mostly lost their relative importance in their respective economies. In contrast, manufacturing of motor vehicles and transport equipment experienced a significant extension in the region, especially in Czechia, Hungary, Poland, Romania and Slovakia. Since Hungary and Poland are

increasingly turning into leading producers of batteries for electric vehicles in Europe, the relative importance of the automotive sector there might further increase in the medium term.

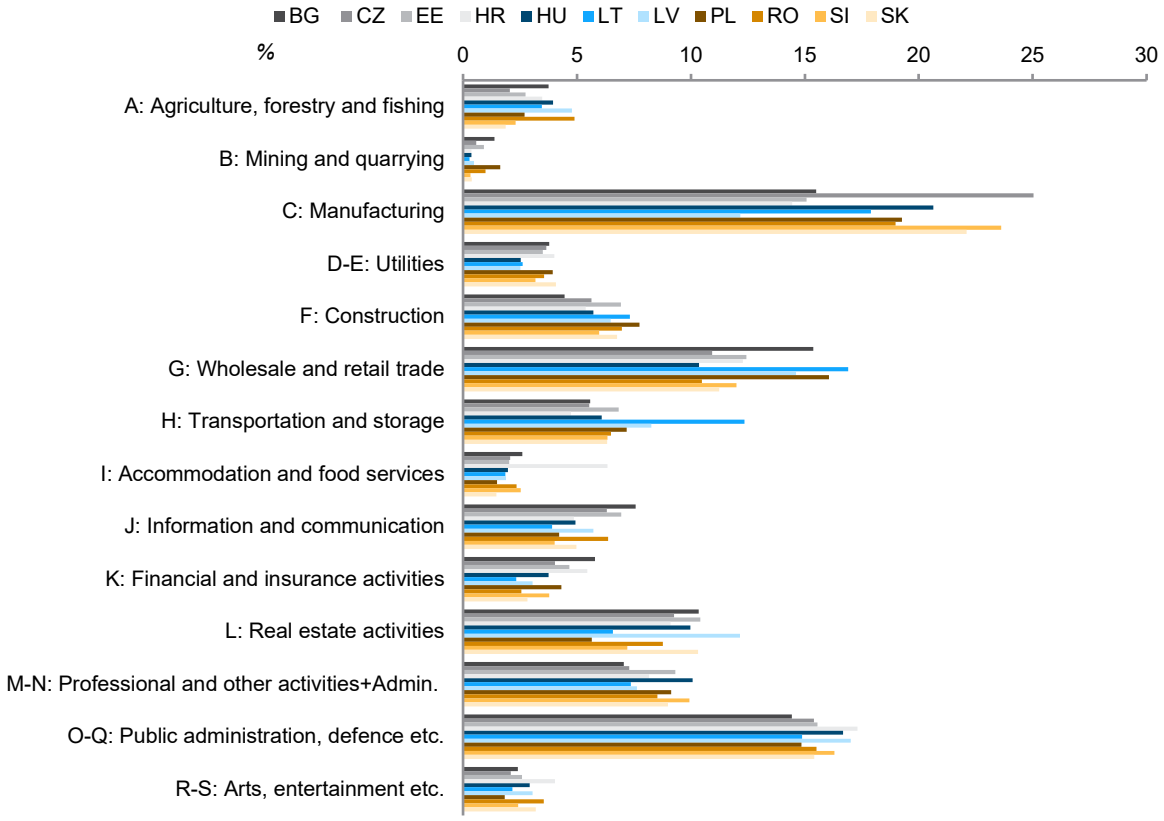
Table 4 / Change in industry shares in value added between 2000 and 2019 (in pp)

NACE-Code	Description	BG	CZ	EE	HR	HU	LT	LV	PL	RO	SI	SK
A	Agriculture, forestry and fishing	-8.8	-1.5	-1.6	-2.5	-1.8	-2.8	-0.2	-0.8	-7.1	-1.2	-0.1
B	Mining and quarrying	-0.4	-0.7	-0.3	-0.3	0.1	-0.4	0.4	-0.8	-1.3	-0.3	-0.4
C	Manufacturing	1.9	-0.6	-2.2	-5.7	-1.8	-1.0	-3.0	1.2	-3.0	-1.2	-0.5
C10-C12	Food, beverages and tobacco	-0.3	-1.3	-1.3	-1.0	-1.3	-1.1	-2.6	-0.1	-1.8	-1.0	-1.4
C13-C15	Textiles and wearing apparel	-0.5	-0.9	-1.8	-0.9	-1.2	-2.6	-1.3	-0.5	-1.0	-1.7	-1.2
C16-C18	Wood, paper, printing and rep.	0.3	-0.3	-0.2	-0.1	-0.4	0.1	-0.4	-0.1	-0.5	-0.8	-0.9
C19	Coke and refined petroleum	-1.7	-0.4	0.3	-1.4	-0.4	0.0	0.0	0.1	-0.4	0.0	-0.3
C20-C21	Chemicals and pharmaceuticals	-0.3	-0.5	-0.3	-1.7	0.1	0.4	0.4	-0.2	-0.4	0.7	-0.8
C22-C23	Rubber and plastic products	0.9	-0.5	-0.2	-0.4	0.3	0.4	0.7	0.0	-0.1	0.2	0.1
C24-C25	Basic metals and metal products	0.8	-0.2	0.6	0.3	-0.2	0.5	0.0	1.0	-0.4	0.5	0.0
C26-C27	Computer, electronic and optical production, electrical equip.	0.8	1.0	0.7	-0.4	-0.7	-0.3	0.4	-0.2	0.1	-0.3	0.3
C28	Machinery and equipment n.e.c.	0.4	0.2	0.2	0.0	0.3	0.3	0.0	0.0	-0.2	0.7	0.3
C29-C30	Motor vehicles and transport equipment	0.4	2.4	0.0	-0.3	1.1	0.1	0.0	0.9	1.8	0.7	3.6
C31-C33	Installation of machinery, other machinery	0.9	-0.1	-0.5	0.2	0.5	2.1	-0.1	0.3	-0.1	0.0	-0.1
D-E	Utilities	-1.5	0.0	0.1	0.4	-1.5	-1.4	-1.6	0.2	0.0	0.2	-0.1
F	Construction	-0.7	-0.5	1.0	0.5	0.7	1.3	-0.5	-0.5	1.2	-0.5	1.1
G	Wholesale and retail trade; repair of motor vehicles	4.8	-0.8	-0.2	1.2	0.6	0.2	0.1	-3.8	-1.1	1.2	-2.3
H	Transportation and storage	-2.7	-1.7	-3.9	-0.5	0.4	3.9	-3.6	2.0	0.1	1.1	-0.6
I	Accommodation and food services	0.3	-1.2	0.4	2.8	-0.1	0.3	0.8	0.3	0.0	0.2	-0.2
J	Information and communication	4.4	2.0	1.7	0.1	-0.1	-0.9	0.1	0.7	0.9	0.2	1.1
K	Financial and insurance activities	3.4	0.9	0.4	1.1	0.2	0.3	-0.3	-0.4	-1.9	-1.0	0.1
L	Real estate activities	-1.2	1.4	-0.9	-0.2	1.4	-0.2	5.6	-0.7	0.7	-0.6	0.0
M-N	Professional, scientific, technical activities+Admin. and support	2.7	1.3	4.5	3.5	3.0	3.5	1.9	2.6	5.8	2.7	2.1
O-Q	Public administration, defence, social sec., human health	-2.5	1.8	1.0	-2.0	-0.9	-2.7	-0.3	0.3	5.1	-0.1	-1.2
R-S	Arts, entertainment and recreation+other services	0.3	-0.4	0.0	1.7	-0.1	-0.1	0.4	-0.2	0.5	-0.8	1.1

Note: The colour shadings range from dark green to dark red marking, respectively, the greatest increase/decrease in value added shares across the region.
Source: Luiss EUKLEMS & INTANProd database

Services mostly provided by the public sector (e.g. public administration, defence, and social and health services) constitute the second main pillar in a large majority of EU-CEE11 economies. However, with a value added share ranging from 14.5% in Bulgaria to just above 17% in Hungary (Figure 22), the size of the public sector is distinctly smaller than the EU average (nearly 19%). In Bulgaria, Lithuania and Poland, wholesale and retail trade contributes more to overall value added than the public sector (more than 15%, nearly 17% and 16%, respectively). Hence, the wholesale and retail sector in Poland remains the second-biggest among EU-CEE11 countries despite a notable relative decline over the last two decades. In contrast, the sector has substantially strengthened in Bulgaria.

Figure 22 / Industry shares in value added in 2019



Source: Luiss EUKLEMS & INTANProd database

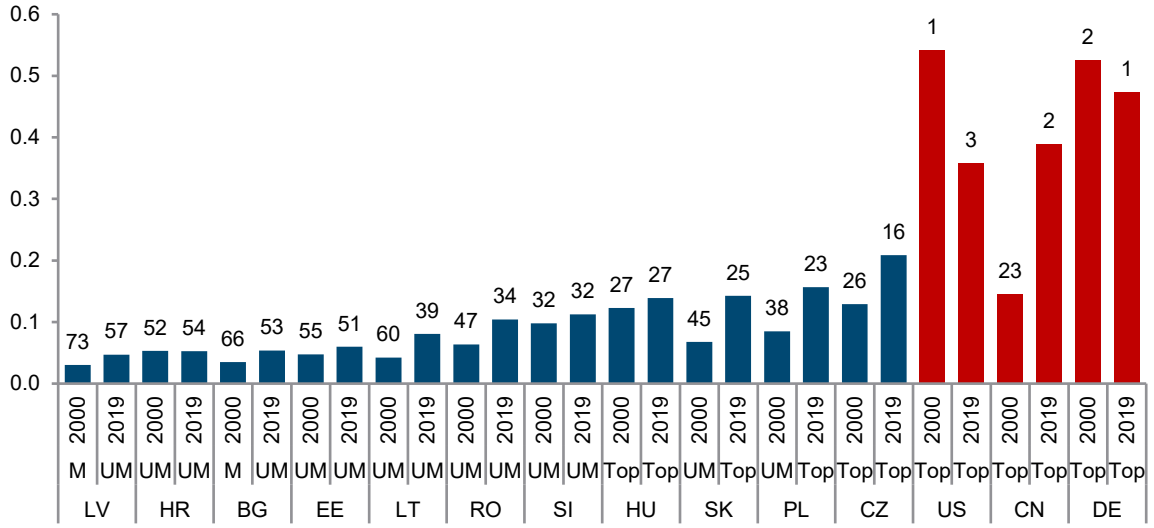
The manufacturing sector in EU-CEE11 countries has increased its competitiveness and, in some aspects, it ranks among the world's top performers. The Competitive Industrial Performance Index (CIP) is a composite measure compiled by the United Nations Industrial Development Organization (UNIDO) to serve as a non-linear combination of various indicators. This index benchmarks a country's ability to produce and export manufactured goods competitively along three dimensions: (i) capacity to produce and export manufactures; (ii) technological deepening and upgrading; and (iii) world impact. Figure 23 shows that, except for Croatia, the CIP score for all EU-CEE11 countries has increased over the last two decades and that all countries improved their relative position in the global ranking.[21] In 2019, Latvia's manufacturing sector held rank 57, the worst among EU-CEE11 peers, while the best performer in the region, Czechia, ranked 16th in the global ranking. Whereas there is still a significant gap vis-à-vis the competitive leaders (i.e. Germany, China and the US), the manufacturing sectors of Czechia, Hungary, Poland and Slovakia rank among the top 20% of performers worldwide. The latter two countries, in particular, have made a quantum leap in terms of competitiveness since 2000. The remaining EU-CEE11 countries are in (or have advanced to) the second-best (i.e. upper middle) quantile. A closer look at some of the subdimensions of the CIP reveals even more cheerful prospects. Figure 24 plots the industrial export quality index in 2000

[21] The reader might find it striking that while the EU-CEE11 manufacturing sectors improved their competitiveness according to the CIP, the region mostly deteriorated in terms of the innovative capacity according to the above-described GII. This is not necessarily a contradiction, as the two indices gauge different things. Obviously, the EU-CEE11 countries have established themselves as competitive manufacturing hubs without superb innovation capacity. In a way, these findings can be interpreted as a corroboration of the functional specialisation trap detailed below.

and 2019 on the horizontal and vertical axes, respectively. As the vertical distance above the 45-degree no-change line suggests, all EU-CEE11 countries except Croatia and Estonia have improved their industrial export quality. In some instances, such as Romania and Slovakia, the rise was particularly remarkable – and even higher than in China. What is more, the quality of industrial exports in Czechia, Hungary and Slovakia is compatible with (if not better than in) Germany.[22]

In addition, the structure of the manufacturing sector has shifted towards medium- and high-tech manufacturing. Figure 25 shows the value added share provided by medium- and high-tech manufactures in total manufacturing value added (again for 2000 on the horizontal axis and for 2019 on the vertical one). As the climb above the 45-degree no-change line suggests, most EU-CEE11 countries have promisingly increased their relative production of medium- and high-tech goods, most strikingly in the cases of Romania and Slovakia. Although this structural refocusing of the manufacturing sector is certainly welcome, it also must be borne in mind that the shift has largely been driven by the fact that the EU-CEE11 economies have increasingly been losing competitiveness in some manufacturing sectors (e.g. food and textiles) on the back of rising labour costs (relative to global competitors). As a result, the manufacturing structure has been shifting towards more competitive medium- to high-tech industries, particularly automotive. While this may possibly also imply some upgrading towards higher value added, the fact that the EU-CEE11 countries produce more in the medium- and high-tech industries (e.g. assembly in automotive) does not automatically imply higher value added.

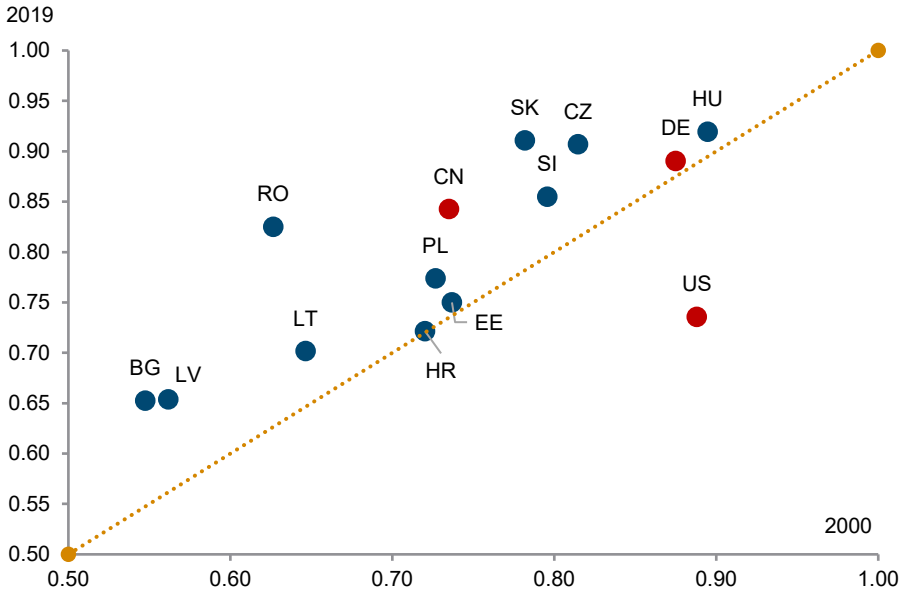
Figure 23 / Competitive Industrial Performance Index (CIP), worldwide rank and quantile



Note: Countries are ordered according to CIP level in 2019. Labels above bars show the worldwide rank in terms of the CIP. The acronyms 'M' (=Middle), 'UM' (=Upper-Middle) as well as 'Top' show the quantile that a given country belongs to in the global distribution.
Source: UNIDO

[22] Benkovskis and Wörz (2018) show that export quality in EU-CEE11 increased particularly due to higher quality of imported inputs rather than due to the value added in the respective EU-CEE11 country.

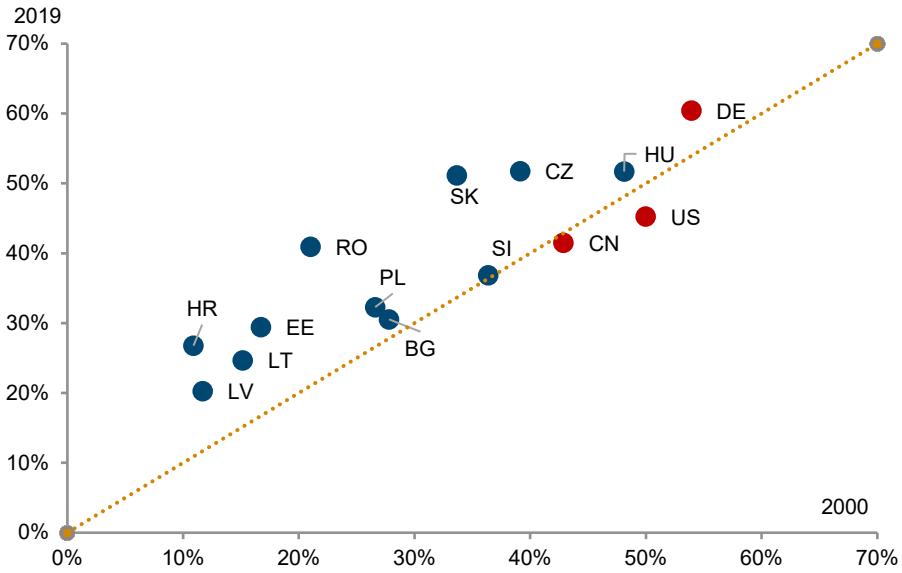
Figure 24 / Industrial export quality index, 2000 vs. 2019



Source: UNIDO

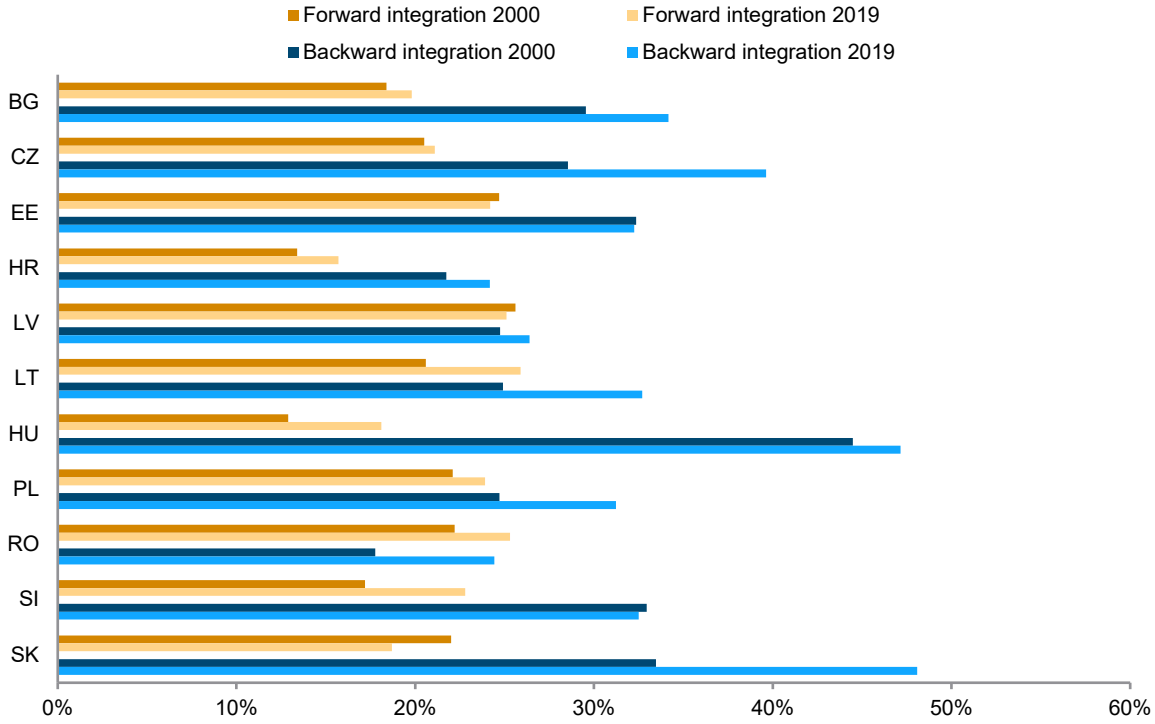
The profile change of the manufacturing sector towards more competitive and possibly higher value added industries has been accompanied by rising dependence on foreign demand and greater integration into global value chains (GVCs). The corollary of improving competitiveness in a globalised economic system (especially) for small open economies is a mounting dependence on foreign demand and global supply chains as well as greater exposure to potential shocks to these external factors. The crucial role of foreign demand is epitomised, for example, in the continuously increasing share of domestic value added embodied in foreign final demand. At present, between about 50% (Croatia) and more than 80% (Slovakia) of domestic value added serves foreign final consumers. In five of the EU-CEE11 countries (i.e. Czechia, Estonia, Hungary, Slovakia and Slovenia), this share is more than double the EU27 aggregate (Zavarska et al. 2023). In addition, the EU-CEE11 region is becoming increasingly integrated into global supply chains. This particularly holds true when it comes to backward integration (i.e. the foreign value added content of a country's exports). As Figure 26 shows, in most EU-CEE11 countries, this ratio has increased (in some instances remarkably) over the last two decades and currently reaches almost 50% in Hungary and Slovakia. Moreover, the heat map in Appendix 1 illustrates that exports in some industries (e.g. electronics, computers, motor vehicles and transport equipment) – again, especially in Hungary and Slovakia – contain up to 70% of foreign value added. So-called forward integration is defined as the domestic value added of a Country C embodied in foreign exports of other countries as a share of total gross exports of Country C. Despite some increase over the last 20 years, forward integration in most EU-CEE11 countries – except Latvia and Romania – remains significantly lower than backward integration.

Figure 25 / Medium- and high-tech manufacturing value added (MVA) as a share in total MVA, 2000 vs. 2019



Source: UNIDO

Figure 26 / Forward and backward integration of EU-CEE11 economies in 2000 and 2019



Note: Forward integration is defined as domestic value added of Country C embodied in foreign exports of all other countries as a share of total gross exports of Country C. Backward integration is defined as foreign value added content of gross exports of Country C.
Source: OECD Trade in Value Added (TiVA)

The EU-CEE11 region has benefited a great deal from rising GVC integration and its continuously improving ability to cater to foreign demand. The advantages of ever-deeper integration into world trade are well established and manifold. They range from efficiency and productivity gains for firms and countries via lower production prices to the creation of new jobs. As a result, exported value added has been the main source of economic convergence in EU-CEE11 countries. Empirical research suggests that exports have contributed at least half of the value added growth in most EU-CEE11 countries since the mid-1990s. In Bulgaria, Czechia, Hungary and Slovakia, more than 70% of the GDP growth has been driven by exports (Hagemejer and Muck 2019[23]). However, it has not been exports of final goods that has been key to economic growth, as at least 60% of the growth of exported value added can be attributed to the exports of intermediates. This highlights the role of vertical specialisation and GVC participation of firms in EU-CEE11 as the international production process has become more fragmented. In addition, findings in the literature – including specifically for the EU-CEE11 region – suggest that it has particularly been the sectors most integrated into global supply chains – and, thus, the most export-focused – that have developed the comparative advantages which have led to productivity gains (Giorno 2019; Miroudot and Cadestin 2017).

However, the increased integration into global markets also comes with risks and vulnerabilities. The extent to which the EU-CEE11 region is exposed to external shocks has become apparent during the recent series of crises. These ranged from the pandemic, via ensuing supply chain disruptions of various kinds, to subdued foreign demand and economic growth as a result of, among other things, the energy crisis, the Russo-Ukrainian War and periods of high inflation. The automotive industry, which is key in many EU-CEE11 countries, was the primary case in point. The vast majority of automotive companies reported shortages of intermediate products, and one may recall the iconic images of unfinished cars parked on rented airport runways waiting for the missing chip(s) in 2021 and 2022. It goes without saying that the supply bottlenecks of recent years have significantly reduced economic growth, as has subdued foreign demand.[24] Hence, the risky flipside of global interlinkages is not negligible for any country and for the EU-CEE11 region in particular. Reiter and Stehrer (2021) develop a product riskiness index that makes it possible to identify potential vulnerabilities of industry sectors and dependencies on trading partners. Based on this index, the authors find that more than 30% of EU imports are accounted for by products that pose a considerable availability risk in the event of trade turbulences. In some EU-CEE11 countries (e.g. Czechia, Hungary and Slovakia), the share of risky product imports reaches as high as 35-40%. High-tech industries, in particular, are more prone to supply-chain vulnerability given the large share of risky products (e.g. semiconductors) in high-tech product categories.

In addition to the above-mentioned dependencies and exposures to discrete shocks, the EU-CEE11 countries' deepened participation in GVCs has also implied a structural boon and bane. On the one hand, the EU-CEE11 economies' integration into GVCs has allowed them to reap the above-detailed benefits of an efficient resource allocation and functional specialisation within the value chain. On the other, however, the very same specialisation has largely cemented the economic structures and

[23] Similarly, Giorno (2019) corroborates for Slovakia that the increased involvement in global trade has acted as a driving force for the economy, which has been reflected in the strength of exports and the creation of value added from foreign demand since 1995, despite the effects of the 2008-2009 crisis.

[24] See e.g. Kemp et al. (2023) for the assessment of the impact of supply disruptions on the recovery from the global pandemic in 2021. While the authors find a reduction in global value added ranging between 0.5% and 1.2% in 2021, countries more exposed to the supply disruptions – and particularly those with a significant manufacturing sector (e.g. Germany) – faced much more sizable decreases in GDP (about 3% in Germany).

technological asymmetries. Stöllinger (2019) provides evidence that developing countries primarily serve as 'factory economies', while developed countries assume the role of 'headquarter economies', as hypothesised by Baldwin and Gonzales (2013). Factory economies tend to specialise in value-chain functions that generate comparatively less value added. Advancing to higher value added activities would thus provide a boost to economic growth. Indeed, Stöllinger (2021) and Grieveson et al. (2021) find that the structure of EU-CEE11 economies is disproportionately focused (i.e. over-specialised) on production. This is a function along the value chain that generates less value added than pre-production (i.e. headquarters and R&D) and post-production (i.e. logistics and support services) segments. The EU-CEE11 countries are struggling to advance to more sophisticated stages within manufacturing value chains. This hard-to-overcome manufacturing structure is thus a version of EU-CEE11 being 'trapped' at the middle-income level. The authors also see this phenomenon as the key contributing factor to the post-2008 convergence slowdown documented above. To maintain this growth model in EU-CEE11 would require restraint in wage growth to remain competitive. Alternatively, the EU-CEE11 countries can try to escape the middle-income growth trap. The authors conclude that breaking out will be difficult but not impossible. The region needs to broaden its functional specialisation and adjust it towards more knowledge-intensive value-chain functions, especially in the knowledge-intensive pre-production activities. This implies, in particular, that the economies have to become more innovative.

Despite some shift of the economic structures towards promising sectors, for now, the latter remain too small to constitute significant foundations of a new growth model. The greatest relative increase in value added shares since 2000 can be observed in professional, scientific and technical as well as administrative activities (Table 4). This sector contains, among other things, legal, accounting, architectural, engineering, marketing and management activities as well as research and development.[25] In addition, some countries – most notably, Bulgaria, Czechia and Estonia – have seen a strong relative increase in value added in the ICT sectors. Hence, in several instances, the EU-CEE11 countries have managed to strengthen areas that could potentially generate higher value added than former champions (e.g. agriculture, food or textile manufacturing). However, despite these relative gains, the promising areas remain rather small in terms of the size of their respective economies and/or relative to the EU average benchmark. Hence, the professional and other activities provide between 7% (Bulgaria) and 10% (Hungary) to value added, which is still (well) below the EU average (11.3%). While the ICT sectors in Bulgaria (7.6%), Czechia (6.3%) and Estonia (6.9%) do outstrip their average EU counterparts in terms of the value added share (5%), they would still have some way to go to become major drivers of economic growth (Figure 22).

[25] It is fair to hypothesise about the extent to which these activities differ from those of the above-mentioned 'factory economies'. Consulting/back-office positions may be just another type of production-line-type activities, with the difference being that intangible services are delivered instead of manufacturing tangible assets.

4. Conclusion and policy discussion

This paper has revisited the growth and convergence performance of the 11 EU countries in Central and Eastern Europe (EU-CEE11) over the last few decades, examining the underlying driving factors, structural changes in their economies, and the resulting outlook. The purpose of this review has been to assess the sustainability of the current economic model and to identify areas where economic policy should focus on boosting economic growth.

We have presented evidence that the pace of convergence has significantly slowed since the global financial crisis (GFC) for the vast majority of EU-CEE11 countries. Despite noteworthy heterogeneity across sectors and countries, value added growth declined in virtually all industries after the GFC. Moreover, the fact that potential economic growth slowed in parallel with headline growth suggests that there are structural rather than cyclical drivers at play that may dampen the convergence process in future.

While total factor productivity (TFP) has been the main driver of economic growth, it is also the primary culprit behind the post-GFC slowdown. Rather than being specific to EU-CEE11, the decline in TFP growth is a widespread phenomenon in both advanced and emerging economies. Potential growth projections for the EU-CEE11 region in the medium term are not optimistic. Although the rise and fall in TFP growth in EU-CEE11 were mainly driven by external factors, these factors are unlikely to provide a boost in the future. Substantial institutional changes, such as euro adoption in countries that have not adopted it yet, are also not expected to significantly enhance economic growth. Hence, the EU-CEE11 countries must make substantial efforts on their own to polish their economic model so as to boost growth and convergence. But what should they focus on?

A closer look at production factors suggests that, despite some improvement, a large capital stock gap remains compared to advanced economies. Nonetheless, investments appear to have been mostly sufficient to preserve the capital-to-output ratio, at least when benchmarked against the lower bound of the investment rate. However, there might be an even more important gap concerning the quality of capital. We have shown that uncertainty, energy costs and the availability of skilled staff are key factors preventing firms from making bigger investments. Firms in EU-CEE11 have to deal with rather expensive energy, which tends to be high in EU-wide as well as global comparison. Moreover, firms are more sensitive to energy costs than elsewhere, as output in EU-CEE11 continues to be very energy-intensive despite substantial improvements in recent decades. Some industries – especially the chemical industry, production of non-metallic minerals, and the food industry – consume particularly large amounts of energy. Additionally, the largest industrial energy consumers rely heavily on fossil-based energy sources, whose relative costs are set to rise. Hence, to remain competitive in future, the EU-CEE11 countries will need to overcome the challenges of reducing the energy intensity of their economies as well as of making energy cheaper and greener at the same time.

Turning to the labour factor, we found that, in terms of labour force participation, the labour supply in EU-CEE11 has been broadly comparable to relevant benchmarks. However, there are pockets of underutilised labour potential – especially among the oldest and youngest cohorts, women, minorities

and refugees – that should be activated. Moreover, underutilised labour potential could be activated by increasing regional labour mobility within countries. The evidence calls for a deeper analysis of the drivers and socioeconomic factors at play to potentially prompt policy interventions aimed at bolstering employment. Stimulating latent labour supply appears even more essential in light of the rather gloomy projections of working-age population developments in the coming decades.

Despite falling working hours, people in EU-CEE11 work significantly longer hours than their counterparts in advanced EU countries. As EU-CEE11 continues to catch up and grow richer, working hours in the region are expected to converge towards those in wealthier countries. At present, longer working hours in EU-CEE11 reflect, among other things, significantly lower labour productivity compared to the benchmarks. Moreover, labour productivity has slowed, mainly due to lower TFP growth, followed by a lower contribution of tangible non-ICT capital. The decline in TFP can potentially be ascribed to waning innovative capacity, which tends to be further dampened in aging societies. The innovative performance of the EU-CEE11 region draws a rather heterogeneous but overall not too bright picture. All EU-CEE11 countries except Estonia demonstrate only mediocre innovative capacity and performance. Moreover, most of the EU-CEE11 countries have been worsening in terms of innovative capacity. In addition, the decline in labour productivity growth is primarily explained by intra-sector dynamics rather than by the reallocation of resources across different sectors. As a result, no major changes in labour productivity growth can be expected from potential structural shifts in the economy.

On a positive note, the EU-CEE11 economies are still largely endowed with human capital that is comparable to or even outperforms the benchmarks in advanced economies. However, some countries need to intensify efforts to keep up with the international competition in providing high-skilled labour. Going forward, the EU-CEE11 countries must ensure that they stay competitive when it comes to technical human capital endowment. Skill mismatches, where available skills are not employed in relevant occupations, have tended to be worse in EU-CEE11 than in advanced European countries, partly due to deficiencies in labour market policies and institutions.

Turning to economic structure, despite some loss of relative economic significance, manufacturing remains the key sector in most EU-CEE11 countries, with a particular focus on the automotive industry. The manufacturing sector in the EU-CEE11 countries has increased its competitiveness and, in some aspects, ranks among the world's top performers. Additionally, the structure of the manufacturing sector has shifted towards higher value added products.

However, the profile change in the manufacturing sector towards more competitive, higher value added industries has been accompanied by rising dependence on foreign demand and greater integration into global value chains (GVCs). While the EU-CEE11 region has benefited greatly from rising GVC integration and the continuously improving ability to cater to foreign demand, increased integration into global markets also bears risks and vulnerabilities. In addition to cyclical dependencies and exposure to discrete shocks, EU-CEE11's deepened participation in GVCs has also cemented its economic structures and technological asymmetries, disproportionately focusing on production. The EU-CEE11 countries struggle to advance to more sophisticated stages along the manufacturing value chains, creating a version of being 'trapped' at the middle-income level. This phenomenon is a key contributing factor to the post-2008 convergence slowdown.

To conclude, the EU-CEE11 countries will have to grow faster and better. One of the key prerequisites will be addressing the energy intensity of the economies, investing in energy generation and distribution, and potentially reconsidering the structural features of the energy market, energy pricing and taxation. At the same time, dormant labour potential needs to be activated and, in some aspects, human capital has to be upgraded to keep up with the global competition. Equally if not most importantly, however, the EU-CEE11 economies should become more innovative, broaden their functional specialisation, and adjust it towards more knowledge-intensive value chain functions. To date, despite some shifts towards potentially promising sectors, the latter remain too small to constitute significant foundations of a new growth model.

References

Acemoglu, D., P. Aghion and Zilibotti (2006), 'Distance to Frontier, Selection, and Economic Growth', *Journal of the European Economic Association*, 4(1), 37-74.

Acemoglu, D., D. Autor and C. Patterson (2023), 'Bottlenecks: Sectoral Imbalances and the US Productivity Slowdown', *NBER Working Paper* 31427.

Arnold, M. and A. Bounds (2024), ''Big Bang' EU countries risk losing competitive edge', *Financial Times*, 30 April.

Astinova, D., R. A. Duval, N.-J. H. Hansen, B. Park, I. Shibata and F. G. Toscani (2024), 'Dissecting the Decline in Average Hours Worked in Europe', WP 2024/002, International Monetary Fund (IMF), January.

Baldwin, R. (2016), *The Great Convergence: Information Technology and the New Globalization*, Harvard University Press, Cambridge, MA.

Baldwin, R. and J. Lopez-Gonzalez (2013), 'Supply-chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses', Discussion Paper 9421, Centre for Economic Policy Research (CEPR).

Baqaee, D. R. and E. Farhi (2020), 'Productivity and Misallocation in General Equilibrium', *Quarterly Journal of Economics*, 135(1), 105-163.

Barro, R. J. and J.-W. Lee (2013), 'A new data set of educational attainment in the world, 1950-2010', *Journal of Development Economics*, 104, 184-198.

Benkovskis, K. and J. Wörz (2018), 'What drives the market share changes? Price versus non-price factors', *Structural Change and Economic Dynamics*, 45(C), 9-29.

Bloom, N., I. J. Charles, J. Van Reenen and M. Webb (2020), 'Are Ideas Getting Harder to Find?', *American Economic Review*, 110(4): 1104-1144.

Bubbico, R. L., L. Gattini, A. Gereben, A. Kolev, M. Kollar and T. Slačík (2017), 'Wind of change. Investment in Central, Eastern and South Eastern Europe', Regional Studies and Roundtables, European Investment Bank.

Bubbico, R. L., M. Kollar and T. Slačík (2018), 'Structural investment needs in CESEE and the use of EU funds', Focus on European Economic Integration Q3/18, Oesterreichische Nationalbank.

Crespo Cuaresma, J., M. A. Dimitz and D. Ritzberger-Grünwald (2002), 'Growth, Convergence and EU Membership', Working Papers 62, Oesterreichische Nationalbank.

D'Auria F., C. Denis, K. Havik, K. McMorrow, C. Planas, R. Raciborski, W. Röger and A. Ross (2010), 'The production function methodology for calculating potential growth rates and output gap', *Economic Papers*, No. 420, European Commission, Economic and Financial Affairs, July.

Delanote, J., M. Ferrazzi, M. Ghodsi, D. Hanzl-Weiß, A. Kolev, A. Locci, S. Petti, D. Rückert, J. Schanz, T. Slacik, M. Stanimirovic, R. Stehrer, C. Weiss and M. Wuggenig (2022), 'Recharging the batteries: How the electric vehicle revolution is affecting Central, Eastern and South-Eastern Europe', *Economics – Thematic Studies*, European Investment Bank, March

Deutsche Bundesbank (2021), 'The slowdown in euro area productivity growth', *Deutsche Bundesbank Monthly Report*, January 2021.

Draghi, M. (2024), 'An Industrial Strategy for Europe', Acceptance Speech at the Monastery of San Jeronimo de Yuste (Spain, 14 June 2024) for the Carlos V European Award. Available at: https://geopolitique.eu/en/2024/06/14/mario-draghi-grand-continent-an-industrial-strategy-for-europe/

Feenstra, R. C., R. Inklaar and M. P. Timmer (2015), 'The Next Generation of the Penn World Table', *American Economic Review*, 105(10), 3150-3182.

Fernández C. and P. García Perea (2015), 'The impact of the euro on Euro Area GDP per capita', *Documentos de Trabajo*, No. 1530, Banco de España.

Ferrazzi, M., J. Schanz and M. Wolski (2024), 'Strengthening CESEE Competitiveness: The Role of Innovation in Economic Growth. The state of innovation, obstacles, and how to overcome them', European Investment Bank (EIB), forthcoming.

Franks, J., B. Barkbu, R. Blavy, W. Oman and H. Schoelermann (2018), 'Economic Convergence in the Euro Area: Coming Together or Drifting Apart?', *IMF Working Papers*, 18/10.

Giorno, C. (2019), 'Increasing the benefits of Slovakia's integration in global value chains', *Economics Department Working Papers*, No. 1552, OECD.

Gregori, W. D., M. Martinez-Cillero and M. Nardo (2024), 'The effects of cross-border acquisitions on firms' productivity in the EU', *The World Economy*, 47, 9-36.

Grieveson, R., A. Bykova, D. Hanzl-Weiss, G. Hunya, N. Korpar, L. Podkaminer, R. Stehrer, and R. Stöllinger (2021), 'Avoiding a Trap and Embracing the Megatrends: Proposals for a New Growth Model in EU-CEE', *wiiw Research Reports*, No. 458, The Vienna Institute for International Economic Studies (wiiw), Vienna, November.

Gros, D. (2018), 'Convergence in the European Union: Inside and outside the euro area', Centre for European Policy Studies (CEPS).

Hagemejer, J. and J. Muck (2019), 'Export-led growth and its determinants. Evidence from Central and Eastern European countries', *The World Economy*, 42(7), 1994-2025.

IMF (2016), 'Central, Eastern, and Southeastern Europe: How to Get Back on the Fast Track', *Regional Economic Issues*, May, Chapter II.

IMF (2023), World Economic Outlook, Box 1.1, October, 26.

Jirka, L., M. Kamionka and L. Mackova (2023), 'High-skilled precarity: The situation of Ukrainian refugees in the Czech Republic and Poland', *Sociological Studies*, 2(23), 41-48.

Jones, C. I. (2015), 'The Facts of Economic Growth', *NBER Working Papers*, No. 21142, National Bureau of Economic Research.

Kaltenberg, M., A. B. Jaffe and M. E. Lachman (2023), 'Invention and the life course: Age differences in patenting', *Research Policy*, 52(1), 104629.

Kemp, H., R. Portillo and M. Santoro (2023), 'Assessing the Impact of Supply Disruptions on the Global Pandemic Recovery', Working Paper WP/23/42, International Monetary Fund.

Lewis, C., N. Pain, J. Strasky and F. Menkyna (2014), 'Investment gaps after the crisis', *Economics Department Working Papers*, No. 1168, OECD.

Lopez-Garcia, P. and B. Szörfi (2021), 'Key factors behind productivity trends in euro area countries', *ECB Economic Bulletin* 7/2021.

Miroudot, S. and C. Cadestin (2017), 'Services in Global value Chains: Trade patterns and gains from specialization', *OECD Trade Policy Papers*, No. 208, OECD Publishing.

Rapacki R. and M. Próchniak (2014), 'The Impact of EU Membership on Economic Growth and Real Convergence of the Central and Eastern European Countries', *Ekonomia journal*, 39, Faculty of Economic Sciences, University of Warsaw.

Reiter, O. and R. Stehrer (2021), 'Learning from Tumultuous Times: An Analysis of Vulnerable Sectors in International Trade in the Context of the Corona Health Crisis', *wiiw Research Reports*, No. 454, The Vienna Institute for International Economic Studies (wiiw), Vienna, July.

Schreiner, J. (2022), 'Longer-term growth prospects for CESEE', *Occasional Paper*, No. 2, Oesterreichische Nationalbank (OeNB), Vienna.

Stöllinger, R. (2019), 'Functional Specialisation in Global Value Chains and the Middle-Income Trap', *wiiw Research Reports*, No. 441, The Vienna Institute for International Economic Studies (wiiw), Vienna, October.

Stöllinger, R. (2021), 'Testing the Smile Curve: Functional Specialisation in GVCs and Value Creation', *Structural Change and Economic Dynamics*, 56, 93-116.

Zavarska, Z., A. Bykova, R. Grieveson, D. Hanzl-Weiss and O. Sankot (2023), 'Industrial Policy for a New Growth Model: A Toolbox for EU-CEE Countries', *wiiw Research Reports*, No. 469, The Vienna Institute for International Economic Studies (wiiw), Vienna, July.

Appendix I

Table A.1 / Backward integration for selected industries in 2000 and 2019

	BG		CZ		EE		HR		LV		LT		HU		PL		RO		SI		SK	
	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019
Total economy	30%	34%	29%	40%	32%	32%	22%	24%	25%	26%	25%	33%	44%	47%	25%	31%	18%	24%	33%	33%	33%	48%
Agriculture, forestry and fishing	17%	29%	24%	31%	31%	31%	19%	27%	24%	30%	21%	32%	27%	32%	27%	32%	8%	19%	22%	27%	34%	34%
Mining and quarrying	27%	17%	22%	26%	27%	26%	23%	29%	27%	29%	22%	35%	31%	34%	14%	17%	19%	17%	27%	32%	30%	34%
Food, beverages and tobacco	29%	44%	31%	34%	36%	40%	24%	32%	33%	40%	30%	37%	34%	43%	32%	36%	13%	22%	34%	38%	36%	38%
Textiles, wearing apparel	28%	40%	34%	36%	39%	42%	24%	38%	39%	30%	38%	27%	44%	43%	34%	39%	27%	23%	37%	46%	30%	35%
Wood and paper products	38%	37%	31%	35%	33%	34%	24%	29%	24%	32%	27%	33%	40%	44%	29%	32%	14%	23%	37%	40%	30%	36%
Chemicals	51%	56%	36%	47%	38%	40%	34%	44%	36%	36%	42%	57%	42%	49%	33%	41%	27%	35%	37%	34%	41%	50%
Basic metals	37%	54%	36%	38%	46%	48%	36%	35%	35%	44%	35%	40%	46%	49%	33%	40%	30%	34%	42%	42%	35%	47%
Computer, electronics	39%	46%	38%	55%	52%	58%	29%	36%	37%	49%	35%	41%	70%	67%	35%	52%	24%	29%	38%	44%	42%	63%
Machinery and equipment	31%	35%	32%	39%	46%	44%	39%	33%	31%	38%	30%	36%	45%	54%	28%	37%	20%	29%	37%	40%	32%	48%
Motor vehicles and transport equipment	38%	45%	43%	52%	38%	46%	38%	42%	38%	42%	41%	43%	59%	68%	35%	46%	25%	37%	56%	53%	58%	68%
Utilities	27%	40%	28%	31%	28%	25%	21%	31%	26%	32%	26%	28%	24%	33%	17%	19%	23%	25%	21%	22%	23%	41%
Construction	27%	34%	28%	29%	35%	32%	24%	29%	24%	26%	23%	26%	33%	37%	21%	25%	n..a.	n.a.	29%	26%	24%	22%
Business Sector Services	27%	21%	19%	21%	29%	25%	18%	20%	22%	20%	14%	25%	22%	25%	17%	19%	13%	19%	18%	21%	21%	23%

Note: Backward integration is defined as foreign value added content of gross exports of a country c. The colour shadings range from dark green to dark red marking, respectively the highest/lowest level of backward integration across the region.
Source: OECD Trade in Value Added (TiVA)

Table A.2 / Change in labour productivity growth in selected sectors between the periods 2009-2019 vs. 2000-2008 periods (in pp)

	BG	CZ	EE	HR	HU	LT	LV	PL	RO	SI	SK
Manufacturing	–2.2	–5.7	–5.7	–1.7	–6.2	–5.1	–1.2	–4.0	–6.6	–3.8	–4.8
Construction	2.1	–1.2	–1.2	–3.3	3.1	–6.2	–1.1	5.5	–8.8	0.2	–4.7
Wholesale and retail trade; repair of motor vehicles	–1.3	–3.8	–3.8	–3.4	–1.2	–2.5	–3.7	1.3	–4.3	–1.5	–5.6
Transportation and storage	–3.5	–0.7	–0.7	–4.0	–3.2	–2.7	0.5	1.2	1.6	–0.6	4.9
Accommodation and food service activities	6.4	2.1	2.1	–1.1	5.8	2.2	–8.2	5.2	12.0	1.3	1.7
Information and communication	–11.0	–0.9	–0.9	–5.9	–3.0	–1.0	–7.6	–0.1	–3.3	–2.8	–3.5
Financial and insurance activities	–16.2	2.1	2.1	–1.2	1.3	–2.7	–9.0	2.7	–0.2	–3.1	2.4
Real estate activities	10.6	3.0	3.0	–0.5	–1.4	4.9	–2.4	2.1	–7.0	4.6	–1.1
Total	–1.4	–2.5	–2.5	–1.4	–3.3	–4.0	–3.3	0.0	–4.5	–1.9	–3.1

Source: wiiw KLEMS

Table A.3 / Selected education and human capital indicators (in 2012 and 2019 – left and right column for each country, respectively)

		BG		CZ		EE		HR		HU		LV		LT		PL		RO		SI		SK		EU27	
Public expenditure on primary education (% of GDP)	2012-2019	0.7%	0.8%	0.8%	0.9%	1.3%	1.6%	1.6%	1.7%	0.8%	0.8%	1.9%	1.3%	0.7%	0.8%	1.5%	1.3%	0.5%	0.5%	1.6%	1.4%	0.8%	0.9%	1.3%	1.2%
		54%	70%	59%	77%	99%	135%	139%	140%	59%	66%	145%	108%	58%	63%	117%	105%	38%	38%	125%	119%	63%	77%	100%	100%
Public expenditure on secondary education (% of GDP)	2012-2019	1.4%	1.6%	2.0%	2.1%	2.0%	1.5%	0.9%	0.8%	1.9%	1.7%	2.2%	1.5%	2.1%	1.6%	1.7%	1.6%	1.1%	1.5%	0.9%	1.7%	1.8%	1.8%	1.9%	1.8%
		77%	91%	107%	116%	106%	82%	46%	46%	99%	95%	120%	84%	111%	86%	92%	88%	58%	85%	46%	93%	97%	97%	100%	100%
Public expenditure per tertiary student (EUR)	2012-2019	1790	3766	5407	8589	4424	9250	5030	4717	3926	5288	5451	5790	3919	4638	3714	5276	1873	3470	6713	8823	5453	7822	8755	11202
		20%	34%	62%	77%	51%	83%	57%	42%	45%	47%	62%	52%	45%	41%	42%	47%	21%	31%	77%	79%	55%	77%	100%	100%
STEM-Graduates per 1.000 inhabitants aged 20 to 29 years	2013-2020	14.6	13.1	16.9	16.0	15.6	17.3	15.5	20.6	11.2	23.5	14.1	14.1	22.5	18.7	20.5	17.7	17.6	17.5	19.8	20.5	18.0	13.0	16.3	18.7
		90%	70%	104%	85%	96%	92%	95%	110%	69%	126%	87%	75%	138%	100%	124%	95%	108%	94%	122%	110%	111%	69%	100%	100%
PISA Reading skills 15-year-olds (PISA score)	2012-2018	436.1	419.8	492.9	490.2	516.3	523.0	484.6	479.0	488.5	476.0	488.7	478.7	477.3	475.9	518.2	511.9	437.6	427.7	481.3	495.3	462.8	458.0	489.0	481.4
		89%	87%	101%	102%	106%	109%	99%	100%	100%	99%	100%	99%	98%	99%	106%	106%	89%	89%	98%	103%	95%	95%	100%	100%
PISA Mathematics skills 15-year-olds (PISA score)	2012-2018	438.7	436.0	499.0	499.5	520.5	523.4	471.1	464.2	477.0	481.1	490.6	496.1	478.8	481.2	517.5	515.6	444.6	429.9	501.1	508.9	481.6	486.2	488.8	488.2
		90%	89%	102%	102%	106%	107%	96%	95%	98%	99%	100%	102%	98%	99%	106%	106%	91%	88%	102%	104%	99%	100%	100%	100%
PISA Science skills 15-year -olds (PISA score)	2012-2018	446.5	424.1	508.3	496.8	541.4	530.1	491.4	472.4	494.3	480.9	502.2	487.3	495.7	482.1	525.8	511.0	438.8	425.8	514.1	507.0	471.2	464.0	496.6	483.2
		90%	88%	102%	103%	109%	110%	99%	98%	100%	100%	101%	101%	100%	100%	106%	106%	88%	88%	104%	105%	95%	96%	100%	100%

Note: STEM stands for science, technology, engineering and mathematics in tertiary education. First line and spark line for each indicator in the respective stated unit. Highlighted line in % of EU27 formatted as follows: the darker the shade of red/green, the lower/higher the respective score relative to the EU27. Spark lines serve to demonstrate the development of a given indicator in a given country in time, and they are not directly comparable across countries due to their possibly different levels.
Source: Eurostat

Appendix II: Development accounting framework

To assess the extent to which different production factors contribute to differences in the levels of economic development (i.e. income), so-called development accounting can be employed. We follow the framework as described in Jones (2015). The approach starts out from the standard aggregate Cobb-Douglas production function

$$\mathrm{Y}_t = \mathrm{A}_t K_t^{\alpha} H_t^{(1-\alpha)}$$

where Y_t stands for real output in time t, K_t stands for the capital stock, and A_t represents total factor productivity. The labour input H_t can be decomposed into the product of the number of employed persons L_t and human capital quality h_t. Dividing both sides of the production function by Y_t^{α} and solving for Y_t gives:

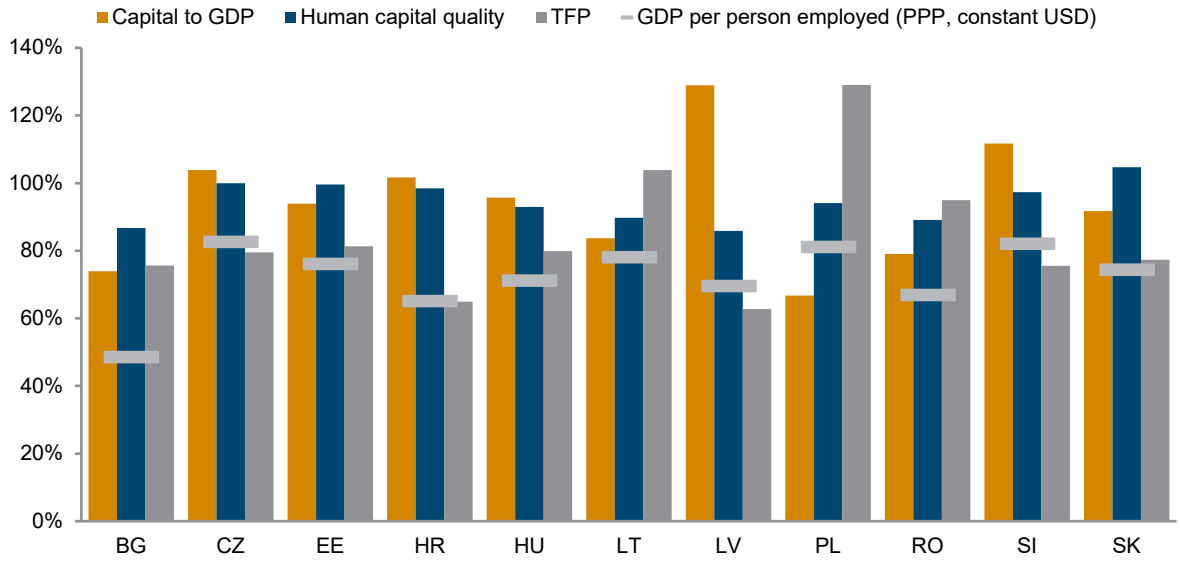
$$\mathrm{Y}_t = \left(\frac{K_t}{Y_t}\right)^{\frac{\alpha}{1-\alpha}} H_t \, Z_t$$

where $Z_t \overset{\text{def}}{\equiv} \mathrm{A}_t^{\frac{1}{1-\alpha}}$. We can now divide both sides by L_t to get the following format:

$$\frac{\mathrm{Y}_t}{\mathrm{L}_t} = \left(\frac{K_t}{Y_t}\right)^{\frac{\alpha}{1-\alpha}} \frac{H_t}{\mathrm{L}_t} \, Z_t$$

This formula thus allows for a decomposition of GDP per worker in each country into three factors: (i) capital-output ratio; (ii) total factor productivity and (iii) human capital quality $h = \frac{H_t}{\mathrm{L}_t}$. The latter is gauged by the Barro-Lee educational attainment index (Barro and Lee 2013). Subsequently, each of the variables can be expressed in relation to our benchmark country (i.e. Germany). The data for the calculations is used from the latest Penn World Tables 10.01 (Feenstra et al. 2015), which provide cross-country data on the capital stock, GDP per worker and the Barro-Lee indicator of educational attainment. The latest observations are available for 2019. The capital share α is calibrated to 0.37 following D'Auria et al. (2010).

Figure A.1 / Development accounting in EU-CEE11 relative to Germany



Source: Authors' calculations, Penn World Tables 10.01 (Feenstra et al. 2015)

The blue lines in Figure A.1 show the size of GDP per worker for each country relative to the Germany. In 2019, it ranged between about 50% (Bulgaria) and just above 80% (Czechia). The income per worker can be decomposed into the product of the three factors: (i) capital to GDP; ii) human capital quality and iii) TFP, which is represented by the bars in Figure A.1 relative to Germany. Observing the results, one can see that human capital quality in EU-CEE11 is comparable to the one in Germany (as detailed in Chapter 3). In Slovakia, the quality of human capital seems even better than in Germany. In Croatia, Czechia, Estonia and Slovenia, it is basically equal, and even in the remaining EU-CEE11 countries, it hovers at around 90% relative to Germany. Hence, labour quality – at least when gauged by this rough measure – does not explain the differences in economic development. The capital-to-output ratio in most of the EU-CEE11 countries is also comparable to or even higher (Latvia, Slovenia) than in Germany, which suggests that the capital stock in EU-CEE11 is largely adequate given the countries' level of economic development. Only Bulgaria, Lithuania, Romania and (particularly) Poland lag somewhat behind in this respect. In contrast, TFP falls significantly short of the one in Germany in most EU-CEE11 countries – particularly in Bulgaria, Croatia, Latvia and Slovenia – and thereby explains the lion's share of the relative income gap. Somewhat surprisingly, Lithuania, Poland and, to a lesser extent, Romania feature rather high levels of TFP, with the former two countries having levels even higher than that of Germany.

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ZVR-Zahl: 329995655

Postanschrift: A 1060 Wien, Rahlgasse 3, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
Internet Homepage: www.wiiw.ac.at

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