



Wind of change: Investment in Central, Eastern and South Eastern Europe

September 2017

This is a report of the EIB Economics Department

Authors

R. L. Bubbico^{*}, L. Gattini^{*}, Á. Gereben^{*}, A. Kolev^{*}, M. Kollár^{*}, T. Slacik⁺

About the Economics Department of the EIB

The mission of the EIB Economics Department is to provide economic analyses and studies to support the Bank in its operations and in its positioning, strategy and policy. The Department is a team of 35 economists and staff, and is headed by Debora Revoltella, Director of Economics.

Disclaimer

The views expressed in this document are those of the authors and do not necessarily reflect the position of the EIB or OeNB.

^{*} European Investment Bank; ⁺ Oesterreichische Nationalbank (OeNB).

Wind of change: Investment in Central, Eastern and South Eastern Europe¹:

R. L. Bubbico, L. Gattini*, Á. Gereben*, A. Kolev*, M. Kollár*, T. Slacik⁺*

¹ In the present paper the CESEE region covers - subject to data availability - the Czech Republic, Slovakia, Hungary, and Poland, which we group as Central and Eastern Europe (CEE); the Baltics, consisting of Latvia, Lithuania and Estonia; EU member countries in South-East Europe (Bulgaria, Romania and Croatia grouped as SEE-EU) as well as non-EU member countries in South-East Europe (SEE-non-EU), i.e. Albania, Bosnia and Herzegovina, Kosovo, FYR Macedonia, Montenegro and Serbia.

* European Investment Bank. ⁺ Österreichische Nationalbank (OeNB). The views in this report do not necessarily reflect the official views of OeNB or European Investment Bank. We are grateful to Mark Allen for reviewing the earlier draft and providing helpful comments.

1 Contents

Executive summary.....	5
Introduction.....	7
1. Investment and investment finance in CESEE: stylized facts	9
1.1 Investment in CESEE.....	9
1.2 Change in the environment of investment finance in CESEE	17
1.3 Changing conditions on the labour market.....	21
2. Investment gap: are CESEE countries investing enough?	26
2.1 A simple benchmark for investment rate: the “Growth Commission” approach	26
2.2 Capital-preserving investment along the steady-state growth path	27
2.3 An investment equation based on output growth and user cost of capital	29
2.4 Infrastructure and competitiveness gaps.....	31
3. A closer look into corporate investment through the EIBIS survey	36
4. Policy conclusions.....	42
Bibliography	44
Appendix 1: Growth accounting.....	45
Appendix 2: Development accounting	47
Appendix 3: Investment, growth and the user cost of capital – an econometric analysis.....	49
Appendix 4: Infrastructure gaps, country by country	52

Executive summary

Investment dynamics before and after the crisis	Investment in CESEE has been higher, but also more volatile, than in the EU over the last two decades. The financial crisis resulted in a slowdown in capital formation, which contributed to lower growth. Public investment supported by EU funds has been robust, whereas private capital formation has been lagging. The composition of investment is tilted towards tangibles.
Investment finance	When it comes to financing investments, the region has traditionally relied on foreign capital inflows. The crisis resulted in a substantial slowdown of net private capital inflows.
Labour market developments	CESEE countries have been experiencing a rapid aging of the population, combined with outward migration. The decline in total population in the region is almost entirely accounted for by the contraction of working age population, which weighs negatively on GDP per capita growth.
Investment gaps	The level of public and private investment in CESEE has been below the levels experienced in countries that successfully graduated from middle income to high income in the past. For most CESEE economies the current investment levels are not sufficient to maintain the size of the capital stock relative to GDP under reasonable growth assumptions. In comparison with the EU average, CESEE countries have been investing more in utilities and transport as a share of their GDP, and less in health infrastructure. The CESEE region underperforms the EU average in the vast majority of strategic and competitiveness indicators, with some exceptions in the realm of human capital.
Corporate investment through the EIBIS survey	The EIBIS survey shows that the investment outlook for financial year 2016 among firms in the region was modestly optimistic. Corporate investment is above EU average in terms of tangibles, but below EU average in terms of R&D. The share of state-of-the-art machinery and equipment and highly energy-efficient building stock is below EU average. CESEE firms are more likely than the EU average to report that they had invested too little over the previous three years. Uncertainty about the future, business and labour market regulations, as well as availability of staff with the right skills are the main long-term barriers to investment. Even though availability of finance does not seem to be a major obstacle for too many firms in the region, more firms than the EU average report being constrained by a shortage of external finance. Collateral requirements are an important constraint on access to finance.
More role for domestic savings in investment finance	Overall, there are still significant capital gaps in CESEE. The pre-crisis model of financing capital accumulation - based on FDI and funds channelled through cross-border banking - is not operating the way it did earlier, so domestic savings will have to play a stronger role in filling these gaps. While the CESEE countries should continue to attract foreign capital, a more balanced growth and financing model would support further steady convergence.

The role of EU funds and capital market developments

The region continues to benefit from EU structural and cohesion funds. EU funds played an important role in maintaining a healthy level of public investment during the post-crisis downturn. In the context of the infrastructure gaps, leveraging these funds to improve the operating environment remains crucial. Capital market development could be highly important in creating channels for savings and decreasing firms' reliance on banks. For the firms to use more equity or bond finance for investment activities, more pro-active measures are needed to change economic conditions conducive to, and incentives for tapping, capital market financing.

Elements of a new growth model for the CESEE

Against this background, a successful post-crisis model of economic convergence and growth for the CESEE region would ideally include the following elements. First, with the post-crisis decline in FDI inflows to the region, as well as changed strategies of large foreign banks vis-à-vis the region, the system of financial intermediation in the CESEE countries needs to rely more on domestic savings. Second, beyond the cyclical tightening of labour market conditions, structural bottlenecks are emerging across CESEE in terms of shortages of skilled staff. Hence policies are vitally needed to help maintain competitiveness and facilitate moving up the value chain, including further investment in skills and education. Third, there is a need for a stronger focus on innovation to increase productivity, particularly by better aligning public spending on R&D with business needs.

The corresponding enabling factors should be strengthened

In the post-crisis period, investment in utilities, transport and communication (including digital) infrastructure has been lagging the EU average. In terms of strategic and competitiveness indicators, innovation capacity in the CESEE region is also lower than in the EU. More investment in higher value-added sectors would be warranted. Lastly, further improvements in the business environment and the efficient management of public funds are necessary.

Introduction

Until the onset of the global financial crisis in 2008, economies of Central, Eastern and to a lesser extent South Eastern Europe (CESEE) established a record of significant growth and economic progress. The countries' inherent strengths were unleashed, as previously state-owned industries were privatized and reforms implemented, attracting capital and foreign direct investment that drove productivity improvements and GDP growth. However, in many instances the pre-crisis growth was propelled by unsustainable levels of consumption and borrowing. Hence, while the regions' economies continue to recover from the crisis, their economic models need to be revisited, with an emphasis on investment-led growth, stronger domestic financing and more innovation.

Against this background, the present report aims to shed some light on developments in investment activity and investment finance in CESEE over the last twenty years from both macro- and microeconomic perspectives. We pursue in particular questions of why and where investment has declined, in the period after the financial crisis, and whether changes in investment and output have been cyclical or structural. In addition, we address the question of whether countries in the CESEE region have been investing enough and where there are possible country-specific investment gaps and structural needs. Regarding the former, being aware of the elusiveness of the underlying concept, we employ different analytical approaches to estimating the investment gap.

Another original contribution of our work is our use of results obtained from a special EIB corporate survey on investment and investment finance for the microeconomic analysis of firms' investment behaviour. The new survey (to be conducted annually in future) samples around 12,000 firms of all sizes in five economic sectors in the 28 EU countries. The survey thus provides a unique stepping stone towards a deep understanding of the challenges that European corporates are facing in their investment decisions and ultimately in their contribution to economic growth and job creation. In addition, we combine this analysis with the already well-established EIB bank lending survey, which maps credit demand and supply developments in the CESEE region.

The paper is structured as follows. The first, descriptive chapter summarizes developments of investment and investment finance along various dimensions and sub-categories generating a number of stylized facts. It shows, *inter alia*, that investment has been rather heterogeneous, pro-cyclical and volatile across the region over the past twenty years. Most importantly, we illustrate that investment is still (well) below the pre-crisis levels in the vast majority of CESEE countries and that the investment decline has contributed to slower post-crisis economic growth. We also document changes in capital flows and borrowing behaviour of the corporate sector in the wake of the financial crisis. Furthermore, we highlight some of the demographic developments in the region that affect economic growth.

The objective of the second chapter is to identify and quantify the investment gap and structural investment needs in CESEE countries. To address the model uncertainty associated with any methodology that aims at determining a desirable or equilibrium level of investment – and thus the corresponding investment gap – we employ several analytical and normative approaches. On the one hand, we look at simple benchmarks based on best practices as identified in the literature against which we gauge actual investment levels. On the other hand, we derive investment yardsticks based on simple theoretical economic growth concepts and econometric techniques. On this basis, we show that public and private investment in CESEE has been below levels experienced in countries that successfully graduated from middle income to high income status in the past. Furthermore, for most CESEE economies the current investment levels are not sufficient to maintain the size of the capital stock relative to the GDP under reasonable growth assumptions and are also too low compared to a long-term macroeconomic equilibrium. Moving beyond aggregate investment we then identify particular areas where obvious gaps and needs exist in the capital stock, especially with respect to infrastructure. Finally, we examine a broad set of competitiveness indicators to identify areas where the largest improvements could be achieved through investment.

In the third chapter we turn to the microeconomic perspective and analyse investment patterns and behaviour on the basis of data obtained in the EIB Investment Survey (EIBIS) in the corporate sector. EIBIS provides a timely look at investment activity in the EU countries of the CESEE region. The survey suggests that the investment outlook is modestly optimistic. Corporate investment is above the EU average in terms of tangibles, but below the EU average in terms of R&D. CESEE firms are more likely than the EU average to report that they have invested too little over the previous three years. The share of state-of-the-art machinery and equipment and highly energy-efficient building stock is below the EU average. Uncertainty about the future, business and labour market regulations, as well as availability of staff with the right skills are the main long-term barriers to investment. Even though availability of finance does not seem to be a major obstacle for too many firms in the region, more firms than the EU average report being constrained by external finance.

In the last chapter we elaborate on the policy conclusions of our analysis, and attempt to sketch the elements of a new, post-crisis growth model for the region, which includes heavier reliance on domestic savings, increased focus on maintaining and increasing the skilled labour force, and a stronger role for innovation.

1. Investment and investment finance in CESEE: stylized facts

- *Investment in CESEE has been higher, but also more volatile, than in the EU over the last two decades. The crisis resulted in a slowdown in capital formation, which contributed to lower growth. Public investment supported by EU funds has been robust, whereas private capital formation has been lagging. The composition of investment is tilted towards tangibles.*
- *The region has traditionally relied on foreign capital inflows to finance investments. The crisis resulted in a substantial slowdown of net private capital inflows, pushing the CESEE towards a new growth model: the region needs to rely more than before on domestic savings to finance investment.*
- *CESEE countries are experiencing rapid population aging, combined with outward migration. The decline in total population in the region is almost entirely due to the contraction of working age population, which weighs negatively on the growth of GDP per capita.*

1.1 Investment in CESEE

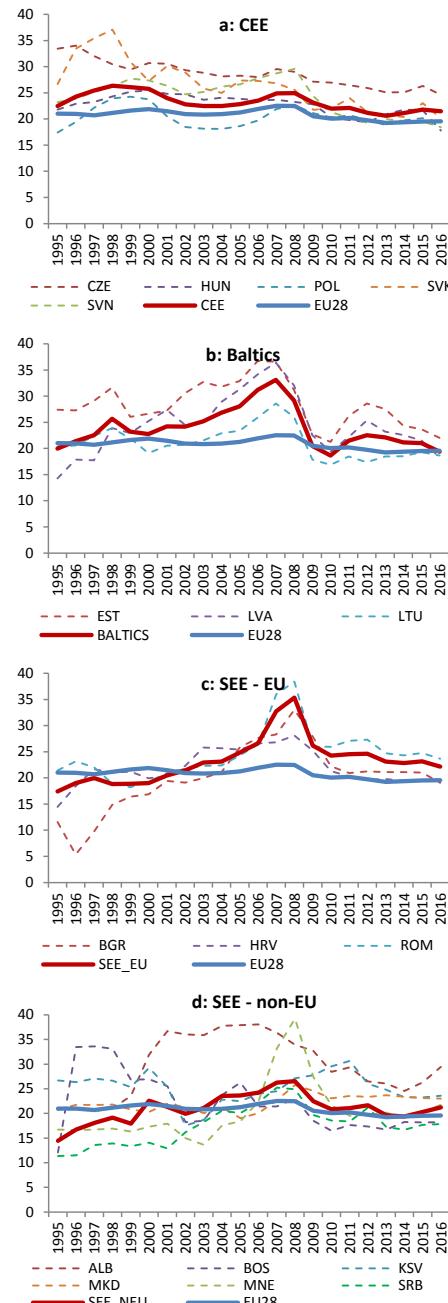
As part of their economic transition, the countries of CESEE went through an important period of capital accumulation during the last 20 years. During these years, the countries in the region have opened their economies and experienced capital inflows that supported investment both directly, and through financial intermediation. Many of the countries have also been benefiting from EU structural funds to support both public infrastructure and private sector capital formation. In the following we identify some of the main characteristics of the capital accumulation process of the CESEE economies.

1.1.1 Despite notable heterogeneity, investment in CESEE has generally exceeded the EU level

Over the past 20 years, aggregate investment showed heterogeneous patterns across Central, Eastern and South Eastern Europe, although it generally exceeded the average levels observed in the EU. In the EU-28 the share of gross fixed capital formation (GFCF) in GDP hovered slightly above 20% before the crisis and peaked at around 22% of GDP in 2007.² Following the outbreak of the crisis, investment activity weakened more sharply than GDP: the share of GFCF fell to just above 19% of GDP by 2013. Investment has since stabilized at around 20% of GDP (EIB, 2016).

Although at a somewhat higher level relative to GDP, GFCF in the five countries of Central and Eastern

Figure 1: Gross Fixed Capital Formation as a share of GDP (in %, at current market prices)



Source: Eurostat, AMECO and HIS (SEE non-EU apart from SRB forecasts for 2016).

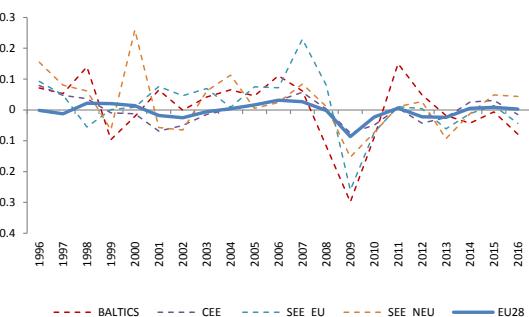
² In this report we use the terms investment and gross fixed capital formation interchangeably.

Europe (CEE) has broadly followed the dynamics observed in the EU. Investment fluctuated between 20% and 25% of GDP, with more pronounced humps in the late 1990s and before the crisis. The decline from the pre-crisis peak of around 25% to just above 20% of GDP in 2013 was also somewhat steeper than in the EU-28. Following the correction in the wake of the crisis, the investment rate in CESEE picked up again in 2013, driven mostly by CEE countries and continued at that level in 2014 and 2015. Since early 2016, the investment rate has fallen by 2 p.p. of GDP to a level below that following the financial crisis. This decline is not exclusive to CEE countries. It is common across the whole CESEE region and is concentrated mostly in investment categories “other buildings and structures”, and “machinery and equipment”. The increase in 2013 and the subsequent decline in 2016 have been associated with the deadline for payments related to the previous programming period of European Structural and Investment Funds (ESIF) at the end of 2015. Investment in the run up to the 2015 deadline was high, boosting investment figures significantly in 2014 and 2015. (EIB, 2016)

GFCF has followed a somewhat different pattern in South-Eastern Europe (SEE) and in the Baltic region, with stronger cyclical fluctuations. Investment in the 1990s remained at comparatively low levels relative to GDP. This was particularly the case in non-EU SEE. There was then a steep increase to a level at least a third higher than the EU28 average. In the Baltics, GFCF reached 33% of GDP in 2007, after which a dramatic collapse occurred over the next two years to roughly 18% of GDP. In the SEE region, developments were very similar. While the post-peak fall was slightly less deep than in the Baltics, the increase before the peak in 2008 was even larger. The share of GFCF in GDP thus skyrocketed in both EU- and non-EU SEE countries by some 17 p.p. from approximately 18% and 10% respectively in 1995. This boom-and-bust pattern has been associated with the construction and real estate sector in many of the countries in the region and may signal unsustainable levels of investment prior to the crisis.³ Investment in the countries of the EU SEE group fell in 2016 similarly to their peers in CEE; this decline is broadly driven by the same factors as in CEE.

Investment developments in individual countries have been influenced by both regional and idiosyncratic factors. Investment relative to GDP was already relatively high in the late 1990s in the CEE sub-region, possibly because these countries were the earliest and largest recipients of foreign investment inflows (particularly intermediated by the banking system), as well as of pre-accession EU funds. From these high levels, investment has been gradually and continuously declining in the Czech and Slovak republics, while it has been broadly stable in Hungary and Poland. In contrast, the Baltics, the EU SEE and some of the non-EU SEE countries typically started from a lower investment level at the beginning of the period, experienced an investment boom before the crisis, and in many cases a dramatic correction thereafter. Beyond these broad patterns, we can also observe rather heterogeneous investment developments in the individual countries. For example, Hungary’s fiscal consolidation of the mid-90s resulted in major cuts in public investment; as a result its investment rate is lower than that of its peers during these years. These idiosyncratic factors have been particularly influential for the non-EU SEE countries, which experienced periods of political instability, while the influence of the EU integration process during the period under investigation was smaller than elsewhere.

Figure 2: Year-on-year change in GFCF/GDP (in %, at current market prices)



Source: Eurostat, AMECO and IHS (SEE non-EU apart from SRB forecasts for 2016).

³ This boom-and-bust pattern was also associated with a financial shock, with banks wanting to rein in their exposure. The construction and real estate sectors were particularly overexposed, and the financial shock hit them. The construction and property booms might have collapsed by themselves, but the trigger was a flaw in the financing. Without the financial factors, the overinvestment might have been absorbed and corrected more gradually.

1.1.2 Investment in CESEE has been highly pro-cyclical and volatile

Investment in CESEE is highly pro-cyclical, but more volatile than GDP and significantly more volatile than investment in the EU. Table 1 suggests that investment is strongly correlated with GDP, and this pro-cyclicality has further increased since the crisis in all country groups except non-EU SEE. Investment is generally more volatile than GDP due to the so-called accelerator effect⁴. As the middle panel of Table 1 shows the relative volatility of investment to GDP was comparable or lower than in the EU before the crisis but has increased after the crisis in the Baltics and SEE. Moreover, volatility of investment was significantly larger in CESEE than in the EU before the crisis. This could be an indication of an unsustainable investment boom before the crisis followed by a bust in the SEE and Baltic regions. In the post-crisis period investment volatility relative to the EU has dropped significantly across the region.

Table 1: Pro-cyclicality and relative volatility of GFCF

	Correlation btw. GFCF and GDP	Volatility of GFCF rel. to GDP*	Volatility of GFCF rel. to EU**			
	1996-2008	2009-2016	1996-2008	2009-2016	1996-2008	2009-2016
BALTICS	0.82	0.97	1.8	2.3	4.2	3.4
CEE	0.80	0.87	1.5	1.5	2.4	1.4
SEE-EU	0.82	0.94	1.6	2.4	4.2	2.1
SEE-non-EU	0.84	0.73	0.8	2.3	4.1	1.5
EU	0.84	0.96	1.7	1.8		

* S.D. of the yoy change in GFCF relative to S.D. of the yoy change in GDP

** S.D. of the yoy change in GFCF relative to S.D. of the yoy change in GFCF in the EU 28

Source: Authors' calculations

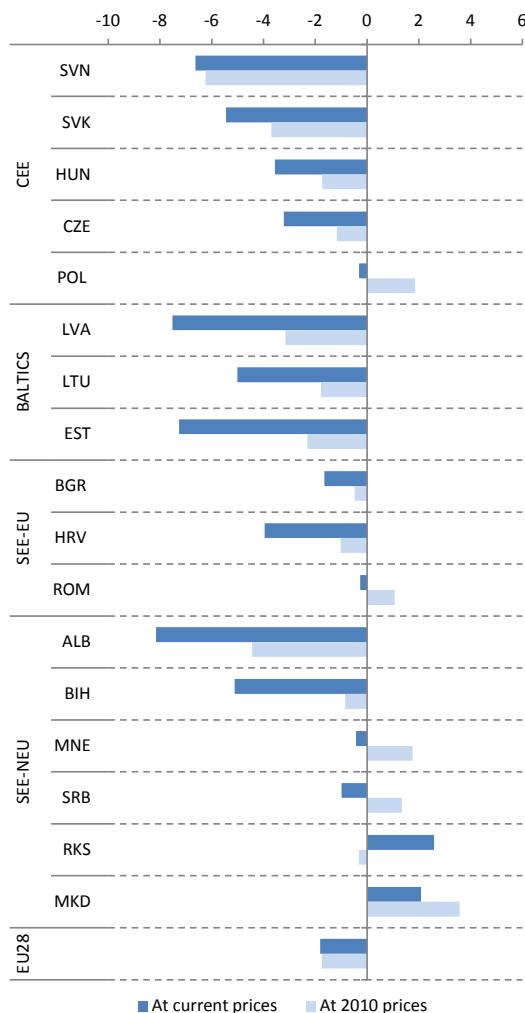
⁴ Rising sales, profits and cash flow combined with easy availability of financing on the back of a booming economy encourage profit expectations and confidence and thus boost investment. In more formal terms, as the capital-output ratio (k) is constant and typically between 2 and 3 in the steady state, investment is a k -multiple of a change in GDP.

1.1.3 Income share spent on investment has been well below pre-crisis levels since 2009

In almost all CESEE countries the share of national income spent on investment has been well below the pre-crisis levels. Figure 3 shows the development of the GFCF to GDP ratio in the CESEE countries since 2009 in comparison to the long-term pre-crisis average. In all countries but Macedonia and Kosovo, nominal investment in the post-crisis period has been between 0.1% (in Romania) and nearly 10% of GDP (in Albania) lower than its long-term pre-crisis average. Looking at the sub-regional aggregates, the gap between the post- and pre-crisis average was the highest in the Baltics (some 6% of GDP), followed by the CEE (roughly 3.5% of GDP) and SEE-non-EU (around 2% of GDP). In the SEE-EU country group, nominal investment is some 1.6% of GDP below the pre-crisis average, particularly thanks to Croatia. In the non-EU SEE group, while investment has been broadly stable in Serbia and Montenegro, the negative development in Albania and Bosnia and Herzegovina has been offset by Kosovo and Macedonia where investment has been rather robust since 2009 compared to the pre-crisis average. On the one hand, this is due to a relative isolation of these countries with respect to developments in the EU. On the other hand, in many of the western Balkan countries investment only started to noticeably recover mostly from rather low levels after the wars and ethnic conflicts which lasted until the late 1990s and early 2000s.

Although the decline in investment spending is mainly due to lower investment volume, the change in the relative price of investment also had an impact in certain countries. Figure 3 shows that in most countries, particularly in the Baltics and some SEE countries, the real investment ratio measured at fixed prices has declined much less than the traditionally used current-price indicator. In these countries, investment goods have become relatively cheaper, and investment volume has actually fallen less than nominal investment spending. In Poland, Montenegro and Serbia real investment even increased while nominal investment dropped. These changes in the relative price of investment indicate that the growth of the GDP deflator has outpaced fixed capital inflation (i.e. investment goods have become relatively cheaper), possibly also pointing to generally weaker demand for investment in the region, alongside more global deflationary trends in intermediate goods. In Kosovo we see the opposite: the relative price of investment increased during the crisis. As a consequence, investment volume decreased while the current-price measure suggests an increase.

Figure 3: Change in GFCF/GDP after the crisis (% point)



Note: The chart shows the difference between the average GFCF/GDP of the given country in the 2009-2016 period relative to the 2000-2008 average. Source: Eurostat, AMECO and IHS. (SEE non-EU apart from SRB forecasts for 2016).

1.1.4 Lower investment contributed to the slower post-crisis growth, in addition to the decline in productivity

While cyclical investment corrections are natural, investment decline caused by structural factors might have long-lasting ramifications for the capital stock and possibly for potential GDP growth. Investment renews and augments the stock of capital, which in turn is a key determinant of potential output. Lower investment implies faster depreciation and lower maintenance of the capital stock. Hence, a structural change in the pattern of fixed investment has implications for the capital stock. This translates, ceteris paribus, into the level of potential output. Figure 4 plots the long-term average rates of growth of the capital stock and potential GDP before (diamonds) and after the crisis (bars).

In all countries but Poland the average growth rate of capital has declined in the wake of the crisis. At the same time, the growth rate of real potential output as calculated by the European Commission has also declined in all countries. In some of them, such as Slovenia, the Baltics and SEE-EU, the decline has been very significant.

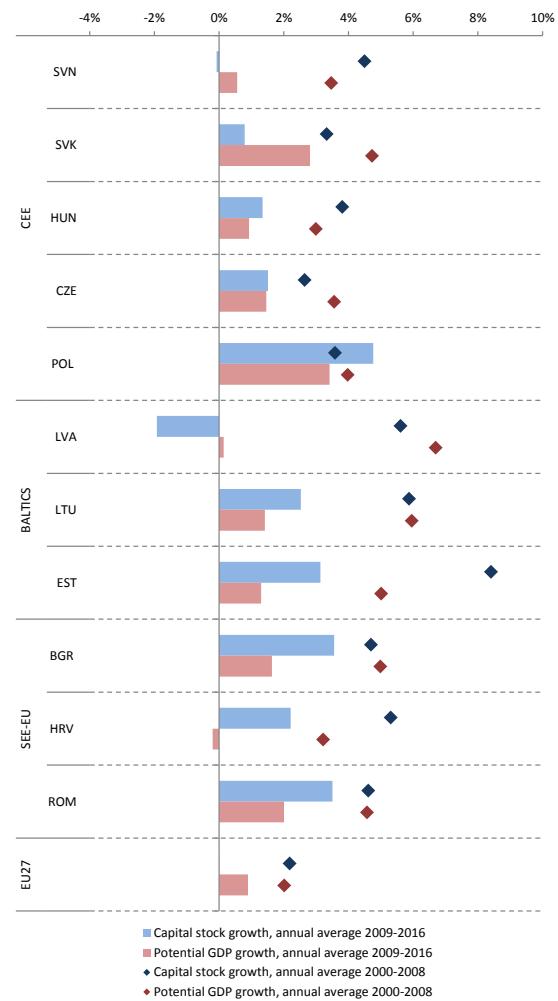
While the decline in productivity growth appears the dominant force driving the decline in potential output common for all countries, slower capital accumulation has also played a role. Based on the analytical framework presented in Appendix 1, it appears that lower investment contributed to the decline of potential growth particularly in the Baltics, Slovenia, Slovakia and Hungary. Poland is the only country in CESEE where capital accumulation has accelerated, and thus largely compensated the total factor productivity (TFP) decline. The contribution of labour reduced potential GDP growth, particularly in Bulgaria and Croatia.

1.1.5 Public investment in CESEE has significantly exceeded the EU average, supported strongly by EU funds

Public investment as a share of GDP has been significantly higher in the CESEE than in the EU-28. Average public GFCF as a share of GDP between 2001 and 2015 exceeded the EU level by 30% in the CEE, by 40% in the Baltics, and by 50% in the SEE-EU country groups (see Figure 5).

Following the crisis, public sector investment declined in the Baltics and SEE countries while it has remained rather robust in CEE. After 2009 the share of GDP spent on fixed capital formation by the government shrank in most countries. This suggests that governments in the CESEE – similarly to other EU countries – were not able to use public investment as a countercyclical stabilisation tool; on the contrary, public sector investment behaved in a somewhat pro-cyclical manner. This is not at all surprising, given that many of the countries in the region had to implement severe fiscal consolidation measures in the aftermath of the financial crisis. However, public investment has recovered over the past couple of years, especially in CEE countries, largely as a result of the

Figure 4: Average growth rate of real capital stock and potential real GDP before and after the crisis (% , 2010 prices)



Source: AMECO.

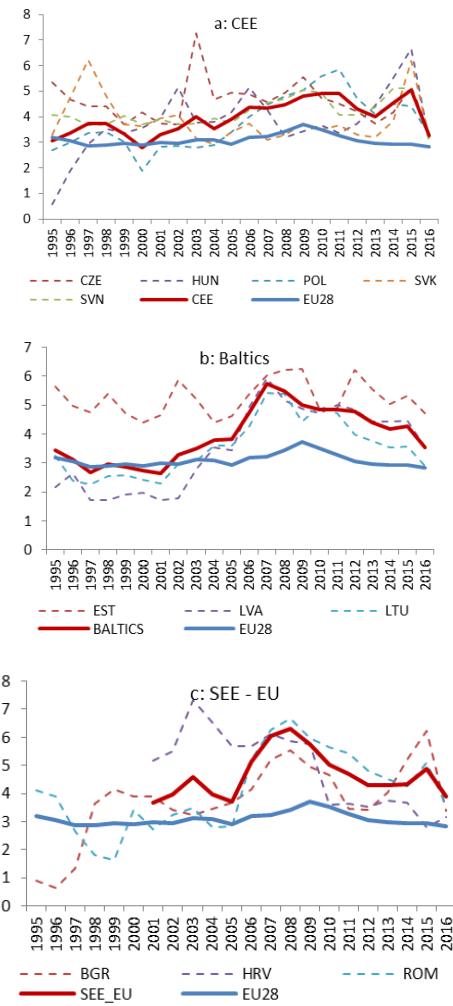
boost given to public investment from disbursements of EU funds as the EU budgetary period came to an end. This boost was temporarily reversed in 2016 due to the 7-year cyclicalities of the ESIF, as noted earlier.

Aggregated public investment figures disguise large heterogeneity across countries. In some countries of the CEE group, such as the Czech Republic, Slovakia or Slovenia, public investment was already consistently above the EU-28 levels before EU accession (see Figure 5). Hungary also caught up with this group after a period of fiscal austerity between 1995 and 1997. Poland, on the other hand, started to spend more on public investment, particularly in infrastructure, only after EU accession.

In most other countries of the Baltics and the SEE, public investment climbed rapidly after 2004, until it peaked at some point during the crisis, and followed a downward path thereafter. This post-crisis reversal came somewhat later in Poland, where the austerity policies implemented in other countries were avoided until 2011 and the Polish economy was sheltered to a large extent from some of the worst effects of the crisis. In Slovenia, public investment fell by more than 1% of GDP between 2009 and 2012, but has since recovered, currently reaching the highest levels in recent history. In Croatia, public investment cuts were part of the fiscal adjustment after 2010.

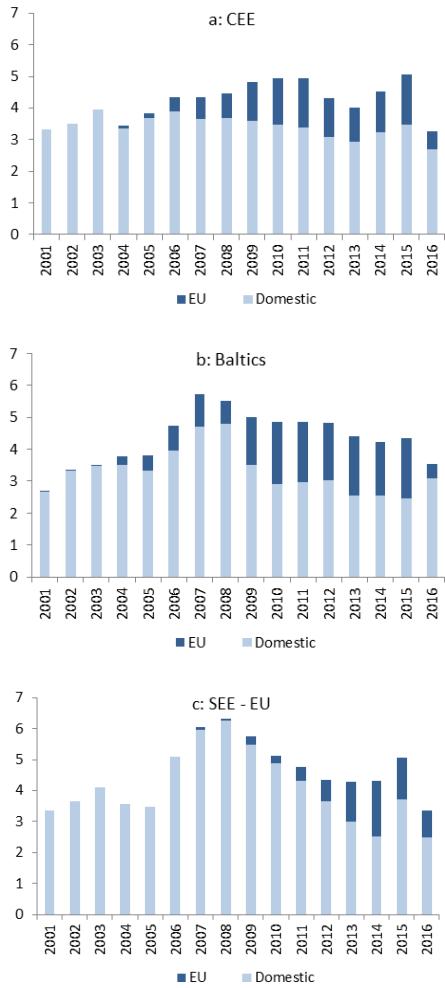
European structural and investment funds (ESIF) have contributed significantly to sustaining public investment in CESEE. Figure 6 shows that after 2004, EU funds became an increasingly important source of public investment in the CEE and the Baltics. Their role was somewhat less pronounced in the SEE country group, mainly because those countries joined the EU at a later stage – Bulgaria and Romania in 2007, and Croatia in 2013.

Figure 5: Public sector investment (GFCF) as a share of GDP (in %, at current market prices)



Source: AMECO

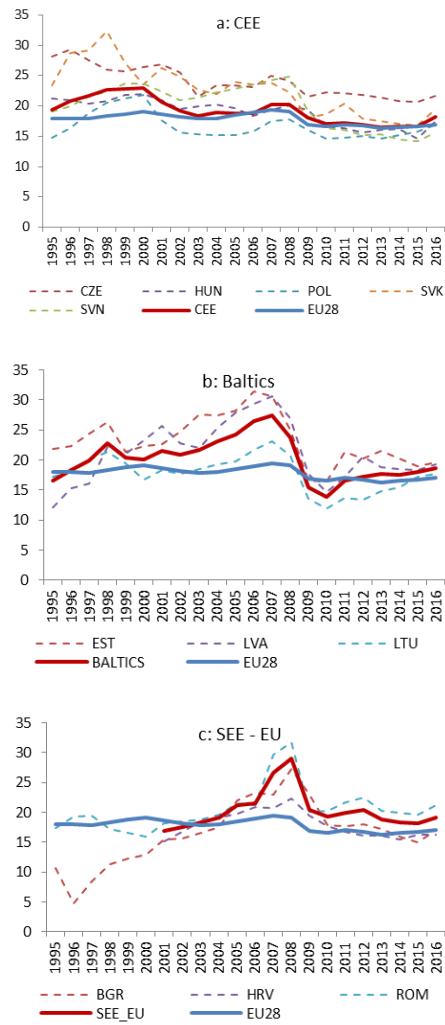
Figure 6: Approximate share of EU funds in public sector investment (GFCF) as a share of GDP (in %, at current market prices)



Note: The EU fund's share in public sector GFCF is represented here by capital transfers from the EU to member state governments. For Poland, we approximate this measure with 95% of the annual payments from the Cohesion Fund and 85% of the European Regional Development Fund.

Source: Eurostat, European Central Bank, and European Commission.

Figure 7: Private sector investment (GFCF) as a share of GDP (in %, at current market prices)



Source: AMECO

One can also conclude that the volume of EU-funded public investment was not fully additional to domestically-sourced investment, as the latter diminished over time in all three country groups. However, the post-2008 economic downturn, and subsequent needs for fiscal adjustment, certainly played a key role in that process. EU-funded public investment also shows a strong cyclical along the 7-year EU budgeting periods, resulting in a significant temporary drop in public investment in 2016.

Even if full additionality in terms of volume was not achieved, EU funds played a crucial role in maintaining a healthy level of public investment during the post-crisis downturn. Without EU sources, public GFCF would certainly have fallen much more in the countries of the CESEE region; the EU Cohesion and Structural Funds played an important countercyclical stabilisation role after 2009.

1.1.6 After a significant drop in the Baltics and SEE, private investment in CESEE is currently at the same level as the EU average

Until the outbreak of the financial crisis, private investment - to a large extent in the form of foreign direct investment - flourished in most CESEE countries. This investment was largely fuelled by economic and political transition, privatisation, prospective of EU accession, financial deepening and a credit boom. These investments helped build up the capital stock in the CESEE countries and facilitated export growth. As a result, the share of national income spent on private investment was (well) above the EU average (Figure 7), especially in the Baltics and SEE. Only in Poland was private investment below the averages of its peers and the EU during most of the past 20 years. This is largely because Poland managed to attract comparatively less FDI inflows relative to GDP compared to its CEE peers for various reasons (OECD 2010). Following the Mass Privatisation Programme initiated in December 1994, FDI flows related to privatised enterprises strengthened and peaked in 2000. However, the privatisation process in Poland, and thus the FDI flow, slowed down substantially thereafter.

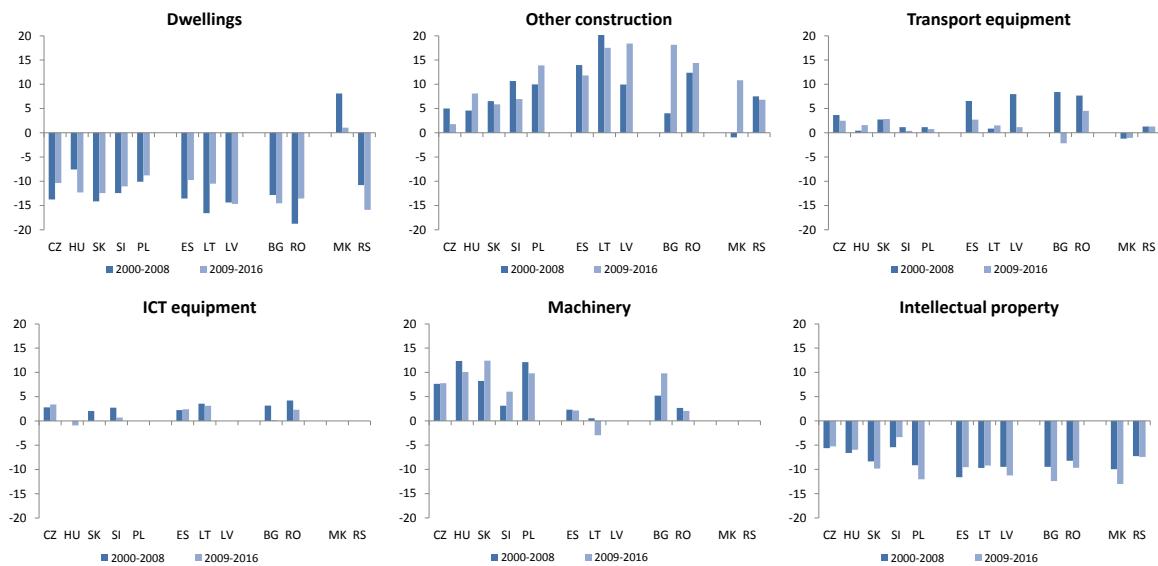
With the onset of the crisis, private investment declined sharply along with foreign private capital inflows. This decline, while varied in terms of magnitude and impact across the countries, reflected the increased risk aversion of financial markets, in part because of significant vulnerabilities and imbalances, as well as the substantial deterioration in external and domestic demand. As a result, the share of private investment in GDP declined in all countries, in many of them dramatically by as much as 15 percentage points. Moreover, there is very little sign of noteworthy recovery, so that in almost all countries the share of private investment in GDP still hovers at or below the EU average. The economic and financial crisis has thus had a major and enduring impact on the region's investment- and export-led growth model.

1.1.7 Investment has been geared to machinery and infrastructure, and less towards R&D

During the economic transition, investment in CESEE focused mainly on machinery and non-residential construction. Figure 8 shows the over- and underrepresentation of the various investment asset classes in the CESEE countries relative to the EU. In almost all countries the share of total investment directed to the residential sector has been well below the EU average, even though the SEE and Baltic economies had experienced periods of unsustainable real estate investment prior the crisis. In contrast, a significantly larger share of investment than in the EU has been geared to non-residential construction, machinery, and to a lesser extent transport and IT equipment. This is because the economic transition required massive investment in renewing vastly outdated, underdeveloped or non-existent infrastructure, non-residential construction and production capacities. In addition, investment in machinery formed part of the process of integrating a number of CESEE economies into western European supply chains.

Investment in intellectual property has been rather underrepresented. As shown above, investment (particularly FDI) has flowed mainly into infrastructure, assembling, production, banking and retail capacities, while making use of the relatively cheap and largely skilled labour in the region. In contrast, investment in R&D has been relatively underrepresented and the gap with the EU average has amounted between 5 and 10 percentage points of total investment. As a corollary, the CESEE countries should try to direct investment into the underrepresented R&D segment, which will allow them to increase total factor productivity and value added and thus help sustain and/or boost economic growth and convergence.

Figure 8: Investment categories, difference vis-à-vis the EU in the share of the respective category in total investment (percentage points)



Source: Eurostat

1.2 Change in the investment finance environment in CESEE countries

Having relied mainly on external funding to support investment, the crisis brought a change in the financing environment for the countries in CESEE. In the following section, we look at the characteristics of this change, by focusing on the post-crisis model of investment finance.

1.2.1 The crisis brought a reversal of capital flows and of FDI in particular

Prior to the crisis, countries in CESEE, especially EU members, enjoyed significant capital inflows (Figure 9), with FDI being the most important component (Figure 10). Large FDI investments underpinned the growth model of CESEE countries. As a result, exports increased rapidly. The capital stock was upgraded with more productive assets allowing for technology transfers to CESEE economies. Resulting higher incomes generated more domestic demand and domestic investment. Large foreign banks saw growth possibilities and high returns in the region and increased their presence, both through local subsidiaries and by lending cross-border to corporates. This helped domestic financial markets development and allowed corporates in the region to increase leverage.

These large net capital inflows allowed economies to increase significantly current consumption and sustain investment. Significant cross-border lending to many CESEE countries through foreign-bank subsidiaries and directly to corporates further weakened the relationship between investment and domestic savings. The ensuing increase in current consumption, along with investment, happened due to expectations of continuing rapid economic growth along the convergence path to high-income EU members. This borrowing against future incomes further strengthened economic growth and domestic demand.

With the advent of the financial crisis, capital flows to the region, both gross and net, collapsed and have remained at a lower level ever since. The largest decline came from inward FDI, which was reduced to a third (EIB, 2016). This decline dealt a hard blow to corporate investment in CESEE, not only through its direct effect

but also through an indirect impact: FDI has a certain catalytic effect on domestic investment that has been reduced with this decline.

Large foreign banks changed their strategies for the region, too. They reduced cross-border loans and intra-firm financing for their subsidiaries, switching to a domestically financed banking model for the region. While international banks remained committed to keep capital for their subsidiaries, they started to repatriate profits and in some cases sold their participations to national or international investors. Portfolio investment in the region halved.

1.2.2 *The corporate sector switched from being a net borrower to a net saver*

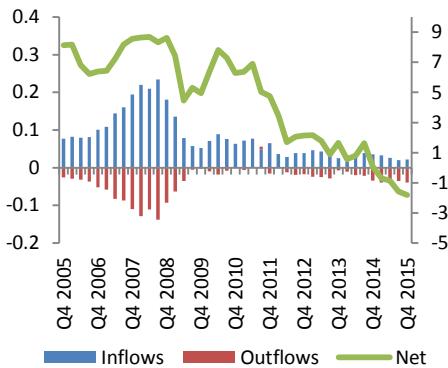
High expected economic growth before the financial crisis and booming international trade implied that corporates in CESEE had optimistic growth expectations. In line with this, the corporate sector increased its indebtedness.

In the wake of the financial crisis, growth and business prospects were revised down significantly, resulting in a debt overhang in the corporate sectors of many countries in the region. Corporates adjusted their balance sheets by increasing substantially their savings and reducing investment. As a result of this deleveraging process, which in some countries encompassed the whole private sector and even the whole economy, the group of CESEE (EU) countries became net exporters of capital (Figure 11 and Figure 12).

Savings were directed at reducing debt, but also at increasing financial assets. A prominent part of financial asset increase is due to liquid assets, cash and deposits, which also improved the loan-to-deposits ratios of banks in countries where debt deleveraging was most prominent. This composition shift to more liquid and shorter maturity assets had started long before the financial crisis: it slowed down during the crisis and accelerated again in 2013, (EIB, 2016). Drivers of this phenomenon are improvements in corporate treasury management, increased volatility of returns and bouts of increased uncertainty. While these are all likely reasons, it is difficult to disentangle and quantify their effects.

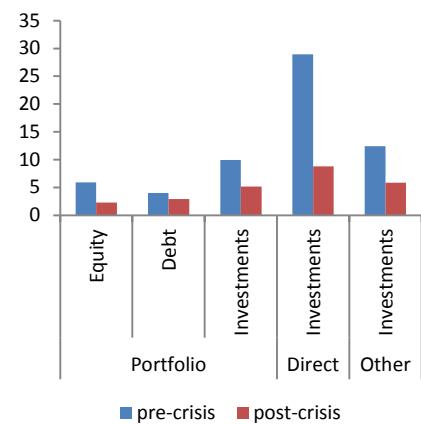
Falling credit demand stemming from balance sheet adjustment and weak growth prospects reinforced the downward pressure on interest rates coming from the global decline in interest rates. As a result, the cost of financing for corporates in CESEE (EU) countries fell substantially. This decline in the cost of financing has not shown up in higher credit volumes and has not pushed up investment significantly yet, partly because it is accompanied by falling investment returns in the region as well as still stretched balance sheets of households and firms in a number of CESEE countries (EIB, 2016).

Figure 9: Evolution of capital outflows and inflows in CESEE-EU (level, USD trillions, lhs, and net flows in % GDP, rhs, both 4-qtr moving average)



Source: ECON calculations based on Eurostat and IMF balance of payments statistics

Figure 10: Capital flows to CESEE-EU (average annual level, USD billions)



Source: Authors' calculations based on Eurostat and IMF balance of payments statistics

Figure 11: Net borrowing over investment (%)

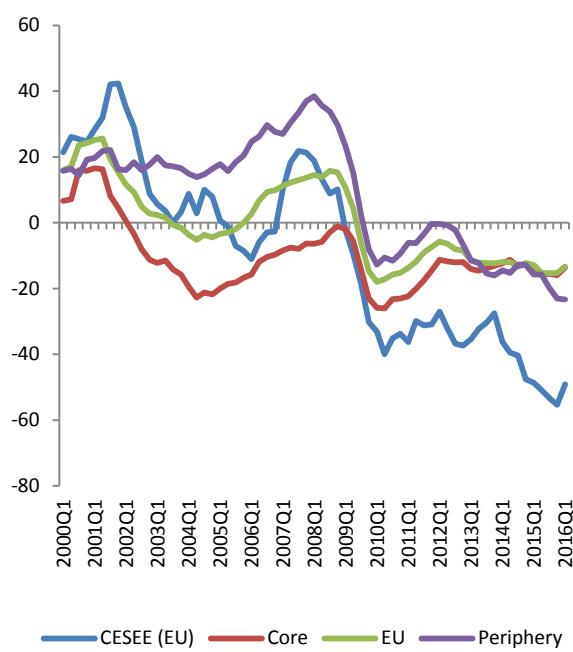
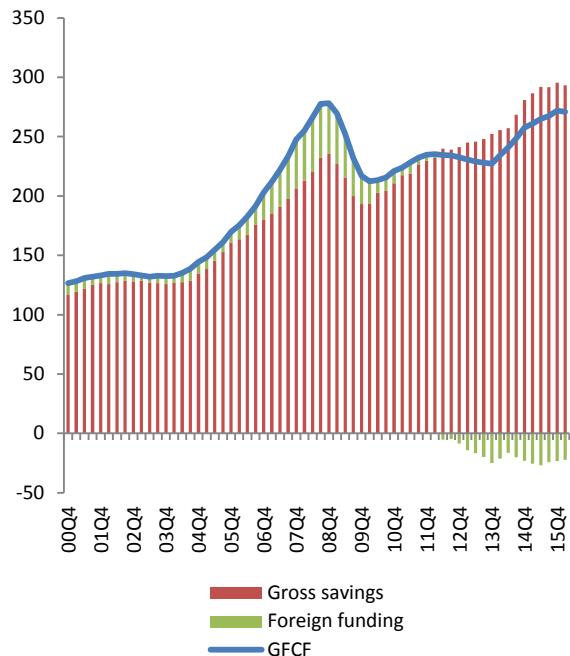


Figure 12: Domestic and external sources of finance for domestic investment (EUR billions, annual flows)

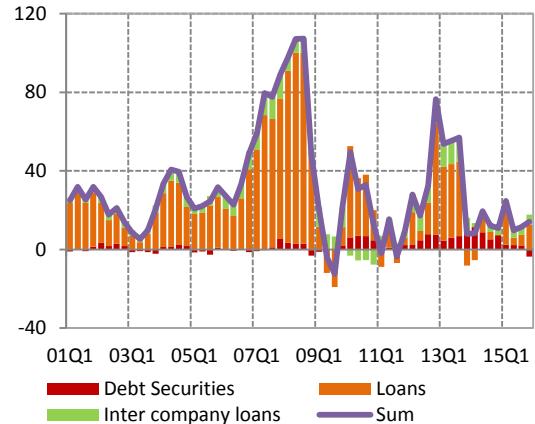


Source: ECON calculations based on Eurostat sectoral accounts.

1.2.3 Bank credit – the quasi-exclusive source of external finance to the corporate sector – fell sharply after the crisis

Bank loans dominated the corporate financing structure in the pre-crisis period. Other sources of external financing were practically negligible except for some positive contributions from intra-group funding (Figure 13). This reflected the financial structure of corporates, which was largely influenced by the degree of development in the regional capital markets. Moreover, the financing through the issuance of debt securities was basically absent, perhaps also thanks to the relatively easy and ample availability of bank credit. A sharp decline in net liabilities is noticeable following the crisis. Most of this decline is attributable to reduced amounts of loans. This largely follows aggregate credit developments in the region. Moreover, a large part of the decline derived from a shortage of long-term loans offered on the market. At the same time, a mild pick up in financing via debt securities has partially offset the loan financing deceleration.

Figure 13: External financing of NFCs (Net transactions in EUR billions, 4-qtr sums)



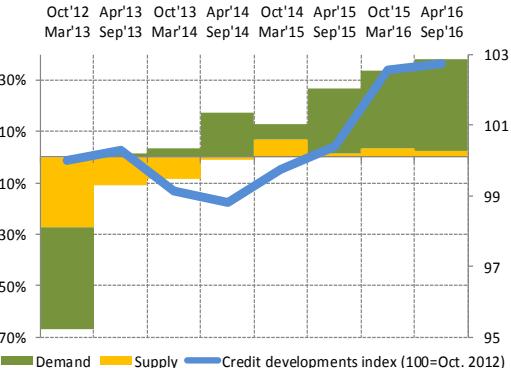
Source: Computations based on Eurostat integrated accounts

Note: Breakdown between intra and extra company loans and debt based on annual accounts. Latest observation: 2015Q4

Figure 14: Year-on-year aggregate credit growth in CESEE (%)



Figure 15: Index of credit developments (RHS) against supply and demand factors (net percentages)



Source: ECB for credit data and EIB Bank Lending Survey for the CESEE region for the factors affecting supply

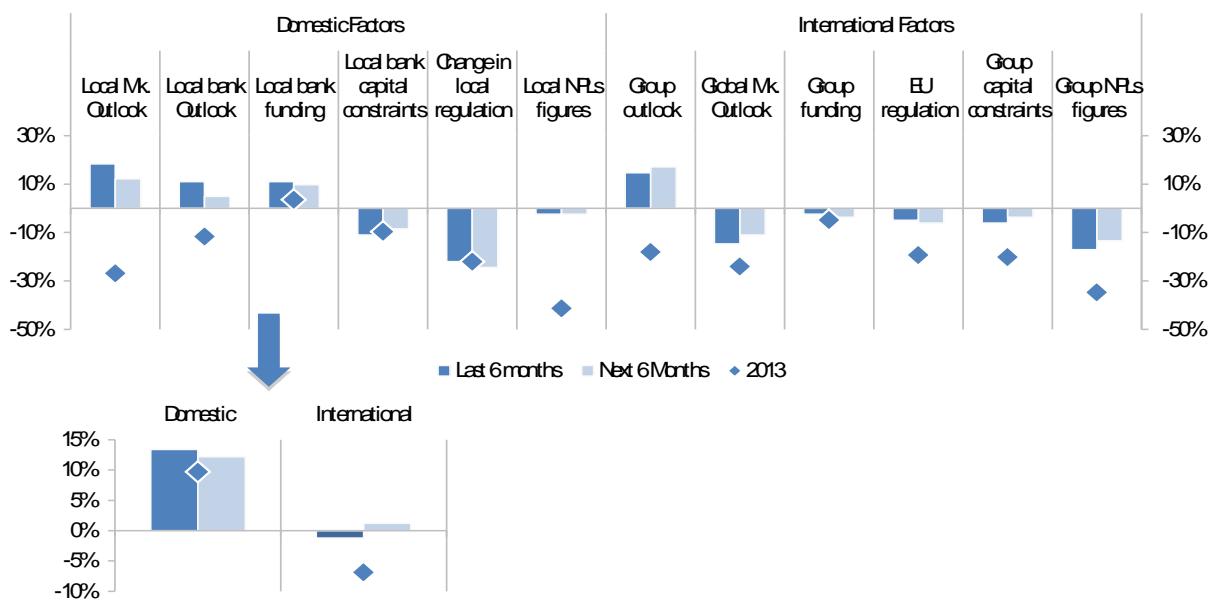
Note: Regional credit developments are defined as the year on year change of aggregate credit converted in EUR for the following countries Bulgaria, Czech Republic, Hungary, Lithuania, Poland, Romania, Slovenia and Estonia

Aggregate credit had been growing at double digit numbers in the CESEE region before the global financial crisis. Figure 14 shows aggregate growth peaking at around 40% year on year around the Lehman Brothers bankruptcy.

The crisis resulted in a stall in total credit growth. Lending began to recover only marginally in 2011-2012 whilst lending growth was essentially around zero afterwards. The EIB Bank Lending Survey for the CESEE region detected that both demand and supply elements influenced aggregate credit developments in CESEE starting from end-2012. Specifically, demand for credit has been in a contracting phase up to mid-2013, whilst credit supply (credit standards) did not ease until end-2016 (Figure 15). This has led to an emerging gap whereby repeated increases in demand have been frustrated by missed easing on the supply side of credit.

On the other hand, mildly positive growth in credit was recorded from mid-2015. It was primarily supported by rebounding demand (Figure 15), whilst supply conditions remained basically unchanged. This also suggests that most of the new (and additional) credit may have been of a higher quality than in prior credit cycles. Some domestic and international factors limited credit extensions. Lately the latter are still being considered a drag on healthy credit growth (Figure 16). Notably the number of limiting factors at domestic level has been decreasing over time compared to 2013 survey, whilst global market outlook, group NPLs, EU regulation and group capital constraints are still having a negative effect on credit supply conditions. Having said this, domestic capital and changes in local regulation also continue to restrain supply conditions.

Figure 16: Factors contributing to supply conditions (credit standards)



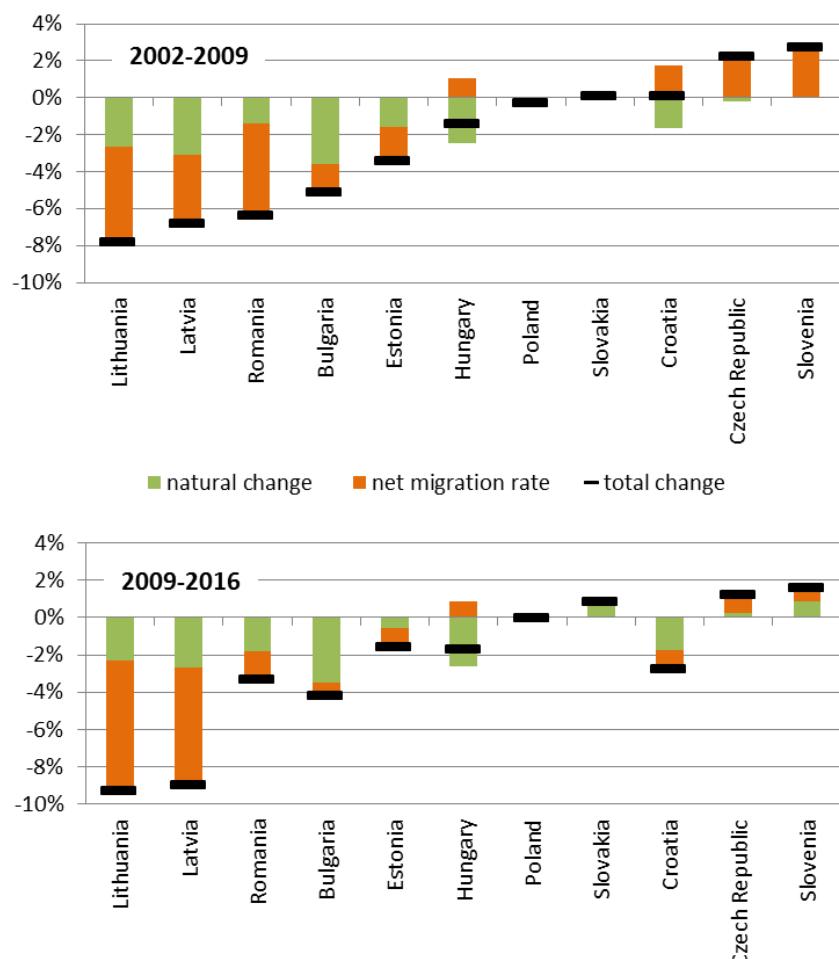
Source: EIB – CESEE Bank Lending Survey – H2:2016 release

Note: Net percentage; positive figures refer to a positive contribution to supply – underlying survey question: “Factors affecting your bank’s credit standards (credit supply). Have the following domestic and international factors contributed to tighten (ease) your credit standards over the past 6 months, and do you expect them to contribute to tighten (ease) your credit standards over the next 6 months?”

1.3 Changing conditions on the labour market

Net outward migration has been an important determinant of the decline in population in the CESEE region. Between 2002 and 2016, total population in EU CESEE countries (EU-11) declined by 4.0 million (-3.8%). Overall, roughly 45% of the population decline was due to outward (net) migration and 55% to the negative impact of natural change. Comparing the periods 2002-2009 and 2009-2016, the pace of population decline due to natural change was almost constant (-1.0% on aggregate in both periods), while the population decline due to net migration halved (from -1.1% in 2002-2009 to -0.6% in 2009-2016). As shown in figure 17, the Baltic States, Romania and Bulgaria suffered greatly in both periods from a negative contribution of both net migration and natural change of population. Overall, since 2002, population declined by more than 15% in Latvia and Lithuania and by around 9% in Estonia and Romania. On the other hand, population increased in Czech Republic (+3%) and Slovenia (+4%).

Figure 17: Rate of population change by component (2002-2009 and 2009-2016)



Source: Eurostat

As a result of rapid aging and outward migration, the median age of the CESEE population has increased. As shown in table 2, life expectancy in the EU-11 generally increased since 2002, but the region did not perform well compared to the EU average either for males and females. In 2002, most countries in the EU-11 had a median age of population below the EU average. All countries witnessed rapid ageing combined with outward migration, and in 2016 most countries showed an alignment of their median age with the one of the EU. On the other hand, Poland and Slovakia recorded a lower median than in the rest of the region.

These trends have led to a rapid increase in old age dependency ratios in the region, particularly in countries where outward migration has been significant. This is somewhat in contrast with a pick up of fertility rates in most EU-11 countries over the last few years. All countries of the region had fertility rates below the EU average in 2002, while in 2015 most countries were aligned with the rest of the Union, with the exception of Poland, Slovakia and Croatia. Even though this is a positive dynamic, fertility rates are still significantly below the replacement threshold of developed countries (2.1 children per woman) and are largely insufficient to reverse the current ageing trend.

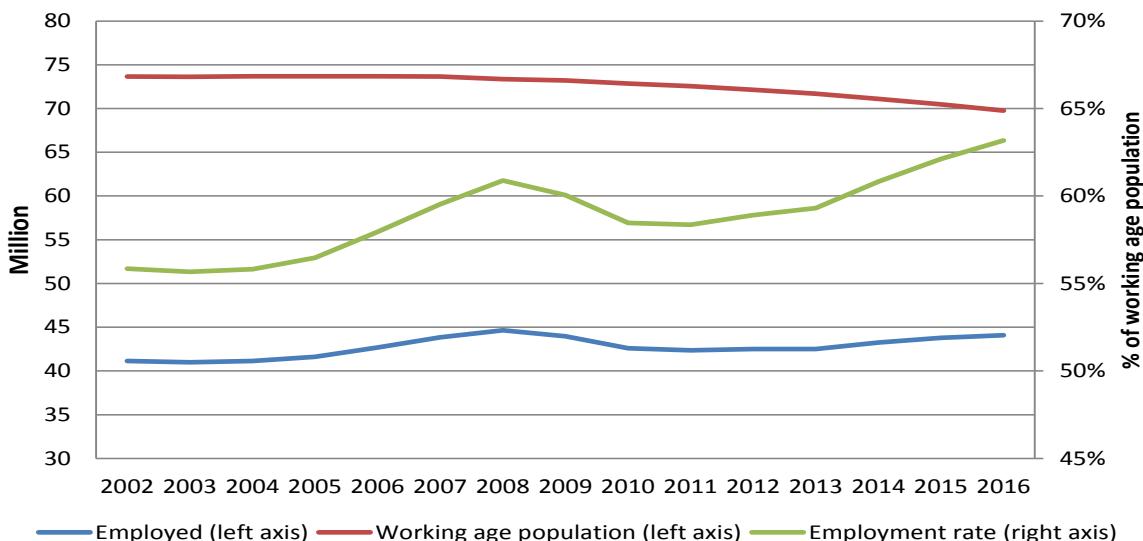
Table 2: Demographic indicators

	Life exp. (females)			Life exp. (males)			Old-age dependency ratio			Median age of population			Fertility rate		
	2004	2009	2014	2004	2009	2014	2002	2009	2016	2002	2009	2016	2002	2009	2015
Bulgaria	76.2	77.4	78.0	69.0	70.1	71.1	25.0	26.1	31.1	40.3	42.0	43.6	1.23	1.66	1.53
Czech Republic	79.2	80.5	82.0	72.6	74.2	75.8	19.7	21.1	27.6	37.9	39.4	41.5	1.17	1.51	1.57
Estonia	77.8	80.2	81.9	66.4	69.8	72.4	22.8	25.8	29.3	38.5	39.9	41.6	1.36	1.70	1.58
Croatia	78.8	79.7	81.0	71.9	73.0	74.7	24.6	26.8	29.0	40.1	41.7	43.0	1.42	1.58	1.40
Latvia	76.2	78.0	79.4	65.9	68.1	69.1	22.7	26.2	30.2	38.5	40.2	42.9	1.26	1.46	1.70
Lithuania	77.7	78.7	80.1	66.3	67.5	69.2	21.8	25.4	28.6	36.7	39.9	43.1	1.23	1.50	1.70
Hungary	77.2	78.4	79.4	68.7	70.3	72.3	22.3	23.8	27.2	38.7	39.6	41.9	1.30	1.32	1.45
Poland	79.2	80.1	81.7	70.6	71.5	73.7	18.2	18.9	23.1	35.7	37.5	39.9	1.25	1.40	1.32
Romania	75.5	77.4	78.7	68.2	69.8	71.4	20.4	23.7	25.9	35.0	40.1	41.4	1.27	1.66	1.58
Slovenia	80.8	82.7	84.1	73.5	75.9	78.2	20.6	23.6	27.6	38.6	41.2	43.2	1.21	1.53	1.57
Slovakia	78.0	79.1	80.5	70.3	71.4	73.3	16.3	17.0	20.6	34.4	36.6	39.4	1.19	1.44	1.40
EU	81.5	82.6	83.6	75.2	76.7	78.1	23.9	25.8	29.3	38.6	40.7	42.6	1.46	1.61	1.58
Notes:	years			years			65+aged 15-64			years			children/woman		

Source: Eurostat

The decline of total population in the region is almost entirely explained by the contraction of working age population (people aged 16-64) – for a total of 3.9 million. The fall of working age population has been faster than total population decline, in line with the dynamics observed in the rest of Europe. As shown in figure 18, this also explains the employment rate trends: while the employment rate of the region increased significantly since 2010 (+5 p.p.), the employed headcount has not reached its pre-crisis peak.

Figure 18: Number of employed, working age population and employment rate in the EU-11 (2002-2016)



Source: Eurostat

CESEE countries have registered an improvement in healthy life expectancy, while quality of health care and prevention still lags behind EU. A relevant indicator to complement life expectancy is the one measuring the expected length of life in good health (healthy life expectancy), which is largely related to the coverage and quality of healthcare services and is obviously a major driver for labour force productivity. In Europe, healthy life expectancy has registered almost no changes since 2002. Instead, in the region, some progress is evident in Czech Republic, Lithuania, Estonia and Hungary. Some countries record significant negative gaps with the EU average, in particular Estonia, Latvia and Slovakia. This evidence is also consistent with the relatively poor

performance of these countries in (bad/very bad) self-reported health status. As shown in table 3, the region scores poorly in terms of quality of healthcare and prevention, with high rates of amendable deaths⁵ and preventable deaths⁶. However, the situation is improving rapidly: in recent years amenable/preventable death rates declined in every country of the region with the exception of Bulgaria.

Table 3: Health quality indicators

	Healthy Life exp. (females)			Healthy Life exp. (males)			Bad/very bad self- reported health			Amenable deaths		Preventable deaths	
	2002	2009	2016	2002	2009	2016	2005	2009	2015	2011	2014	2011	2014
Bulgaria	n.a.	65.9	66.1	n.a.	62.1	62.0	n.a.	12.7	12.2	280	289	248	270
Czech Republic	60.0	62.7	65.0	58.0	61.1	63.4	13.0	12.6	11.0	196	177	308	267
Estonia	52.4	59.2	57.1	48.3	55	53.2	16.1	14.1	15.7	255	235	348	325
Croatia	n.a.	n.a.	60.0	n.a.	n.a.	58.6	n.a.	n.a.	19.8	226	207	339	320
Latvia	53.2	56.0	55.3	50.8	52.6	51.5	21.5	16.6	16.3	371	332	449	423
Lithuania	54.6	61.2	61.7	51.4	57.2	57.6	18.2	18.4	17.6	346	311	486	439
Hungary	54.3	58.2	60.8	52.2	55.9	58.9	21.9	17.5	15.7	288	266	448	414
Poland	66.9	62.5	62.7	61.2	58.3	59.8	18.5	16.4	14.2	197	170	299	277
Romania	n.a.	61.7	59.0	n.a.	59.8	59.0	n.a.	8.2	8.5	344	319	379	364
Slovenia	60.1	61.5	59.6	56.4	60.6	57.8	16.2	13.0	11.6	137	123	290	251
Slovakia	56.6	52.6	54.6	55.2	52.4	55.5	17.5	14.5	12.2	262	243	405	350
EU	62.5	62.0	61.8	61.1	61.3	61.4	10.5	9.2	9.6	138	126	226	214

Notes:

years

years

% of population

per 100,000 inhabitants

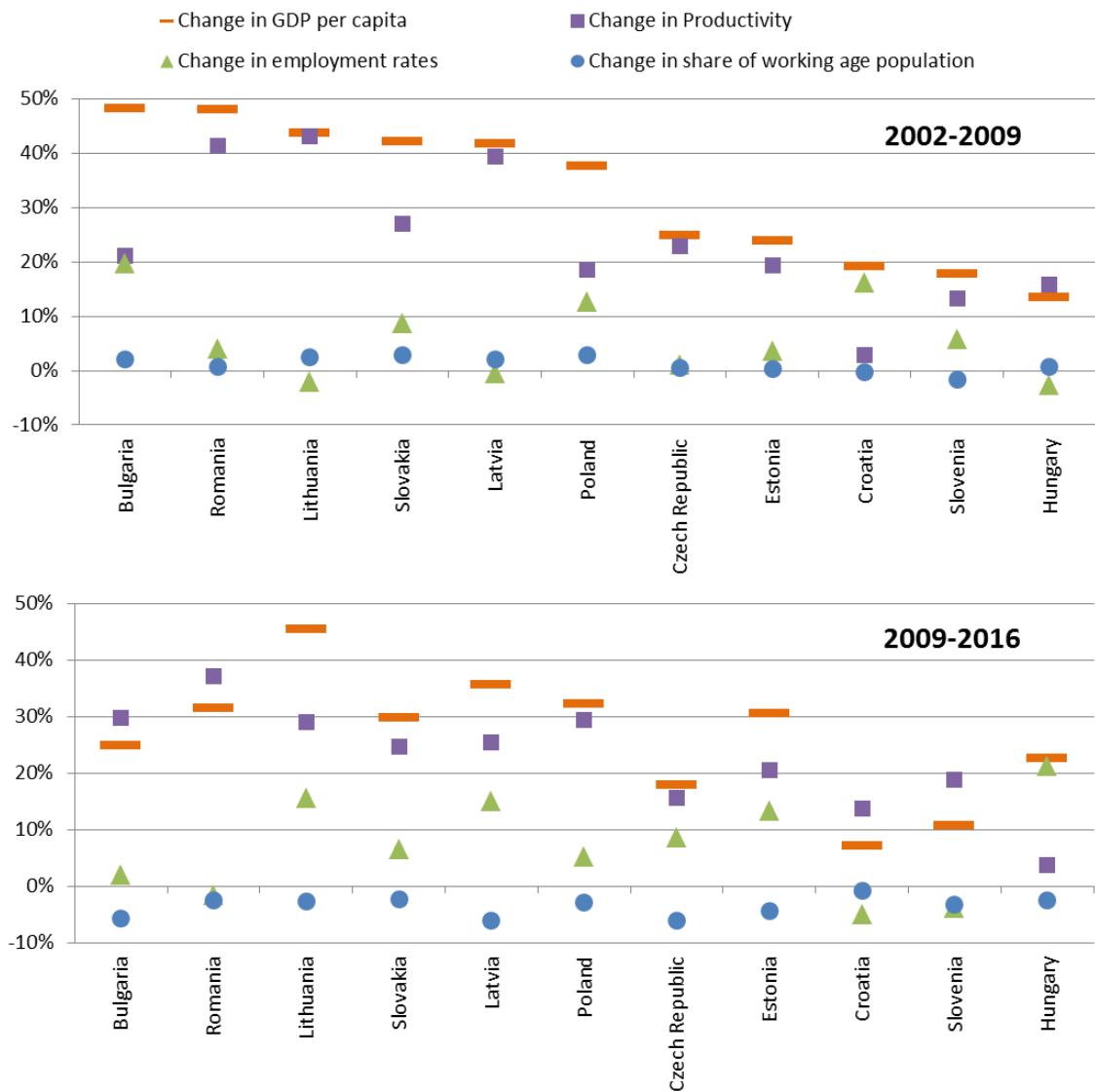
Source: Eurostat

Even under optimistic active population scenarios, the decline of the working age population will put pressure on GDP per capita growth, reinforcing the need to boost labour productivity. As shown in figure 19, changes of GDP per capita between 2002 and 2009 were driven by increased labour productivity and by increases in employment rates, with a neutral impact of the change of working age population. However, between 2009 and 2016 the change in the employment rate has become a drag on GDP per capita growth. As a consequence, GDP per capita has increased less than labour productivity in a number of countries, and has been lifted mainly by higher employment rates. Looking ahead, however, natural change and ageing are expected to play a more important role. The growth of employment rates, therefore, is likely to be less significant as potential labour force will be declining. According to the Eurostat demographic model Europop2013 (EC 2015), Baltic States, Slovakia and Bulgaria in particular are expected to register a significant decline of population and – at the same time – an even stronger decline of working age population until 2060. No country in the region is expected to register an increase in working age population until 2060. Labour productivity thus needs to increase significantly to counterbalance these factors and support GDP per capita growth.

⁵ The amenable death rate considers deaths that could have been avoided through optimal quality health care.

⁶ Wider than the amenable death rate definition, the preventable death rate includes deaths which could have been avoided by public health interventions focusing on wider determinants of public health, such as behaviour and lifestyle factors, socioeconomic status and environmental factors.

Figure 19: Changes of GDP per capita and its components



Source: Eurostat

2. Investment gap: are CESEE countries investing enough?

- *The level of public and private investment in CESEE has been below the levels experienced in countries that successfully graduated from middle income to high income in the past.*
- *For most CESEE economies the current investment levels are not sufficient to maintain the size of the capital stock relative to GDP under reasonable growth assumptions.*
- *In comparison to EU average, CESEE countries have been investing more in utilities and transport as a share of their GDP, and less in health infrastructure.*
- *With respect to strategic and competitiveness indicators, the CESEE region underperforms the EU average in most cases, with some exceptions in the realm of human capital.*

No uniform methodology exists to determine the optimal speed of capital accumulation for countries or groups of countries. When talking about investment in CESEE or elsewhere in the EU, we often compare investment data to the pre-crisis level. However, for many countries, the pre-crisis investment dynamics might not be considered as a sustainable equilibrium and therefore cannot serve as a good benchmark for comparison. A good benchmark in a CESEE context should in one way or another take into consideration the process of convergence of the region towards the EU. It should take into account that a) these countries started their transition with a relatively low stock of productive capital, b) some of them are in the process of switching towards more capital-intensive technologies, and c) that along the path of presumed output convergence, a higher investment rate is necessary to maintain the relative size of capital stock.

In the following, we use several benchmarks to assess the adequacy of aggregate capital accumulation and its components. The first simply looks at the experience of countries that successfully graduated from middle income to high income in the past, and compares their investment activity to that experienced in the CESEE region. The second approach calculates the investment necessary for preserving the relative size of capital under certain convergence and growth scenarios. The third derives the optimal level of investment from an econometric estimation that assumes a long-run relation between investment, the growth rate and the cost of capital.

After this, we move beyond aggregate investment to identify particular areas where clear gaps exist in the capital stock. In particular, we look at investment in infrastructure, and try to identify areas with the most important needs. Finally, we examine a broader set of competitiveness indicators to identify areas where the largest improvements could be achieved through investment.

2.1 A simple benchmark for investment rate: the “Growth Commission” approach

The Commission on Growth and Development, an independent expert panel established by the World Bank in 2006, studied policies and strategies that underlay rapid and sustained economic growth (Commission on Growth and Development, 2008). The key question of the analysis was to study how countries are able to successfully graduate from middle income to high income status. Since 1950, only very few (13) economies achieved the necessary fast, sustained growth to make the leap from middle income to high income.⁷ The study attempted to establish some common factors of such successful transitions. Given that the transition economies of the CESEE have been also in the income category between middle and high income, the results can be considered relevant.

Among the key lessons, two relate to investment:

⁷ The 13 countries are Botswana; Brazil; China; Hong Kong; Indonesia; Japan; the Republic of Korea; Malaysia; Malta; Oman; Singapore; Taiwan; and Thailand.

- **High investment levels above 25 per cent of GDP are needed for sustained periods (15 years).** If the cases examined in the report can serve as a guide, overall investment rates of 25 percent of GDP or above are needed for the transition leap, including both public and private investment expenditures;
- **Around 5 to 7 per cent of GDP should be spent on public investment.** None of the countries has sustained fast growth without also maintaining impressive rates of public investment in infrastructure, education, and health.

These benchmarks can be considered as necessary, but not sufficient conditions for a successful transition from middle to high income. Investment is only one, albeit important, component of success. There are many other policy components that have been identified as common patterns in the countries observed by the study, including macroeconomic stability, openness to the global economy, sound governance and market orientation, among others.

Most CESEE countries have reached the 25 percent benchmark for total investment to GDP only for short periods of time during the last 20 years. Within the CEE group, the Czech Republic and Slovakia have been consistently above the 25 per cent level during the pre-crisis period; Hungary and Slovenia showed an uneven performance, while Poland remained well below the benchmark for most of the period. The countries of South Eastern Europe and the Baltics (except Estonia) performed above the benchmark only during the pre-crisis boom, and their investment rate deteriorated significantly after 2008. Within the non-EU group, only Albania has managed to invest more than a quarter of its GDP for longer periods.

When it comes to public investment, the picture is similar, if not worse. Even with the support of the EU structural funds, the level of public sector investment broke through the lower level of 5 per cent only for a short period of time before the crisis, and stayed well below the thresholds for most of the period observed (Figure 6).

2.2 Capital-preserving investment along the steady-state growth path

A simple benchmark for investment can be derived from the presumed stability of the capital stock relative to output. The stability of the capital-to-output ratio is one of the six stylised facts of economic growth put forward by Kaldor (1961). The stable capital-to-output ratio also plays a pivotal role in most growth models, such as Harrod (1939) and Domar (1946), but also in Solow (1956), and later in the aK model of Romer (1986).

Under the assumption of a constant capital-to-output ratio, given a path for economic growth and a capital depreciation rate, it is possible to derive the corresponding “capital-preserving” investment-to-output ratio. If we assume an exogenous growth rate (g), and a depreciation rate (δ), the following formula can be used to calculate the capital-preserving investment-to-output ratio:

$$k^* = \frac{K_0}{Y_0} = \frac{K_1}{Y_1} = \frac{K_0(1 - \delta) + I_1}{Y_0(1 + g)} \quad \rightarrow \quad \frac{I_0}{Y_0} = \frac{I_1}{Y_1} = i^* = k^* \frac{(g + \delta)}{(1 + g)}$$

where K_t , Y_t , I_t denotes the capital stock, output and investment, respectively, and i^* and k^* represent the investment-to-output ratio and the capital-to-output ratio along the “steady-state” growth path characterised by the preservation of the capital-to-output ratio.⁸

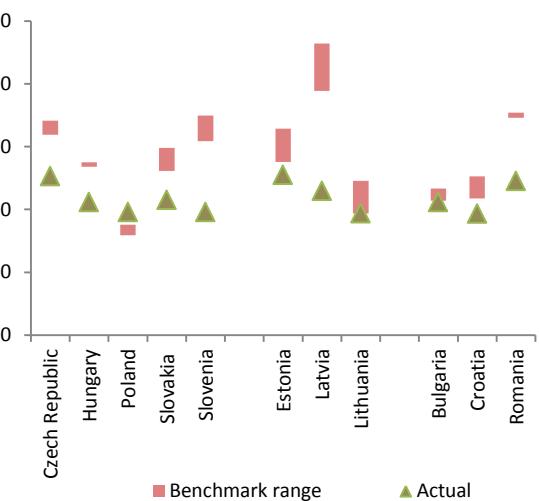
⁸ A similar approach is used for determining the “golden rule” investment benchmarks for CESEE economies by IMF (2016), and for the EU countries by Lewis et al (2014).

An investment benchmark based on the stability of the capital stock relative to output is a relevant basis of comparison for most CESEE economies, at least as a lower bound for investment. It is fair to ask whether one could assume a constant capital-to-output ratio in a transition economy. If the gap in economic development between Western Europe and the CESEE is due to the relative scarcity of capital in the CESEE countries, one would expect an increase in the K/Y ratio over the convergence path. The development accounting framework presented in Appendix 2 shows that for most of the countries, the difference between CESEE and the EU in economic output per employee is chiefly due to lower productivity, rather than to a lower capital stock. The majority of CESEE countries have K/Y ratios similar to or even higher than the EU average. For these economies, the above benchmark is particularly relevant. In certain countries (mainly Poland, but to some extent also Bulgaria and Lithuania) the lower level of capital relative to GDP plays a non-trivial role in the economic development gap, besides lower productivity. In these countries, the above benchmark can be considered as only a lower bound.

For most countries of CESEE, actual investment remains well below the capital-preserving benchmark investment-to-GDP ratio. Figure 20 shows actual investment rates (the average between 2013 and 2015) for each CESEE-EU country against a range that represents the capital-preserving benchmark investment rate. The range is defined by two different growth scenarios. One assumes that the growth rate of CESEE economies will remain the same as has been experienced since 2000. The other takes the latest forecast of the European Commission for 2017, and assumes that it is equal to the steady-state growth rate for the CESEE countries in the coming years. Table 4 shows the calculations in more detail.

For most of the countries, this approach suggests that investment should be higher, by at least 5 percentage points relative to the GDP. Such an increase would be able to guarantee the maintenance of the existing capital-to-GDP ratios along the projected growth paths. The countries where the gap is small, or even negative are Poland, Bulgaria and Lithuania. In these countries however, the capital-to-output ratio remains well below the EU average. Although it is possible that this lower level represents equilibrium, it is as plausible to assume that these countries will also converge eventually in terms of their capital-to-output ratio. In this respect, it is probably better to interpret the benchmark investment ratios as minimum targets, rather than optimal levels for investment.

Figure 20: Difference between the capital-preserving investment benchmark and actual investment (% of GDP)



Source: Own calculations based on PWT and AMECO data. See the notes for Table 4.

Table 4: Calculation of the investment gap based on the capital-preserving investment benchmark

	Capital-to-output ratio in 2014	Average GDP growth rate 2010-2016 (%)	EC potential growth estimate 2017 (%)	Depreciation rate (%)	Capital-preserving investment ratio (past growth) (% of GDP)	Capital-preserving investment ratio (potential growth) (% of GDP)	Average actual investment ratio (2013-2015) (% GDP)	Investment gap (% GDP)
Czech Republic	5.2	2.8	2.3	4.0	34.1	31.9	25.3	-7.7
Hungary	4.2	2.1	2.3	4.4	26.8	27.5	21.2	-6.0
Poland	2.1	3.6	2.8	4.8	17.6	15.9	19.6	2.8
Slovakia	3.4	3.9	2.7	5.2	29.8	26.1	21.5	-6.4
Slovenia	5.4	2.1	1.3	4.5	34.9	30.9	19.6	-13.3
Estonia	4.1	3.8	2.4	4.6	32.8	27.6	25.5	-4.7
Latvia	6.6	3.9	2.6	3.4	46.4	38.9	23.0	-19.7
Lithuania	3.1	4.2	2.3	4.0	24.6	19.4	19.4	-2.6
Bulgaria	2.5	3.7	2.8	6.0	23.3	21.4	21.2	-1.2
Croatia	4.5	1.5	0.7	4.2	25.3	21.8	19.3	-4.2
Romania	4.0	3.6	3.8	5.3	34.6	35.4	24.5	-10.5

Sources: Capital-to-output ratio and depreciation rate was calculated using the Penn World Tables v9.0. Data for the GDP growth rates and actual investment came from the AMECO database.

2.3 An investment equation based on output growth and user cost of capital

Any empirical estimate of potential investment gaps requires a definition of “optimal” or “ideal” investment levels at each point in time. For instance, the Solow – Swan growth model states that in every period a fraction of income produced by physical capital and labour is re-invested in physical capital. Empirical findings have established that investment in physical capital and output move together (i.e. Kaldor, 1957, Shapiro et al, 1986). Moreover, firms employ prices and costs as an important signalling determinant when taking investment decisions, according to the neoclassical growth model. For example, Caballero (1994) and Schaller (2006) found that the level of investment is related to the cost of capital in the long run. Similarly, Coulibaly and Millar (2011) and Shaller (2006) assessed the user cost of capital to be both significant and of economic importance⁹.

Based on these considerations, we model investment levels as the outcome of a long-run relationship¹⁰ with real GDP and the user cost of capital. In practice the user cost is most naturally thought of as the cost per period of using a tangible capital good and can be decomposed into three constituents: (i) the opportunity cost of funds tied up per unit of capital; (ii) the depreciation of the productive capacity of capital; (iii) an implicit cost derived from the alternative of renting. To avoid being too normative, we have employed several models based on alternative data specifications (see the technical annex). For example, we have augmented the Central Europe

⁹ Most notably in the long run for those economies where the supply curve of capital is flat and shocks to capital supply are more likely to be exogenous.

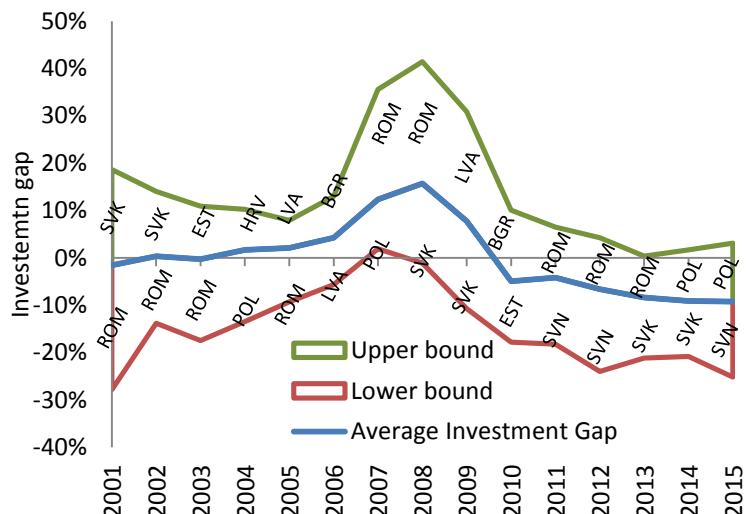
¹⁰ With fundamental driving forces adhering to economic theory and empirical findings

region with old EU member states. By doing so, we accounted for a convergence effect whereby countries in the CESEE region have been catching-up with the old EU member states.

At the regional level, investment dynamics since 2001 evolved from a balanced pattern, through overinvestment to recently experienced investment gaps.

First, average cross country investment levels were roughly balanced until 2004 with some countries experiencing overinvestment and others underinvestment (Figure 21¹¹). Between 2005 and 2008 a more visible positive misalignment emerged across the board, basically pointing at generalised overinvestment levels. These were closed around 2009. Since then the average investment levels indicated a growing investment gap, and persistently deteriorated over time, leading to an environment characterised by underinvestment.

Figure 21. Investment gap corridor across the region - including average, upper and lower bounds



Source: Authors' calculations

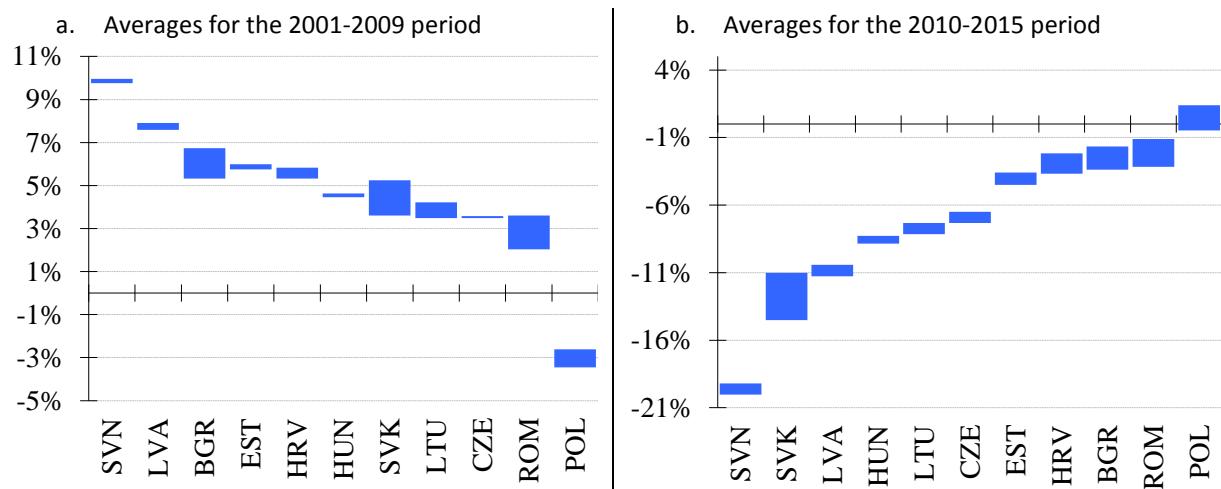
Note: boundaries are the extreme values obtained from any of the four models; average values represent the mean score across all countries and all models – see Annex for technical details.

The estimated gaps reveal divergent country groups before and after the global financial crisis. Looking at the country specificities, Figure 22 reports ranges of investment gaps based on the full set of models¹² (see the technical annex). We detected a generalised average overinvestment until 2009, except for Poland. This was largely influenced by the significant misalignment started in 2004-2005 at the regional level. Overinvestment was on average above 5% in Slovenia, Latvia, Bulgaria, Estonia and Croatia, while it was between 3% and 5% in Hungary, Slovak Republic, Lithuania, Czech Republic and Romania. After the crisis the picture is even more heterogeneous. The Slovak Republic and Slovenia show the largest average undershooting in investment between 2010 and 2015, with investment levels misaligned more than 10%. Investment in Latvia, Hungary, Lithuania and Czech Republic are negatively misaligned between 5% and 10%, whilst investment in Estonia, Croatia, Bulgaria and Romania have been undershooting less than 5% on average. Average investment levels are roughly in balance in Poland.

¹¹ This figure plots the time series of average investment gaps across all countries. Moreover the minimum and maximum boundaries are also depicted. These are defined as the extreme outcomes obtained from any of the four models in Table A.1 after comparing all individual countries. The data labels indicate the country that set the extreme (minimum or maximum) value in each year.

¹² The results from the various models are statistically significant and robust. Notably local pricing conditions have a stronger effect on investment levels in economies with more developed financial markets because the user cost of capital has a higher impact on investment when old EU member states are included.

Figure 22: Investment gaps - pre crisis and post crisis estimates – min-max ranges



Source: Authors' calculations

Note: vertical bars report the minimum and maximum values derived from four models (technical details in the Annex)

2.4 Infrastructure and competitiveness gaps

2.4.1. Infrastructure gaps

In this subsection, we move beyond aggregate investment to identify particular areas where obvious gaps exist in the capital stock. In particular, we look at investment in infrastructure, and try to identify areas with the most important needs. Next, we examine a broader set of competitiveness indicators to identify areas where the largest improvements could be achieved through investment.

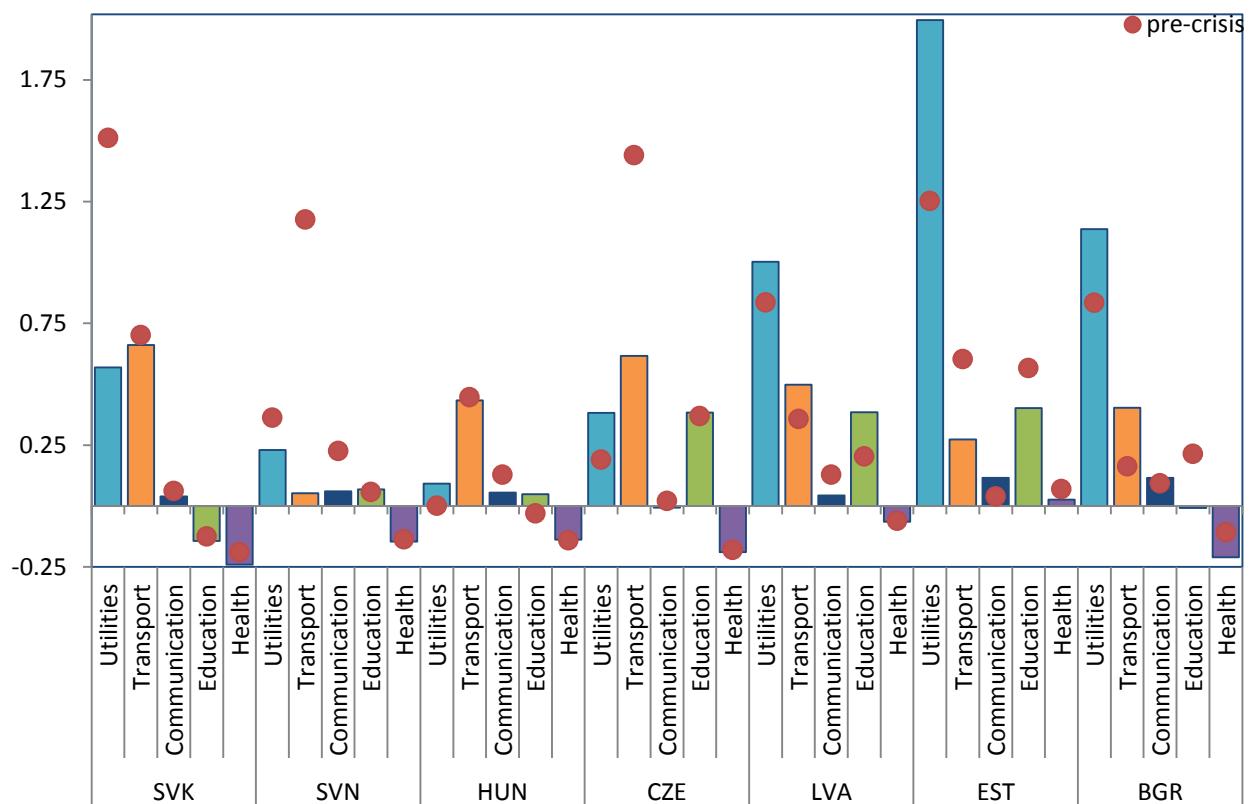
In comparison to the EU average, CESEE countries have been investing more in utilities and transport infrastructure as a share of their GDP and less in health infrastructure (Figure 23). This seems as a natural development in cohesion EU countries as part of their catching up to the infrastructure standards of the core EU countries, and it also reflects the drawing from the EU structural funds post-EU accession. Prioritizing utilities and transport and to some extent also education infrastructure over the healthcare infrastructure vis-à-vis the EU average might be appropriate for the time being, but the relative under-investment in health infrastructure could become an issue in the medium term given the aging population. As for the relative prioritization of education and health infrastructure, the positive investment gap vis-à-vis the EU average has been higher in education infrastructure relative to health infrastructure in most countries, with a particularly large positive gap for education infrastructure investment in Czech Republic, Latvia and Estonia. In Slovakia, there has been systematic under-investing in education infrastructure before and after the crisis in comparison to EU average. In Hungary and Bulgaria, investment in education infrastructure fell short of the EU average only after the crisis. While there are already signs of skill mismatches and tertiary education gaps in several countries in the region, education infrastructure is only half of the story, as it does not necessarily relate to investment in the quality of education, training or R&D (see next section below for related indicators).

Post crisis, the main cuts across the region in comparison to the EU average have been in investment in utilities infrastructure in Slovakia and Slovenia, transport infrastructure in Slovenia, Czech Republic and Estonia, and communication infrastructure in Slovenia, Hungary and Latvia. On the other hand, in the Czech Republic, Latvia, Estonia and Bulgaria, the positive gap vis-à-vis the EU with respect to infrastructure investment in utilities has become larger after the crisis than it was before the crisis. Latvia has increased the positive investment gap in comparison to EU average in transport and education infrastructure.

Sector-wise, government and corporate investment in infrastructure has been above the EU average before and after the crisis, particularly in the Czech Republic, Latvia and Estonia (Figure 24). Corporate infrastructure investment in Hungary has been an exception in both periods, lagging the EU average as a share of GDP. On the other hand, infrastructure investment through PPP investment and non-PPP projects has been broadly at or slightly below the EU average across the CESEE region.

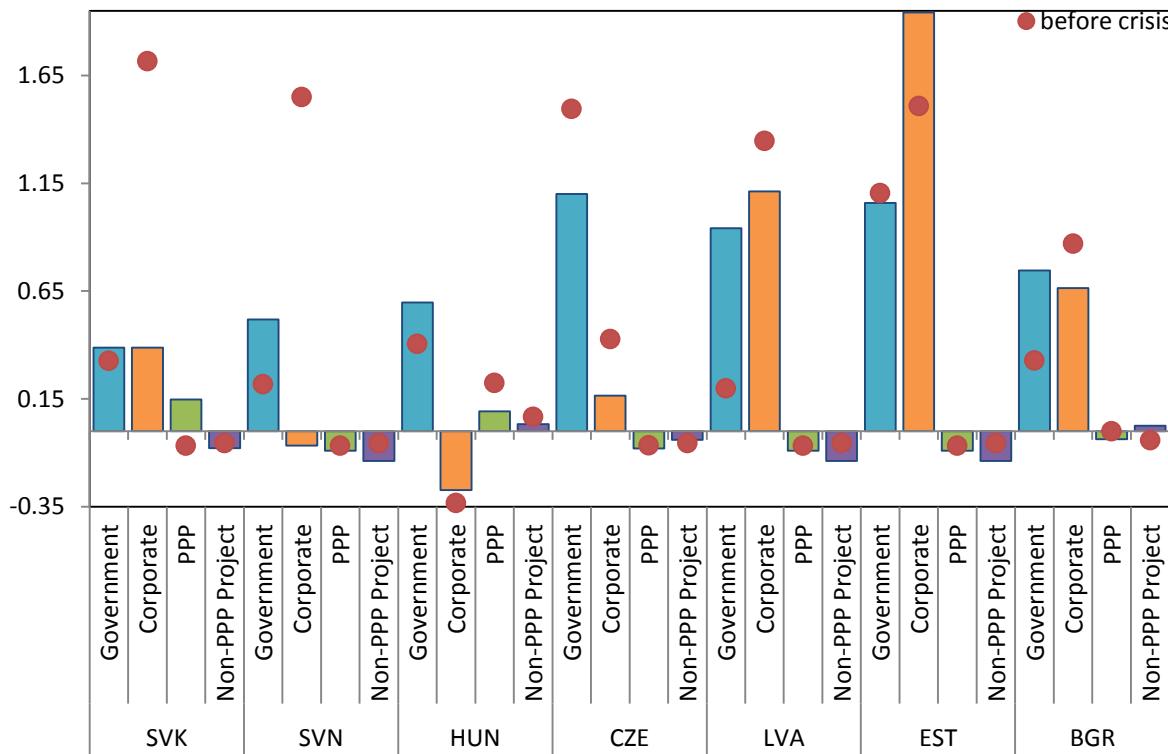
Government infrastructure investment gap vis-à-vis the EU average after the crisis has become more positive particularly in Slovenia, Hungary, Latvia and Bulgaria. On the other hand, the Czech Republic, and to some extent Estonia, has seen a decline in the positive Government infrastructure investment gap vis-à-vis the EU average since the crisis. A significant reduction of the pre-crisis positive gap in corporate infrastructure investment as a share of GDP in comparison to the EU average has occurred in Slovakia and Slovenia, and to a smaller degree in the Czech Republic, Latvia and Bulgaria, whereas the positive gap even surpassed the pre-crisis level in Estonia.

Figure 23: Infrastructure investment by type – gap with EU average pre-crisis and post-crisis



Note: Infrastructure investment by type 2005-2015: % share on GDP, pre-2008 average (dots) and post-2008 average (bars). The data comprises government, corporate, and PPP investment, as well as non-PPP projects. The numbers show differences from EU average, i.e. positive numbers are above EU average, and negative numbers are below EU average. Country coverage: EU member states for which there is available data. Source: Eurostat, Projectware

Figure 24: Infrastructure investment by sector – gap with EU average pre-crisis and post-crisis



Note: Infrastructure investment by sector 2005-2015: % share on GDP, pre-2008 average (dots) and post-2008 average (bars). All types of infrastructure investment. The numbers show differences from EU average, i.e. positive numbers are above EU average, and negative numbers are below EU average. Country coverage: EU member states for which there is available data. Source: Eurostat, Projectware

2.4.2. Competitiveness gaps

With respect to strategic and competitiveness indicators, the CESEE region underperforms the EU average in the vast majority of cases, with some exceptions mainly in the realm of human capital. Figure 25 shows the CESEE countries' performance relative to the EU average in four structural and competitiveness areas: human capital, innovation capacity, energy and strategic infrastructure.¹³ In most areas CESEE countries perform below the EU average. Only the endowment of human capital¹⁴ in some CEE countries, such as Poland, Slovenia and the Baltics, is comparable with the EU benchmark. Encouragingly, in the outperforming countries the human capital endowment has mostly improved over the last couple of years despite the crisis. Apart from human capital endowment there are only few isolated areas where CESEE countries have some comparative advantage. The Czech Republic's strategic infrastructure, for instance, sticks out thanks to a relatively dense railway network. Latvia performs well in the realm of energy infrastructure due to a high consumption of renewable energy. Moreover, the country has narrowed the substantial gap with the EU-28 in the area of strategic infrastructure, as it has caught up significantly on mobile telephone subscriptions.

¹³ Radar charts in the annex (Figure A.5) disentangle the four broad categories of Figure 25 into individual structural indicators and show for each country its relative strengths and weaknesses.

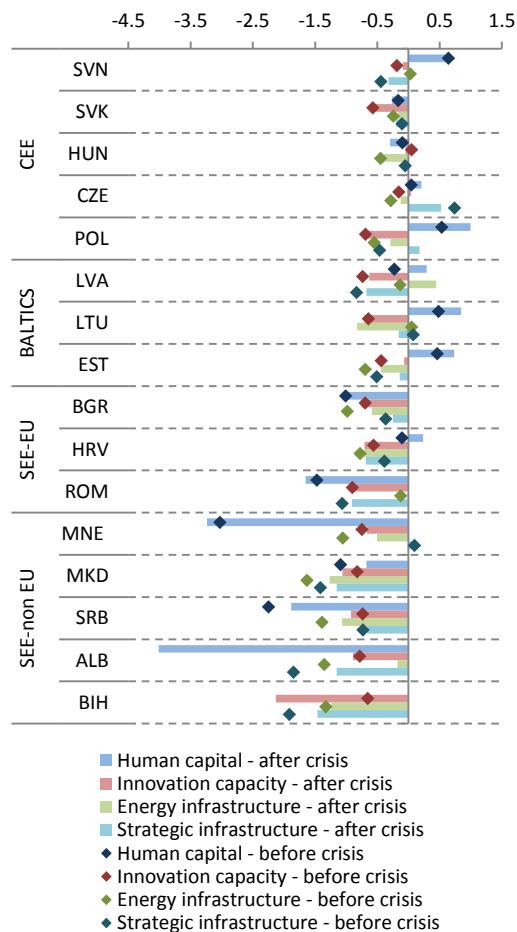
¹⁴ The education indicators capture secondary and tertiary education attainment and, to some extent, via the average PISA score, also the quality of the former.

While CEE and Baltic countries remain in sight of the EU average, most SEE countries, especially those outside the EU, lag substantially. The Czech Republic and the Baltics, especially Estonia, approach the EU benchmark overall rather closely. Poland, Slovakia, Latvia and Lithuania have somewhat larger room for improvement with respect to their innovation capacity. For SEE countries other than Croatia, the greatest challenge is the low endowment with human capital. Also innovation capacity in SEE significantly underperforms the EU benchmark. One reason is the relatively low spending on education. While in SEE countries spending on education typically ranges between 3% and 4% of GDP, Slovenia spends nearly 6%. In addition, in the Western Balkans the science sector is characterised by a restricted scientific performance due to inadequate availability of human resources, research funds and institutions and a research-hostile legal environment (World Bank, 2013). The brain drain over the last two decades has also played an important role and cooperation between research and industry has been given little importance so far.

Despite the relatively good educational attainment in several (particularly EU) countries, innovation capacity is lagging. The rather scarce empirical evidence on the link between education and innovation is mixed. OECD 2011 finds that education lifts the quality of labour and has an important positive impact on economic performance through its effects on the pace of technological change, labour market participation and capital accumulation. In addition, firms' innovation capacity, growth and productivity can be (but is not necessarily) positively affected by training. In contrast, Makkonen and Inkkinen (2013) find that Granger-causality tests identify education as a driving force behind innovative capacity in EU countries.

Another reason for the weak link between education and innovative capacity is the fact that the economic growth model has largely relied on foreign investment in sectors with low to medium value added fuelled by low labour costs. Investors' business strategies have thus typically focused on producing manufactured goods for export. In addition, investments have flowed into underdeveloped financial sectors, retail and real estate. These four categories have amounted lately to between 50%

Figure 25: Deviation from EU average for four groups of indicators: human capital, innovation capacity, energy and strategic infrastructure (in standard deviations)



Note: For a given country and indicator group the chart shows the average of standard deviations of individual indicators in that group from the EU-28. The indicator group Human capital comprises the level of secondary and tertiary education and the average PISA score. The group Innovation capacity is composed of the following indicators: R&D intensity, university-industry-collaboration, high tech employment, high tech exports, competitive advantage and value chain sophistication. The category Energy infrastructure averages over the following indicators: CO2 emissions, energy loss, energy dependence, renewable energy consumption. The area strategic infrastructure captures health expenditures, mobile phone subscriptions and rails density.

For each indicator we take the last available figure. Before the crisis this is a value for any of the years 2007-2008, after the crisis last observations are from 2011-2014. More details on the indicators are provided in the annex.

Source: Authors' calculations based on Eurostat, World Economic Forum (Global Competitiveness Index), OECD, World Bank.

FDI in Hungary and almost 80% in the Czech Republic (WIIW 2015). This is also attested by the (below-) average performance of indicators measuring the value chain sophistication and competitive advantage (see Figure A.4 in the appendix). Hence, to put it simply, investors have put their money particularly in new shopping malls, car assemblers or bank subsidiaries rather than R&D centres. One of the few exceptions is Slovenia, whose strong performance in categories like R&D spending or high-tech employment suggests that the economic growth model has been more knowledge-based than in other peers. However, on the side of the CESEE countries, the financial and economic crisis has spurred some rethinking and efforts to move up the value-chain and therefore to attract investment in sectors with higher value added. To facilitate this moving-up the value chain, investment in CESEE should focus especially on tailoring education to labour market needs, on R&D and on sectors with higher value added and productivity potential.

There is also a significant investment need for physical infrastructure which could have a long-lasting multiplier effect. Western Balkan countries have on average some 54 km of roads per 100 square kilometres of land compared to almost 126 km in the EU CESEE countries (except Romania and Bulgaria). In the latter two countries, the road network amounts to, respectively, just 47 km and 18 km per 100 square km of land. Montenegro is one of the few countries in Europe not to have a single kilometre of motorway¹⁵ and Bosnia and Herzegovina has only very few. Interestingly, Albania, where private car ownership was illegal until 1990, is the leader in motorway density in the Western Balkans. The new EU member countries, particularly Hungary and Slovenia, have greatly increased their motorway densities through EU and other funding. Railway density is at some 2.7 km of railway per 100 square kilometres of land in the Western Balkans, less than half the number in EU CESEE countries. In the CEE countries railway density is above the EU average (Figure A.4 in the appendix). There is also a significant backlog of investment in the field of energy. Especially the Western Balkan countries, such as Kosovo, Macedonia and Albania, suffer from low power-generating capacities, which in turn lead to regular power outages. Losses from transmission and distribution as a proportion of total production also suggest urgent investment needs in the energy sector. This indicator reflects technical shortcomings on the one hand and theft on the other. Despite recent achievements, there is still a lot of room for improvement, particularly in the Western Balkans, Romania, Bulgaria and the Baltics. Against this background, the six Western Balkan countries have agreed on priority infrastructure projects - particularly motorway, railway and energy projects - to be implemented by 2020. This will enhance the connectivity within the Western Balkan region as well as with the EU network. The Vienna Institute for International Economic Studies (WIIW) has estimated that the short and medium term financing needs for new construction of transport infrastructure in the Western Balkans comes to around four billion euro, on average some 6% of GDP. According to the WIIW, such a comprehensive infrastructure investment package could lead to an additional growth boost of up to one percentage point per year for the countries of the region over a period of 15 years and some 200.000 new jobs could be created in the region.

¹⁵ A motorway between connecting the cities Bar, Boljare and Belgrade is under construction.

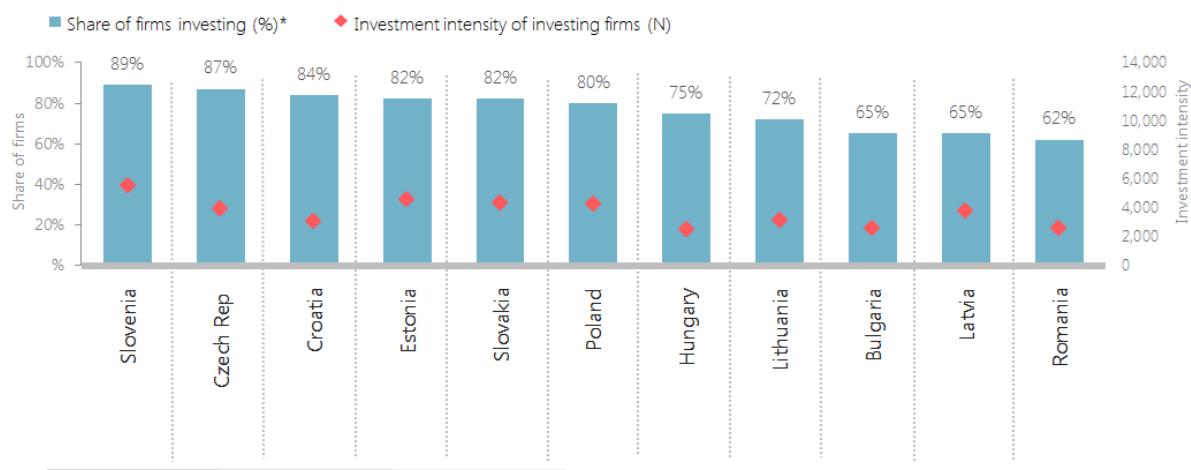
3. A closer look into corporate investment through the EIBIS survey

- *The investment outlook for firms in the region for financial year 2016 was modestly optimistic.*
- *Corporate investment is above EU average in terms of tangibles, but below EU average in terms of R&D. The share of state-of-the-art machinery and equipment and high energy-efficient building stock is below the EU average.*
- *CESEE firms are more likely than the EU average to report that they have invested too little over the last three years. Uncertainty about the future, business and labour market regulations as well as availability of staff with right skills are the main long-term barriers to investment.*
- *Even though availability of finance does not seem to be a major obstacle for many firms in the region, more firms than the EU average report being external-finance constrained.*

The EIB Group Survey on Investment and Investment Finance (EIBIS) is a unique, EU-wide, annual survey of more than 12 000 firms. It collects data on firm characteristics and performance, past investment activities and future plans, sources of finance, financing issues and other challenges that businesses face. Using a stratified sampling methodology, EIBIS is representative across all 28 member States of the EU, as well as for firm size classes (micro to large) and 4 main sectors (manufacturing, services, construction and infrastructure). The 2016 survey was conducted during the months of July to November. The results are weighted by value-added, reflecting firms' contribution to the economy. In the CESEE EU member states, the survey covered 4.881 firms in 11 countries. EIBIS is intended to help the EIB to contribute to a policy response that properly addresses the needs of businesses, promoting investment in EU. From an analytical perspective, it can provide an additional and timely perspective on investment activity and investment plans, with a forward-looking dimension.

Although the share of firms investing in CESEE in 2015 financial year was below the EU average, corporate investment activity was particularly strong in Slovenia, Czech Republic and Croatia, above or at EU average (Figure 26). On the other end of the spectrum, the lowest share of firms investing in 2015 was in Romania, Latvia and Bulgaria. On balance, more firms increased their investment activities than decreased them compared to 2014, consistent with a modest improvement in aggregate investment figures for the region. The average intensity of investment (investment per employee) was lower than for the EU as a whole, consistent with a relatively low capital intensity in the region.

Figure 26: Investment activity in financial year 2015 by country



Base: All firms (excluding don't know/refused responses)

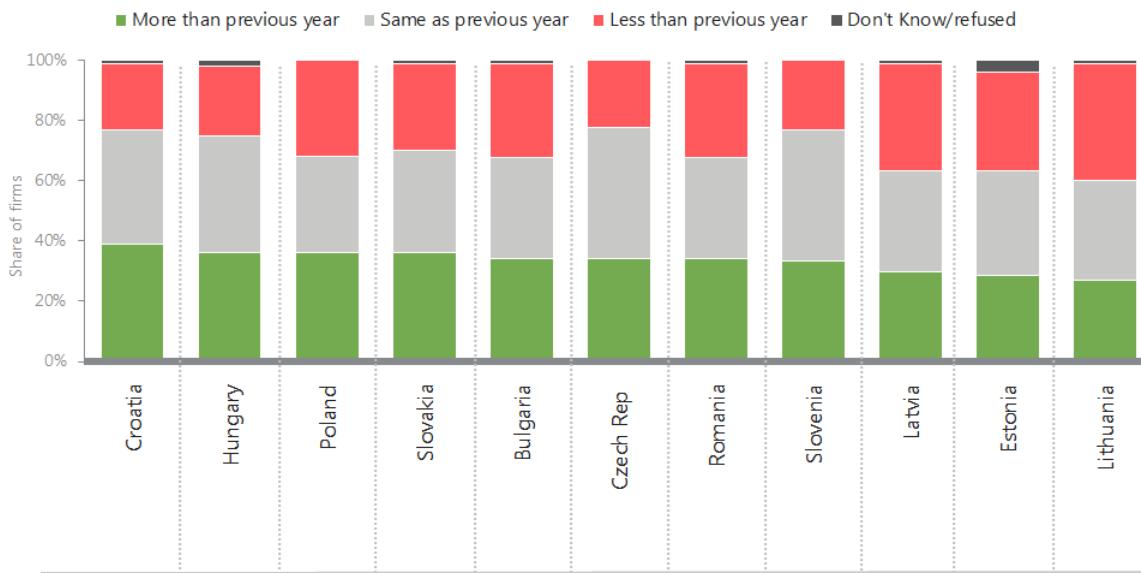
*The blue bars indicate the proportion of firms who have invested in the last financial year.

A firm is considered to have invested if it spent at least EUR 500 per employee on investment activities.

Investment intensity is the median investment per employee of investing firms.

Through the survey lens, the investment outlook in the CESEE region for the 2016 financial year was modestly optimistic. On balance, more firms expected an expansion in investment than a contraction, in line with the EU average. The strongest investment expectations were in Croatia, Hungary, Poland and Slovakia, while the weakest expected investment activity was in Lithuania, Estonia and Latvia. This is consistent with somewhat slower growth in the Baltics recently, and strong domestic demand growth in the CEE4 countries and a recovery from a long and deep recession in Croatia (Figure 27).

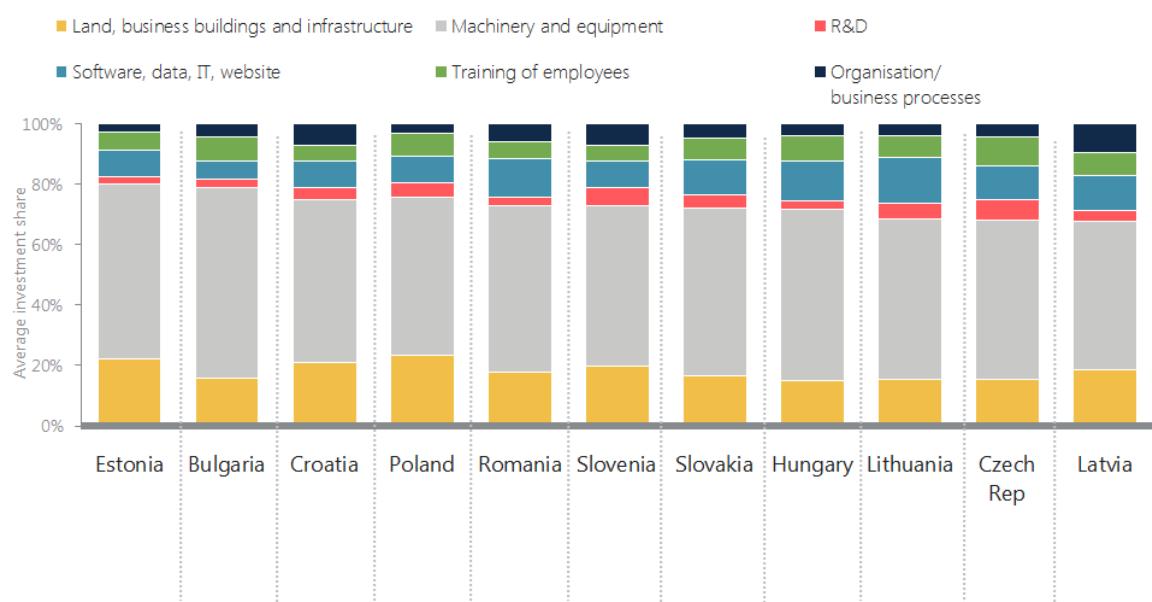
Figure 27: Expected investment in financial year 2016 compared to previous year by country



Base: All firms

Data is derived from two questions: firms who had invested in the last financial year were asked if they expect to invest more, around the same amount or less than last year; firms who had not invested in the last financial year were asked if they had already invested, or expect to invest in the current year

Figure 28: Investment areas by country



Base: All firms who have invested in the last financial year (excluding don't know/refused responses)

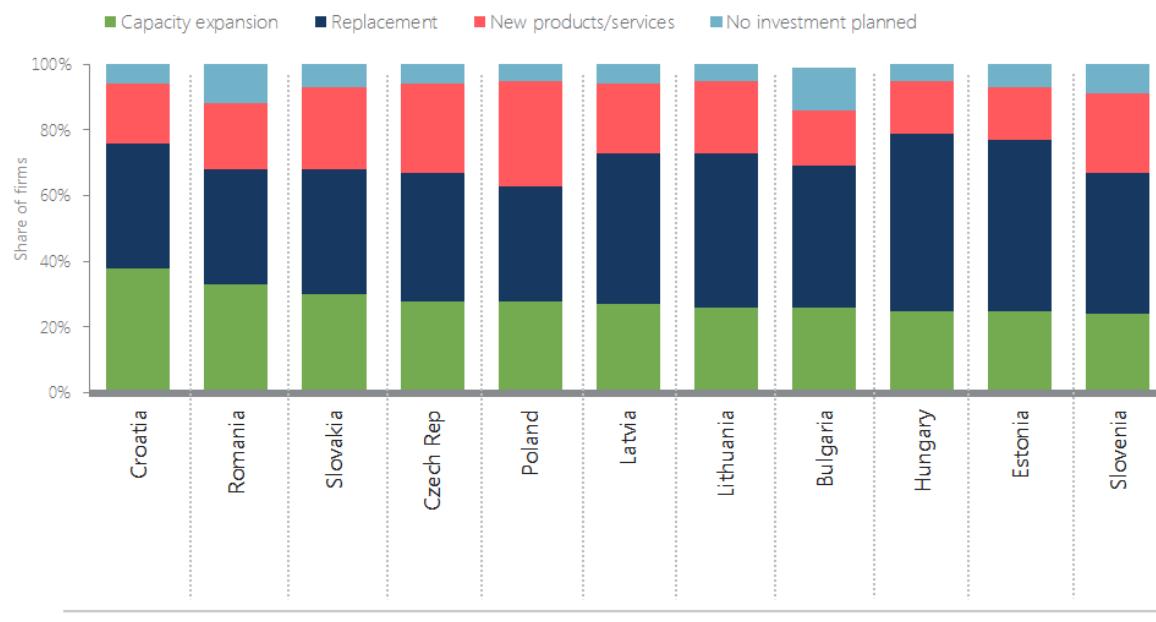
"The average share of investment that goes into different investment areas"

Q. In the last financial year, how much did your business invest in each of the following with the intention of maintaining or increasing your company's future earnings?

Compared to the EU as a whole, firms in the CESEE countries invest relatively more in tangibles (i.e. machinery, equipment, land, buildings, etc.) and they lag behind in R&D investment. This could negatively affect the efforts of the firms to move to higher value-added production in the medium turn, particularly given the fact that firms in the CESEE region lag the EU as a whole in terms of productivity. The Czech Republic, Slovenia and Lithuania fare the best in the region in terms of the share of R&D outlays in total investment (Figure 28).

Firms' investment priority for the next three years is replacement, which features particularly prominently among firms in Hungary and Estonia. Poland, the Czech Republic, and Slovakia have the highest share of firms planning to invest in new products and services. Capacity expansion plans – usually the highest investment outlay – feature relatively more prominently among firms in Croatia (38% of firms), Romania (33%) and Slovakia (30%), which is consistent with strong domestic demand in Slovakia and a period of under-investment during the long and deep recession in Croatia (Figure 29).

Figure 29: Future investment priorities by country

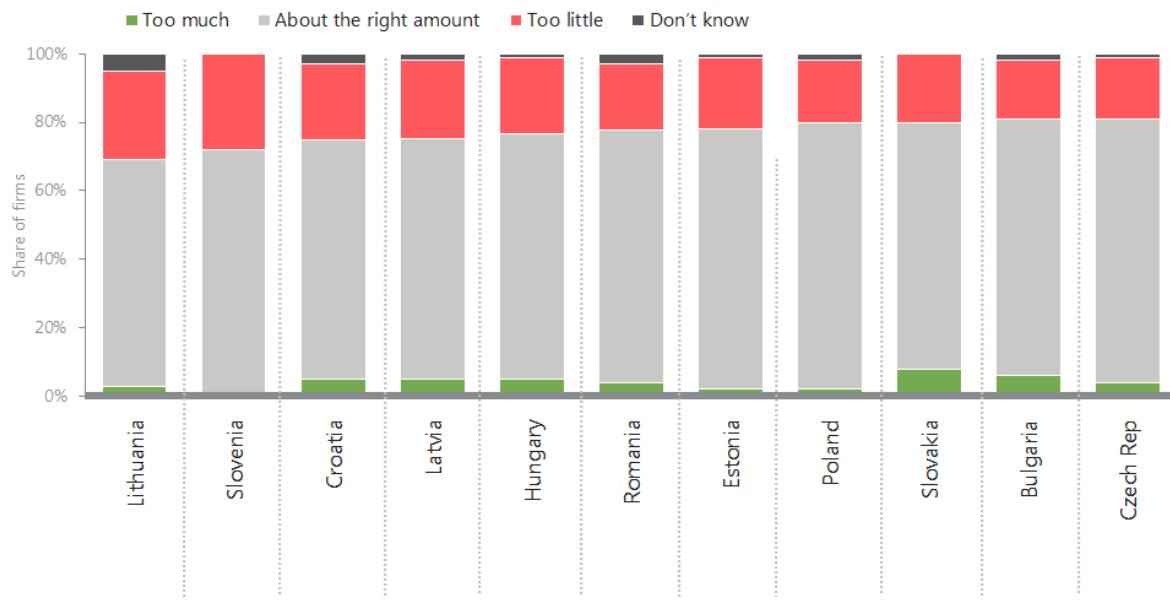


Base: All firms (excluding don't know/refused responses)

Q. Looking ahead to the next 3 years, which of the following is your investment priority (a) replacing existing buildings, machinery, equipment, IT (b) expanding capacity for existing products/services (c) developing or introducing new products, processes, services?

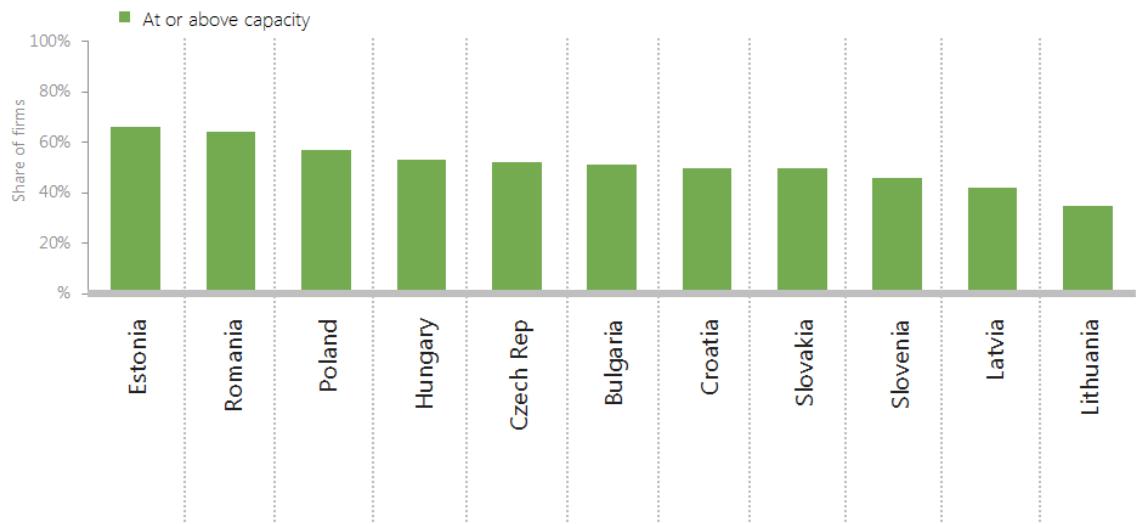
For the CESEE as a whole in comparison to EU average, more firms reported that they had invested too little over the last three years, and more firms in the CESEE region than in the EU are operating at or above full capacity. About 28% of firms Slovenia, 26% in Lithuania, 23% in Latvia, and 22% in Croatia and Hungary state that they invested too little in the last three years (Figure 30). The highest share of firms operating at or above full capacity is in Estonia (66%), Romania (64%) and Poland (57%) (Figure 31). This is broadly in line with the high investment activity of firms in Slovenia and Croatia, the positive investment outlook of firms in Croatia, Hungary and Poland, and the capacity expansion plans of firms in Croatia and Romania.

Figure 30: Perceived investment gap by country



Base: All firms (excluding 'Company didn't exist three years ago' responses)
Q: Looking back at your investment over the last 3 years, was it too much, too little, or about the right amount to ensure the success of your business going forward?

Figure 31: Share of firms at or above full capacity by country

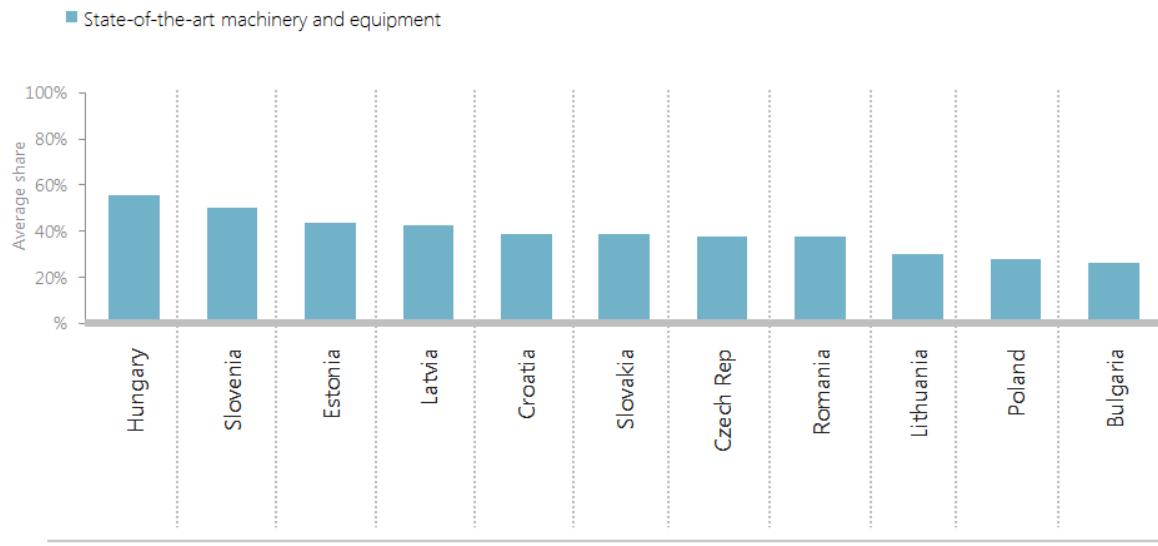


Base: All firms (data not shown for those operating somewhat or substantially below full capacity)
Full capacity is the maximum capacity attainable under normal conditions e.g., company's general practices regarding the utilization of machines and equipment, overtime, work shifts, holidays etc.
Q: In the last financial year, was your company operating above or at maximum capacity attainable under normal circumstances?

However, the quantity of the capital stock is not the whole story, as the shares of state-of-the-art machinery and equipment and of building stock meeting high energy-efficiency standards in the CESEE region are below the EU average. In particular, the lowest proportion of state-of-the-art machinery and equipment is reported by firms in Bulgaria, Poland and Lithuania (Figure 32), and the lowest proportion of commercial building stock satisfying high energy efficiency standards is reported by firms in Lithuania and Poland (Figure 33). Investment in the quality of capital stock therefore substantiates the story of a positive investment outlook in Poland and the perceived investment gap in Lithuania. Recent EIB research (EIB, 2016) showed that firms reporting low levels of capacity utilization tend to be more likely to report an investment gap, i.e., these firms might be more concerned with the quality of their capital stock when reporting an investment gap than its quantity. Firms with an

investment gap tend to report significantly lower levels of state-of-the-art machinery and equipment as well as energy efficient building blocks. This might indicate that some firms that report an investment gap have under-invested, not with respect to the actual or expected demand for their products and services, but more likely with respect to the level of state-of-the-art machinery and equipment and energy efficient building blocks.

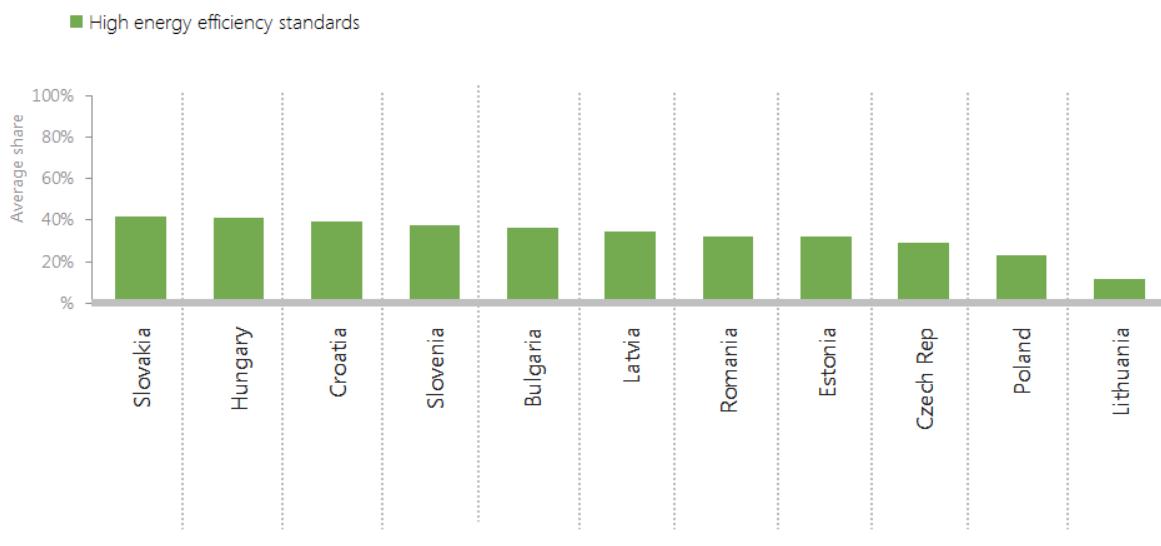
Figure 32: Average share of state-of-the-art machinery and equipment by country



Base: All firms

*Q. What proportion, if any, of your machinery and equipment, including ICT, would you say is state-of-the-art?
Data not shown for Greece and Cyprus, as the Greek translation may have influenced interpretation of the question.
This will be addressed in the next round of interviews.*

Figure 33: Average share of building stock meeting high energy efficiency standards by country



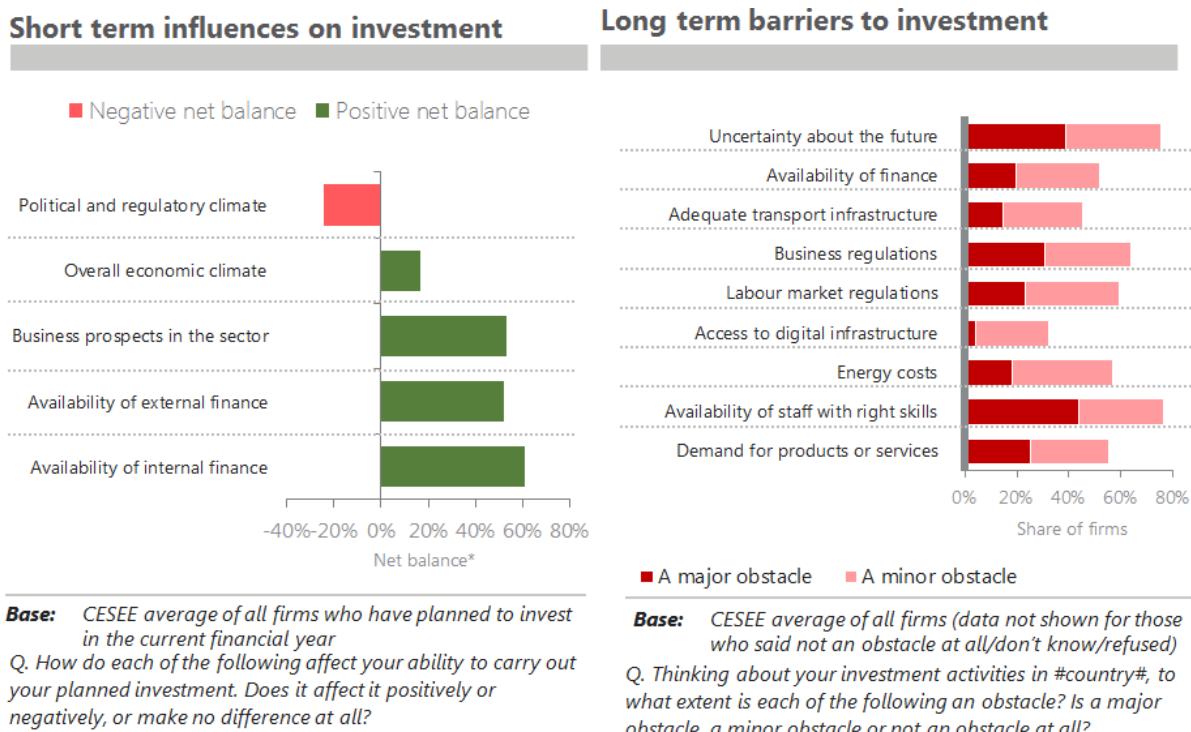
Base: All firms

*Q. What proportion, if any, of your commercial building stock satisfies high or highest energy efficiency standards?
Data not shown for Greece and Cyprus, as the Greek translation may have influenced interpretation of the question.
This will be addressed in the next round of interviews.*

Skill mismatches seem to be an increasingly growing concern of firms in the region. As their main long-term obstacles to investment, firms in the region mentioned uncertainty about the future and availability of staff with the right skills. For firms that invested too little in the last three years, the availability of external finance was named more often as a barrier to investment than for firms that had invested sufficiently. As for short-term influences on investment, adverse political and regulatory changes hamper the implementation of investment

plans in the CESEE region (Figure 34). Business regulations are a major investment obstacle predominantly in Croatia, Latvia, Poland and Slovakia, and particularly in construction and services sectors for the CESEE as a whole.

Figure 34: Short and long term barriers to investment in CESEE region

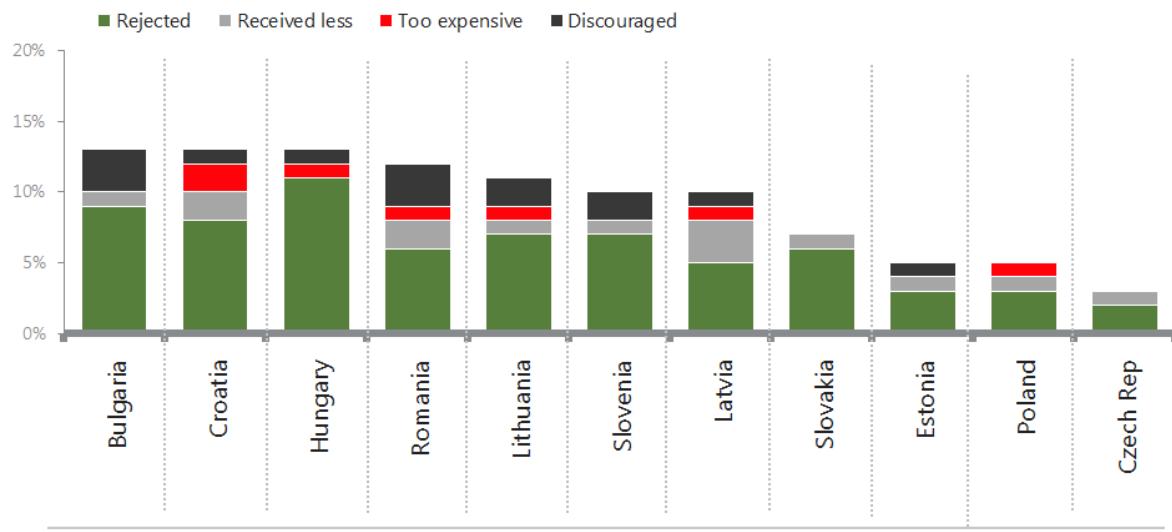


While firms in the CESEE region rely on average slightly more on internal sources of finance than firms in the EU as a whole, firms in Latvia, Slovakia, Croatia and Poland have the highest share of external finance in the region (dominated by bank loans and other bank finance). Compared to the EU as a whole, grants play a significantly more important role in the CESEE region, particularly in the manufacturing and infrastructure sectors, which relates to the use of EU funds. Firms in CESEE want more of the type of external finance that they are already using for investment activities, predominantly bank loans.

On balance, firms in the region that used external finance are satisfied with the various aspects of external finance. The main sources of dissatisfaction with external finance relate to collateral requirements and the cost of funding.

Nevertheless, 7.4% of firms in the CESEE region that actually invested are external-finance constrained, above the 5% average for the EU as a whole. The highest share of finance-constrained firms in the region is in the construction and services industries, and among SMEs. The share of finance-constrained firms is the highest in Bulgaria, Croatia and Hungary. Croatia stands out with a particularly high share of firms that regard external finance as too expensive (i.e., those which did not seek external finance because they thought borrowing costs would be too high) (Figure 35).

Figure 35: Share of finance constrained firms by country – firms that invested



Base: All firms

Finance constrained firms include: those dissatisfied with the amount of finance obtained (received less), firms that sought external finance but did not receive it (rejected) and those who did not seek external finance because they thought borrowing costs would be too high (too expensive) or they would be turned down (discouraged)

In summary: the EIBIS survey provides a timely perspective on the state of investment and investment finance in the CESEE region. Investment activity seems to have picked up recently, and firms are modestly optimistic about their future investment outlays. Nevertheless, current investment activity is predominantly centred on lower ticket replacement items rather than capacity expansion. Investment in R&D lags the EU average, which could constrain the ability of firms in the CESEE region to move up the value chain in future. Investment gaps come not only from insufficient capital stock, but also from shortages in terms of state-of-the-art machinery and equipment and energy efficient corporate building blocks. The political and regulatory environment hampers the animal spirits in the region, and the availability of staff with right skills is a common concern. Relative to the EU average, a higher share of firms remain external-finance constrained, and the main source of dissatisfaction with external finance boils down to collateral requirements and cost of funding.

4. Policy conclusions

There are still significant gaps in the stock of capital in the CESEE. Before the crisis, investment generally exceeded the average levels observed in the EU. However, investment has also been pro-cyclical and more volatile than in the EU. The crisis resulted in a marked slowdown in capital formation, which also contributed to the decline of the growth rate, along with slower dynamics in total factor productivity. While public investment – supported by EU funds – has been relatively robust, private capital formation has been lagging, not exceeding EU levels significantly and consistently across the region. The composition of investment is tilted towards machinery and non-residential construction; while the share of intangibles in general – and research, development and innovation in particular – is lower than in the rest of the EU. Our various estimates of investment gaps show that the level of public and private investment in CESEE has been below the levels experienced in countries that successfully graduated from middle income to high income in the past. Furthermore, for most CESEE economies the current investment levels are not sufficient to maintain the size of the capital stock relative to GDP under reasonable assumptions for economic convergence and growth.

The pre-crisis model of financing capital accumulation - based on FDI inflows and funds channelled through cross-border banking - is not operating the way it did earlier, and domestic savings need to play a stronger role. When it comes to financing investments, the region has traditionally relied on capital inflows. The crisis resulted in a substantial slowdown of net private capital inflows, pushing the CESEE towards a new model of investment finance: the region needs to rely more on domestic savings than before. While the countries in CESEE region would naturally continue attracting foreign capital, a more balanced growth and financing model would support the continuation of steady convergence process.

The shortage of skilled labour is increasingly becoming a constraint for the countries in the region. In the past, growth convergence in CESEE was supported by the possibility of tapping pools of skilled, yet inactive or less productive labour. However, the region is facing increasingly unfavourable demographics – population ageing coupled with outwards migration. Data from the EIB Investment Survey show that finding skilled labour is one of the most important barriers that prevent firms from investing more.

The region continues to benefit from EU structural and cohesion funds. EU funds played an important role in maintaining a healthy level of public investment during the post-crisis downturn. In the context of the infrastructure gaps, leveraging those funds to improve the operating environment remains crucial. Proper planning and advisory work, as well as smart utilization of the funds, will determine the success in boosting the potential growth in the region. Grants play a more prominent role in firms' financing than in the EU as a whole, reflecting this use of EU funds.

Capital market development could be crucial to channel savings to firms and to decrease their reliance on banks. In the post-crisis period, while keeping their overall commitment to the region, large foreign banks have changed their business model towards higher reliance on domestically financed intermediation. The EIB Investment Survey shows that firms in CESEE want more of the type of external finance that they are already using for investment activities, predominantly bank loans. In order for the firms to use more equity or bond finance for investment activities, more pro-active measures are needed to change economic conditions and incentives conducive to tapping capital market financing.

Collateral requirements are an important constraint to access to finance. While on balance firms in the CESEE region that used external finance are satisfied with the various aspects of external finance, one of the main sources of dissatisfaction relates to collateral requirements.

Against this background, a successful post-crisis model of economic convergence and growth for the CESEE region would ideally include the followings elements. First, with the post-crisis decline in FDI inflows to the region as well as changed strategies of large foreign banks vis-à-vis the region, the system of financial intermediation in the CESEE countries needs to rely more on domestic savings. Second, beyond the cyclical tightening of the labour market conditions, structural bottlenecks are emerging across CESEE in terms of shortages of skilled staff. Hence, a concentrated focus on policies which help maintain competitiveness and move up the value chain is needed, including by further investment in skills and education. Third, there is a need for stronger focus on innovation to increase productivity, particularly by the better alignment of public spending on R&D with business needs.

The corresponding enabling factors should be strengthened. In the post-crisis period, investment in utilities, transport and communication (including digital) infrastructure has been lagging the EU average. In terms of strategic and competitiveness indicators, innovation capacity in the CESEE region is also lower than in the EU. In addition, the growth model in the region over the last twenty years has largely relied on foreign investment to sectors with low to medium value added on the back of low labour costs. More investment in higher value added sectors would therefore be warranted. Lastly, further improvements in the business environment and efficient management of public funds are necessary.

Bibliography

- Barro, Robert J. and Jong-Wha Lee (2001)** "International Data On Educational Attainment: Updates And Implications," *Oxford Economic Papers*, v53 (3,Jul), 541-563.
- Caballero, R. J. (1994).** "Small Sample Bias and Adjustment Costs", *The Review of Economics and Statistics*, pp. 52-58.
- Commission on Growth and Development (2008).** "The Growth Report: Strategies for Sustained Growth and Inclusive Development", Washington, DC, World Bank.
- Coulibaly, B. and J. N. Millar (2011).** "The 'Elusive' Capital-User Cost Elasticity Revisited", *The BE Journal of Macroeconomics* , Vol. 11.
- Hakkio, C. S. and M. Rush (1991).** "Cointegration: How Short is the Long Run?", *Journal of International Money and Finance* , Vol. 10 , pp. 571-581.
- EIB (2016),** "Investment and Investment Finance in Europe", European Investment Bank.
- EIB (2013).** "Investment and Investment Finance in Europe", European Investment Bank.
- 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
- IMF (2014).** "World Economic Outlook", October 2014, International Monetary Fund.
- IMF (2015a).** "Making Public Investment More Efficient", IMF Staff Report, June 2015. International Monetary Fund.
- IMF (2015b).** "World Economic Outlook", April 2015, International Monetary Fund.
- Jones, C. I. (2015),** "The Facts of Economic Growth," NBER Working Papers 21142, National Bureau of Economic Research, Inc.
- Kaldor, N. (1957).** "A Model of Economic Growth", *The Economic Journal*, 67:268, 591-624.
- Lewis C., N. Pain, J. Strasky and F. Menkyna (2014).** "Investment Gaps after the Crisis", OECD Economics Department Working Papers No. 1168, OECD Publishing.
- Makkonen, T. and T. Inkinen (2013).** "Innovative Capacity, Educational Attainment and Economic Development in the European Union: Causal Relations and Geographical Variations", in *European Planning Studies*, Volume 21, Issue 12, p. 1958-1976.
- Mihaljek, D. and A. Subelyte (2014a).** "Do We Understand What Drives House Prices?", in *Financial Cycles and the Real Economy*, chapter 9, pages 147-170, Edward Elgar.
- Mihaljek, D. and A. Subelyte (2014b.)** "Determinants of House Prices in Central and Eastern Europe", presented at the Conference on European Economic Integration, Vienna, 18 November 2013.
- OECD (2010).** "OECD Economic Surveys Poland", Volume 2010/8, April 2010.
- OECD (2011).** "Skills for Innovation and Research", OECD Publishing.
- Schaller, H. (2006).** "Estimating the Long-Run User Cost Elasticity", *Journal of Monetary Economics*, Vol. 53 , pp. 725-736.
- Shapiro, M. D., O. J. Blanchard and M.C. Lovell (1986).** "Investment, Output, and the Cost of Capital", *Brookings Papers on Economic Activity*, pp. 111-164.
- Summers L. H. (1987).** "Investment Incentives and the Discounting of Depreciation Allowances", in *The Effects of Taxation on Capital Accumulation*, Martin Feldstein, ed., University of Chicago Press.
- WIIW (2015).** "Recovery in the NMS, Decline in the CIS", FDI Report.
- World Bank (2013).** "Western Balkans Regional R&D Strategy for Innovation; Overview of the Research and Innovation Sector in the Western Balkans", World Bank Technical Assistance Project (P123211), October.

Appendix 1: Growth accounting

It is a widely accepted stylized fact that potential output growth – defined as the GDP growth rate consistent with stable inflation – has declined in recent years both in advanced and emerging economies, including CESEE countries as described above. IMF (2015b) finds that in advanced economies this decline started already in the early 2000s and worsened with the global financial crisis. In emerging economies, the decline in potential GDP growth is believed to have started only after the crisis.

To what extent has this decline in potential GDP growth in CESEE been driven by lower investment which, for its part, might have reduced the accumulation of capital stock? One implication of theoretical growth models – well documented also empirically (see e.g. Kaldor 1957) – is that the size of the capital stock relative to GDP – the capital-output ratio – stays broadly constant over long periods of time. For most CESEE countries this was the case before the crisis. With the outbreak of the crisis, however, the capital-output ratio increased in most instances. For some countries, most notably Estonia, the increase was very abrupt and flattened out later as GDP plummeted dramatically at the beginning of the crisis. In other countries such as Romania, the increase has been rather gradual. Hence, as a result, despite lower investment intensity and lower growth rate of capital stock, in most countries there is more capital available per unit of output than before the crisis. On the one hand, this implies a lower return on capital which, for its part, may lead to more non-performing loans in the banking sector over time. On the other hand, it suggests that lower investment contributed only marginally to the decline in potential output growth after the crisis.

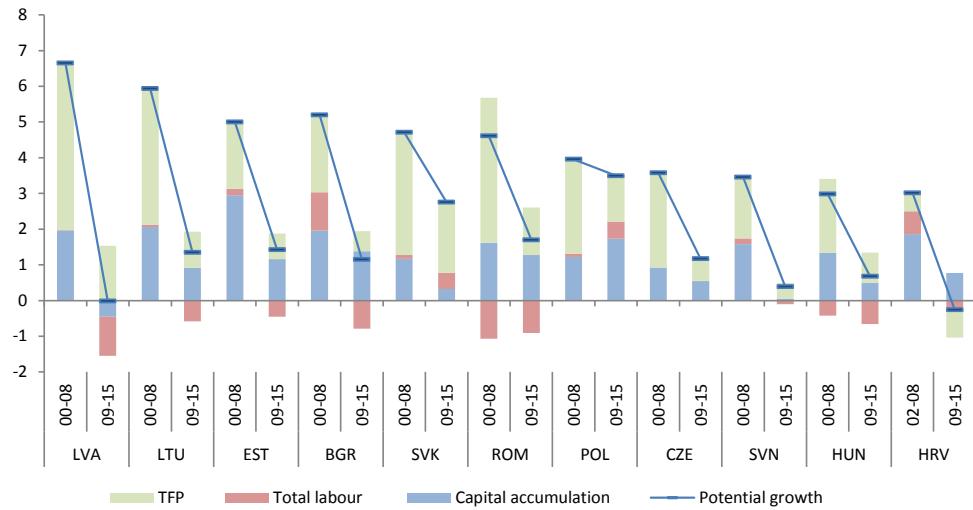
This conjecture is corroborated in a standard, neo-classical (Cobb-Douglas) accounting framework in which potential GDP growth can be disentangled into the production factors – labour (composed of people employed and hours worked), capital accumulation and total factor productivity (TFP). Such a decomposition, carried out using the European Commission's estimates of potential output growth, is shown in the chart below.

The chart suggests that although all factors have contributed to the decline in potential GDP growth, TFP appears the dominant driving force common for all countries. In most countries, the percentage contribution of TFP was halved after the crisis.

Slower capital accumulation has also played a role in the decline of potential growth in the Baltics, Slovenia, Slovakia and Hungary in particular, but its role was secondary. This simple analysis suggests that the bulk of the decline in capital accumulation was in line with the economic slowdown. As to the contribution of labour, it reduced potential GDP growth in the Baltics and Bulgaria. Poland is the only country where capital accumulation has accelerated, and this has largely offset the TFP decline.

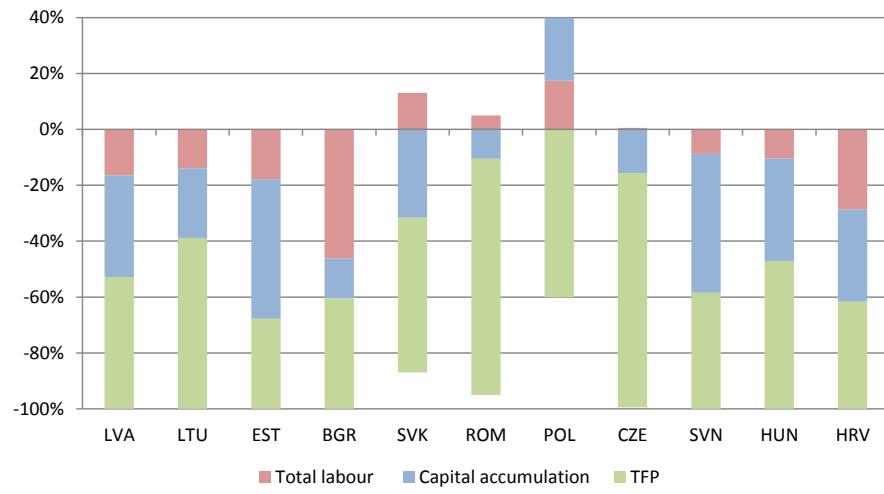
The finding that TFP is the main common culprit behind the decline in GDP growth does not fit easily with theoretical predictions¹. Yet it is exactly in line with IMF's (2015b) conclusion for emerging markets. While TFP is measured as a residual in the growth accounting framework, these results may partly reflect higher volatility, and thus measurement errors, in TFP in emerging markets. At the same time, other factors might be at work, e.g. a gradual slowdown in convergence to the technological frontier after a rapid catch-up before the crisis, reduced growth in input utilization, and lower human capital growth.

Figure A.1: Factor decomposition of potential GDP growth in a Cobb-Douglas accounting framework (in percentage points)



Source: European Commission.

Figure A.2: Contribution of production factors to the change in potential output after the crisis (in %)



¹ TFP is a gauge for the efficiency with which inputs are being used in the production process and it can be interpreted as a rough measure of the rate of technological progress in the economy. One would expect that in a country converging to the technological frontier the potential benefit of adopting new technologies increases, resulting in a higher TFP growth rate.

Appendix 2: Development accounting

The aggregate production function can be used for other things than the factor decomposition of differences in output across time. A similar approach can be followed to disentangle the difference in economic development across countries, and to assess how the various factors of production are contributing to differences in the levels of economic development. This approach is usually referred to as development accounting.

Development accounting can be useful for our analysis, as it allows us to pinpoint the possible role of capital – or the lack of it – in explaining the income difference between countries. We use this framework to decompose the difference in economic development between the CESEE countries and the EU. Following Jones (2015), we will use a somewhat different formulation of the production function than the one used for growth accounting. Our starting point is a standard aggregate Cobb-Douglas production function, but we will decompose the labour input (H) into two factors: number of employed (L), and human capital quality (h). The latter is measured simply as the Barro-Lee educational attainment index (Barro and Lee, 2001).

$$Y_t = A_t K_t^\alpha H_t^{1-\alpha},$$

where the labour input H is the product of the number of employed (L) and the quality index of human capital (h). Dividing both sides by the number of employed allows rearranging the production into a convenient format:

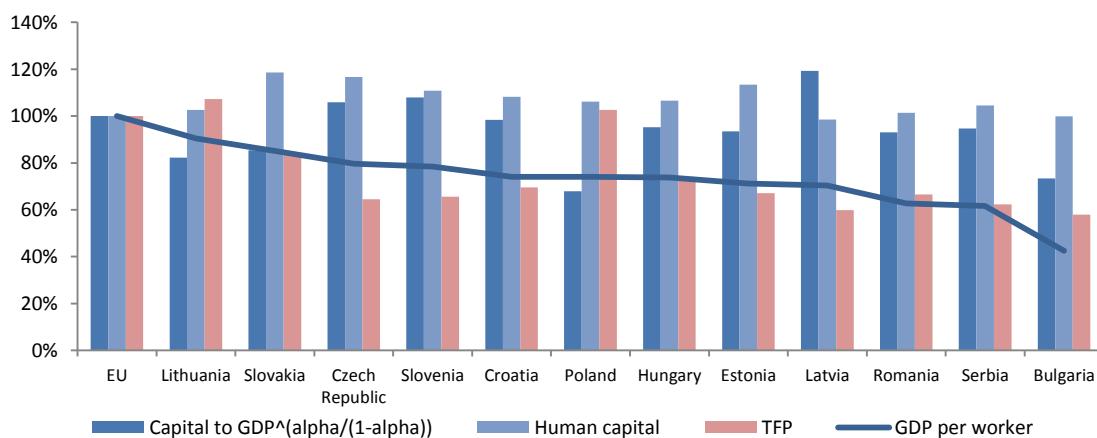
$$\frac{Y_t}{L_t} = \left(\frac{K_t}{Y_t}\right)^{\frac{\alpha}{1-\alpha}} \frac{H_t}{L_t} Z_t$$

where $Z_t = A_t^{\omega(1-\alpha)}$ is a residual representing total factor productivity. This formulation allows us to decompose the difference in GDP per worker (Y/L) between each CESEE economy and the EU to three factors:

- difference in the capital/output ratio (K/Y);
- human capital quality ($H/L = h$); and
- total factor productivity (Z).

To do the actual decomposition, we use the data from the latest (9th) edition of the Penn World Tables (Feenstra et al, 2015), which provide cross-country data on the capital stock, GDP per worker and the Barro-Lee indicator of educational attainment. We use the latest available observations, which are for 2014.

Figure A.3: Development accounting (Penn World Tables)



Source: Authors' calculations, Penn World Tables

Figure A.3 shows the result of the decomposition for the CESEE countries. The blue line shows the size of GDP per worker for each country relative to the EU average, whereas the bars show the relative size of each factor:

capital to GDP, human capital quality, TFP. The measure indicated by the line is the product of the three bars for each country.

Looking at the results, it seems that human capital quality in CESEE – measured by the Barro-Lee indicator – is at about the same level as, or even above the EU average. Thus labour quality – at least when using this rough measure – does not explain the difference in economic development.

In the majority of the CESEE countries, the capital-to-output ratio is close or above the EU average, indicating that their capital stock is adequate for their level of economic development. The exceptions are Poland, Bulgaria, Lithuania and to some extent Slovakia, where the low capital-to-GDP ratio at least partially explains the gap in economic development.

For most of the countries, differences in total factor productivity explain the bulk of the income gap relative to the EU.¹⁶

¹⁶ The results of this analysis are heavily dependent on the data on the capital stock, which at best are rough indicators. In CESEE in particular, capital stock indicators are heavily influenced by the assumptions used when evaluating the pre-transition stock of capital. The uncertainties around capital stock indicators should be taken into account when considering the results above.

Appendix 3: Investment, growth and the user cost of capital – an econometric analysis

The empirical estimation of potential investment gaps requires a definition of “optimal” or “ideal” investment levels at each point in time. Following the relevant literature, we model investment levels as the outcome of a long run relationship¹⁷ with real GDP and the user cost of capital. In practice the user cost is most naturally thought of as the cost per period of using a tangible capital good and can be decomposed into three constituents. First, the opportunity cost of funds tied up per unit of capital, $i_t P_t$; where i_t is the risk-free alternative return on investment and P_t is the price of investment. Second, the depreciation of the productive capacity of capital which reduces the value of capital by a given depreciation rate (dep_t) – thus determining an additional cost on investment. Third, implementing an investment has an implicit cost derived from the alternative of renting the same capital good. Therefore rental charges also affect the user cost of capital whereby an increase (decrease) in the unit price lowers (increases) the user cost of capital. An approximation of marketable charges is a backward-looking change in the market price of new capital, ΔP_t . Finally the user cost of capital in period t can be defined as: $UCC_t = i_t P_t + dep_t - \Delta P_t$. All in all, the empirical model employed can be summarised as follows:

$$I_{jt} = \alpha + \lambda GDP_{jt} + \beta UCC_{jt} + \varepsilon_{jt} \quad \text{and} \quad \varepsilon_{jt} = \delta_j + \mu_{jt} \quad (1)$$

where I_{jt} , GDP_{jt} and UCC_{jt} are the real investment level, the real gross domestic product and the user cost of capital in county j during year t . ε_{jt} is the residual which can be decomposed into a fixed effects (δ_j) component and a cyclical component (μ_{jt}). The latter is interpreted as the Investment gap since it is the difference between the potential and actual investment rate netting out country-specific fixed effects as well as time changing fundamentals embedded in the observable explanatory factors. The panel estimates are conducted with robust standard errors. We assume that time-invariant country characteristics are unique to each country, and they are not correlated with the characteristics of the other countries in our sample. Hausman tests confirm this assumption¹⁸.

The investment variable is defined as the aggregate real gross fixed capital at 2010 prices. Real GDP is measured at 2010 reference values. The UCC is computed including (UCCA) and excluding (UCCB) the depreciation rate¹⁹. All variables are in natural logarithms²⁰. Our data sources are Eurostat, Ameco, ECB and the IHS database²¹. The sample covers the period 2000-2015 and the following countries: Bulgaria, Estonia, Czech Republic, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Slovak Republic and Slovenia. To check the robustness of our estimates we employ an extended set of countries (models 3 and 4 in Table A.1). This includes the basic set plus Austria, Belgium, Germany, Finland, Netherlands, Sweden, Spain, France, Italy, Portugal, Greece, Ireland and Cyprus. The inclusion of these countries allows also accounting for a convergence effect whereby countries in the CESEE region are on a continuous catching-up process aiming at an alignment with old EU member states.

¹⁷ With fundamental driving forces adhering to economic theory and empirical findings

¹⁸ We estimated all models assuming fixed and random effects and conducted Hausman tests afterwards. In all instances we concluded that fixed effects models fit best our data. Hausman tests for the four model specifications in Table A.1 have the following statistics: (i) model 1 - $\chi^2 = 20.28$ and p – value = 0.00; (ii) model 2 - $\chi^2 = 23.23$ and p – value = 0.00; (iii) model 3 - the classic Hausman test is undefined therefore we are forcing the use of a single error variance and get $\chi^2 = 31.78$ and p – value = 0.00; (iv) model 2 - $\chi^2 = 18.52$ and p – value = 0.001.

¹⁹ The depreciation rate is calculated as the ratio of consumption of fixed capital to net capital stock in an economy. This reflects the decline in the value of the fixed assets of enterprises, governments and owners of dwellings in the household sector. Fixed assets decline in value due to normal wear and tear, foreseeable ageing (obsolescence) and a normal rate of accidental damage. Unforeseen obsolescence, major catastrophes and the depletion of natural resources, however, are not included. Unlike "depreciation" in business accounting, the employed depreciation rate is not a method for allocating the costs of past expenditures on fixed assets over subsequent accounting periods. Rather, it is the decline in the future benefits of the assets due to their use in the production process.

²⁰ Specifically the user cost of capital is normalised as follows: $\log(1+UCC)$

²¹ Interest rates are included as 10 year risk free

Table A.1: Estimation Results: Long Run Correlates of Investment

	Model 1 Only CESEE	Model 2 Only CESEE	Model 3 Full sample	Model 4 Full sample
GDP	1.24*** (0.1312)	1.25*** (0.1347)	1.16*** (0.0967)	1.17*** (0.1038)
User cost of capital – definition UCCA	-1.24*** (0.3471)		-1.69*** (0.3579)	
User cost of capital – definition UCC B		-1.01*** (0.3185)		-1.44*** (0.3549)
Constant	-2.58*** (0.7142)	-2.76** (0.7142)	-2.26** (0.5642)	-2.43** (0.5965)
Obs	187	187	408	408
R2	0.80	0.8	0.71	0.7
Number of countries	11	11	24	24
F test	101.92	74.2	110.28	92.43
Prob > F	2.49E-07	1.08E-06	0	0

Note: Robust standard errors in parentheses; *** $p<0.01$; ** $p<0.05$; * $p<0.1$

Source: Authors' calculations

The long run relationship is derived from a priori assumptions, not from the data. The short time dimension of our panel does not allow for meaningful formal cointegration testing. We also avoid the practice of increasing data frequency (e.g. employing quarterly instead of annual frequency). This has been heavily criticised in the literature (Hakkio and Rush, 1991) because cointegration is a long run concept and a meaningful testing requires an expansion of the time period covered. This is not feasible in our analysis because of clear data limitations for the CESEE regional perimeter. Our assumption of a cointegrating relationship though has been well established both in economic theory and in previous empirical work (Lewis et al. 2014).

The results from the various models are statistically significant and robust. Table A.1 reports the main coefficients and key statistics for all regression lines. Two sets of considerations are worth noting. First, the UCC specification including the depreciation rate (UCCA) exercises a larger negative effect on investment levels than the alternative without depreciation rate included. This result suggests that the depreciation rate is a statistically significant driver of investment in the long-run,²² confirming the importance of depreciation in determining the level of investment²³ (Summers, 1987). Second, the UCC has a higher elasticity when estimated on a sample of countries including old EU member states. This suggests that local pricing conditions have a stronger effect on investment levels in economies with more developed financial markets. The latter countries also tend to be more reliant on internally sourced and priced funding. All in all, we obtain investment gaps which are the residual (unexplained) component of our models, and we computed the gaps based on the full range of models, as we do not have strong priors on the best model reported in Table A.1. This allows for the broadest degree of flexibility, as all models are based on reasonable specifications and each of them assesses different effects. As a result, the employment of the full set of models allows obtaining ranges of investment gaps to be found for each country under scrutiny. The ranges are computed taking the average minimum and maximum misalignment across the four models reported in Table A.1 and across time. The larger the bands, the higher the uncertainty surrounding the estimates.

²² We have also tested further this finding estimating a model with the UCC decomposed into the three main subcomponents. As a result, all coefficients are statistically significant and of the right sign across all model specifications and samples. This further validates the reliability of our constructed UCC variable.

²³ Economists have long understood that the present value of depreciation tax determines the effective purchase price of new capital goods, which in turn determines the cost of capital

Table A.2: Investment gaps before and after the crisis – min-max values derived from the 4 different models

Country	Period 2001-2009		Period 2010-2015		Year 2015	
	min %	max %	min %	max %	min %	max %
	BGR	5.3%	6.7%	-3.4%	-1.7%	-8.4%
CZE	3.5%	3.6%	-7.3%	-6.5%	-9.8%	-9.5%
EST	5.8%	6.0%	-4.5%	-3.6%	-8.5%	-7.6%
HRV	5.3%	5.8%	-3.7%	-2.2%	-9.7%	-8.7%
HUN	4.5%	4.6%	-8.9%	-8.3%	-6.2%	-5.5%
LTU	3.5%	4.2%	-8.1%	-7.3%	-0.8%	-0.1%
LVA	7.6%	7.9%	-11.3%	-10.4%	-17.0%	-16.4%
POL	-3.5%	-2.6%	-0.5%	1.4%	1.0%	3.1%
ROM	2.0%	3.6%	-3.2%	-1.1%	-11.2%	-8.5%
SVK	3.6%	5.2%	-14.5%	-11.0%	-13.3%	-9.6%
SVN	9.8%	10.0%	-20.0%	-19.2%	-25.2%	-24.4%

Appendix 4: Infrastructure gaps, country by country

Against the background of Figure 25 and the analysis carried out by the EIB, the EC²⁴ and, in case of SEE countries, also by the EBRD and the WB, we highlight some particularly important structural investment opportunities in each individual CESEE country²⁵.

Bulgaria faces significant investment needs in the infrastructure, education and healthcare sectors. While secondary education attainment in Bulgaria is at par, its quality measured by the PISA score seems comparatively low, not only relative to the EU average but also relative to Bulgaria's per capita income level²⁶. Innovation capacity suffers particularly from low spending on R&D and rather limited high tech exports. With respect to energy infrastructure, while Bulgaria is less dependent on energy imports than the EU average, a significant share of energy production is wasted. According to the European Commission, Bulgaria is the least energy efficient economy in the EU when it comes to industry, transport and housing. Also with respect to CO2 emissions Bulgaria is one of the worst performing countries in the EU. There is also a major investment gap in the transport and energy infrastructure. In particular, investment in gas networks is needed to improve security of supply and connectivity with EU markets.

Given the restructuring now underway in the Croatian economy, investment should focus on the education sector and sectors with higher productivity potential. While most of Croatia's structural indicators correspond to the country's income level, their performance in the EU context is less favourable. It is striking that despite relatively high secondary educational attainment the quality of secondary education as measured by the PISA score is comparatively low. In addition, despite some improvement in recent years, tertiary educational attainment remains below the EU average. Spending on R&D is deeply below the EU benchmark. Consequently, it is not surprising that high-tech exports and employment in the high-tech sector are rather limited. Against this background, investment priorities should focus on further development of human capital and on the strengthening of research and technological innovation, particularly in SMEs and state-owned enterprises. Moreover, there is significant potential to modernise the rather underdeveloped railway network and the inefficient energy sector.

In the Czech Republic, the most promising sectors in need of more investment include education, R&D, transport infrastructure and energy. The Czech Republic hovers around the EU average in most structural categories and also around the level implied by the country's income level. It has a rather well educated workforce, and the transport and energy infrastructure is relatively developed. Nevertheless, there is room for improvement, and more investment is needed particularly in those sectors which are essential for growth based on innovation and higher value added. The rate of investment in education has stalled in the past two decades, and thus remains below the EU average, as is tertiary educational attainment. In this context, better cooperation between the academic and business sectors and more investment in R&D would spur growth. Despite rather dense transport infrastructure networks, insufficient (public) investment in their maintenance and reconstruction²⁷ has led to deficiencies in safety and capacity which has hampered economic growth. Finally, there is scope to invest in energy efficiency, as the Czech economy is one of the most CO2- and energy -intensive economies in the EU.

²⁴ See e.g. http://ec.europa.eu/priorities/jobs-growth-investment/plan/index_en.htm

²⁵ It should be born in mind that investment opportunities in general improve with the creation of an investment-friendly environment, with a stable, transparent and predictable regulatory and judiciary framework and an effective and efficient public administration. While all of the CESEE countries still have to a larger or lesser extent room for improvement in this respect it would go beyond the scope of this paper to address these deficiencies in each individual country.

²⁶ In addition to benchmarking the CESEE countries' performance against the EU average we also compared the actual value of each indicator which is reasonably correlated with GDP to a fictive figure implied by the per-capita income level. The latter we obtained as the fitted value in a univariate regression of each indicator against the per-capita GDP in purchasing power standards.

²⁷ Following the outbreak of the crisis, public investment retrenched by almost a third, from 5.5% of GDP in 2009 to less than 3.5% of GDP in 2013. Investment in transport infrastructure fell particularly sharply during this period.

In Estonia, the most pressing investment opportunities are in the energy sector and transport infrastructure. The radar chart below confirms that Estonia possesses a rather well educated workforce. Correspondingly, exports of and employment in the high-tech sector are – though just in line with the EU average – well above Estonia's income peers. Even though investment in R&D and innovation has increased significantly in recent years, cooperation between academia and businesses is lagging. One of Estonia's main challenges relates to the inefficient and CO2-intensive energy sector. Hence, investment is needed to increase energy efficiency (particularly of housing) and to further improve cross-border connections of the gas and electricity network to integrate the country into the wider EU energy market. Transport infrastructure needs investments to increase the rather low density, to improve quality and safety and to ensure cross-border connectivity.

In Hungary, investment should focus on education and physical infrastructure. To maintain Hungary's relatively high share of high-tech employment and high-tech exports, investment aimed at improving human capital, i.e. in (particularly tertiary) education, R&D (especially if carried out by SMEs) but also healthcare, would be the first priority. In addition, in spite of a relatively dense railway network, more investment in physical infrastructure including railways, public transport and IT, particularly broadband internet, would be beneficial.

More investment in R&D, transport and energy infrastructure is needed to increase Latvia's competitiveness. While Latvia fares rather well in terms of human capital endowment, R&D spending is well below the EU average, although just in line with income peers. Hence, more investment on R&D should also bring about more export and employment opportunities in the high-tech sector in the medium-term. When it comes to energy, Latvia is doing rather well in terms of renewable energy consumption and has improved significantly the efficiency of energy production over recent years. Nevertheless, the country's energy intensity is amongst the highest in the EU, with potential for significant efficiency gains in residential buildings, district heating, and transport. Moreover, investment in electricity and gas networks is needed to improve security of supply and connections between EU markets. Similarly, quality, density, safety and cross-border connectivity in the transport sector should be increased through more investment.

Investment in Lithuania should aim at efficiency improvements in the energy sector and at tailoring of education to labour market needs. Despite rather high educational attainment, both secondary and tertiary, and a decent quality of secondary education as gauged by PISA scores, the human capital endowment does not seem congruent with labour market needs. Lithuania has suffered from relatively high structural unemployment on the one hand and shortages of qualified labour on the other. To ease these tensions, investment (particularly public investment) should focus on high quality training and education. Although the efficiency of energy production has improved significantly over recent years, investment in the energy sector should focus on further improvements of supply and efficiency.

Poland needs higher R&D spending in particular and further improvement of its network and energy infrastructure. Despite a comparatively well educated workforce, Poland has a rather poor innovation record. This is partly because of relatively low R&D spending and an underdeveloped high-tech sector, not only in comparison with the EU average but also with Poland's income level. So given intensifying competition from other emerging markets in high-tech sectors, investment in R&D needs a boost. Despite high public infrastructure investment in recent years, the construction of the transport network, in particular the rail network, needs to be completed. Further investment in more energy generation and distribution, in reducing CO2 emissions as well as in broadband infrastructure is warranted.

Romania lags behind almost on every structural indicator. Apart from renewable energy consumption Romania scores rather badly on most other structural indicators, not only relative to the EU average but in many cases also relative to that implied by its income level. Over recent years, foreign direct investment has been channelled increasingly to energy, machinery, transport, IT and communication, as well as agriculture. Investments in these areas, as well as in transport and healthcare infrastructure, promise to build future potential and may help the country to move up the value chain.

Given Slovakia's growth model, investment should target particularly transport and energy infrastructure and the low quality of education. Even though Slovakia has a relatively dense railway network, the rail and road transport infrastructure is still underdeveloped. However, given Slovakia's specialisation in manufacturing for export, the quality of transport infrastructure is essential and needs to be further improved. In addition, despite the comparatively high secondary school attainment, a relatively low share of the population obtains tertiary education. Moreover, the quality of education and training seems rather low (PISA scores have even deteriorated over recent years) and does not fully match labour market needs. This impedes the chances of skilled people to find the right jobs and leads to a suboptimal allocation of resources. The situation is partially ascribable to the comparatively low public spending on education, which is well below the EU average (4.1% vs. 5.3% of GDP, respectively). Finally, more investment is also warranted in the energy sector to improve the infrastructure, increase efficiency and strengthen interconnections with neighbouring countries.

Slovenia needs in particular private equity and other types of corporate investment to preserve its knowledge-based economic growth model. As the high scores in education attainment and quality categories, R&D spending and high-tech employment suggest, Slovenia is a knowledge-based economy with a highly qualified labour force and the potential to develop further through targeted investment. The knowledge-intensive, medium- to high-tech sectors, such as chemicals, pharmaceuticals, electronics, machinery and transport equipment, show the highest comparative advantage and are currently the most suitable targets for investment, particularly R&D investment. Apart from attractive private equity investment opportunities resulting from ongoing corporate restructuring and privatisation, other investment instruments such as venture capital, early-stage finance or angel investors are needed to help finance the liquidity of restructured companies and reduce non-performing corporate credits. Further development of co-financing and co-investment facilities for SMEs or start-ups is also crucial to facilitate a sustainable economic recovery.

Albania has a significant comparative advantage in the realm of renewable energy with a prospect of becoming a regional player in the renewable energy market. However, despite a dramatic improvement over recent years (see radar chart below) such a goal would require, *inter alia*, increased efficiency of energy generation and distribution. Another investment priority is further infrastructure development, particularly of railways and ports, which is key to encourage Albania's integration in the region. Last but not least, the rather poor education outcomes also call for an increased attention to the education system, which is an essential determinant of Albania's future competitiveness and economic growth.

In Bosnia and Herzegovina, investment priorities are in energy and infrastructure. Bosnia and Herzegovina's competitive advantage is its abundant supply of energy, strong industrial heritage and significant natural resources. However, the latter need to be used in a more efficient and sustainable way, as the unfavourable scores on energy losses or CO₂ emissions suggest. Hence, investment priorities should focus on improving the sustainability and efficiency of energy use and consumption, but also on the repercussions of climate change which threatens key sources of growth, such as agriculture, forestry and hydropower. Moreover, to spur domestic demand, more efficient allocation of resources and trade linkages with regional peers is needed, as well as investment in transport and ICT infrastructure.

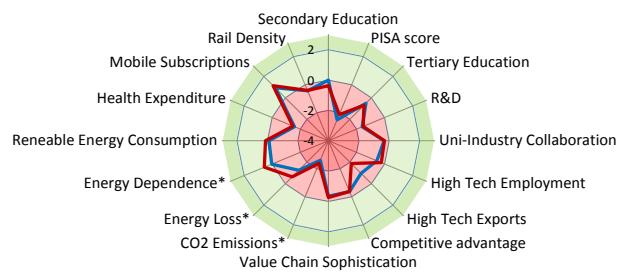
One of the principal objectives of investment in Macedonia is to lower the persistently high unemployment rate. Despite a significant decline over recent years, unemployment in Macedonia remains very high and this has a disproportionate effect on the poor. Hence, one of the investment pillars should concentrate on access to and quality of education and training in order to improve the endowment of the labour force, especially in disadvantaged groups, with skills better corresponding to labour market needs. In addition, persisting transition gaps in the energy sector need to be closed through investment, particularly by developing renewable sources of energy and strengthening of energy efficiency. Finally, an improvement of transport networks would spur cross-border trade and investment.

Given Montenegro's competitive advantages, investment should focus on sustainable development of the tourism sector and on energy. Thanks to Montenegro's natural endowments, tourism will remain an essential growth driver. However, to explore this potential fully, it will be necessary to develop the associated institutions and infrastructure. Moreover, the ensuing environmental implications and risks of a strengthening tourism industry will require more investment in environmental sustainability. Montenegro sticks out through its comparatively high consumption of renewable energy, and the country has the potential to become a regional energy hub. However, despite improvement over recent years, losses in production and distribution are significant and energy efficiency and carbon reduction still have room for improvement, e.g. through more competition in the market.

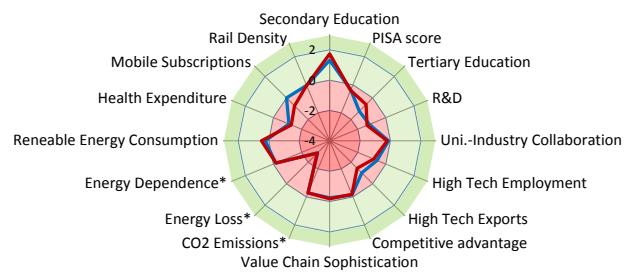
Investment in Serbia should aim, eventually, at strengthening the role or of the private sector and at closing transition gaps in the energy sector. In Serbia, the private sector plays a relatively moderate role in the economy, even in comparison to regional peers, and the state retains a significant share in key industries. Hence, investment needs to focus on reforming and restructuring the public sector and public enterprises and on improving private sector competitiveness. To achieve the latter, investment should be directed into education, training and innovation, which lag significantly behind, as Figure A.4 demonstrates. Moreover, SMEs in particular – the backbone of the Serbian private sector – need special attention as they face limited access to finance in the wake of the crisis and receive virtually no FDI. Last but not least, large transition gaps remain in the energy and infrastructure sectors, calling for a promotion of energy efficiency, higher use of renewable energy and the renovation of aging electricity generation capacities.

Figure A.4: Structural strengths and weaknesses: EU CESEE countries (distance from EU average in standard deviations)

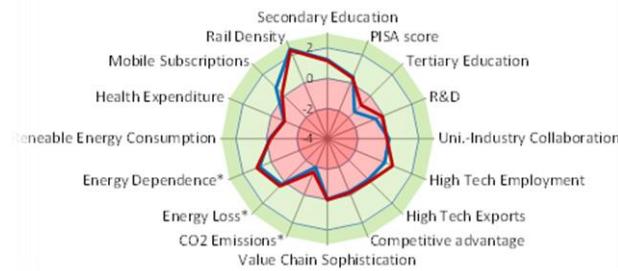
Bulgaria



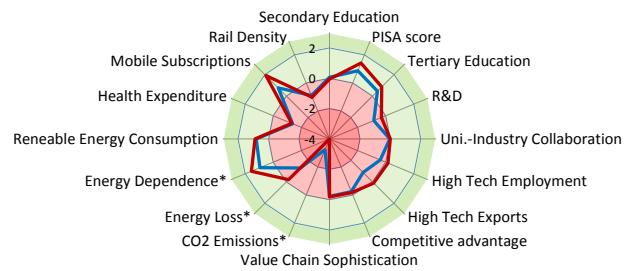
Croatia



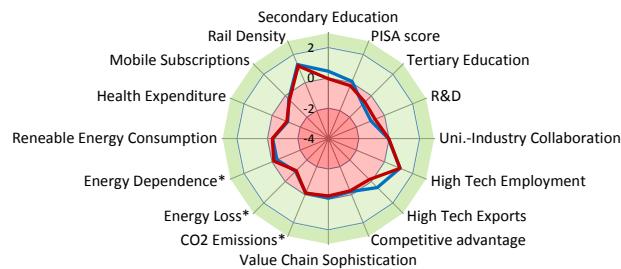
Czech Republic



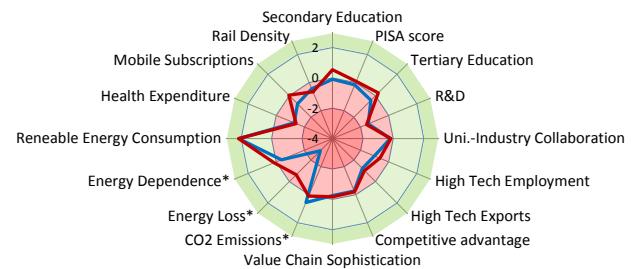
Estonia



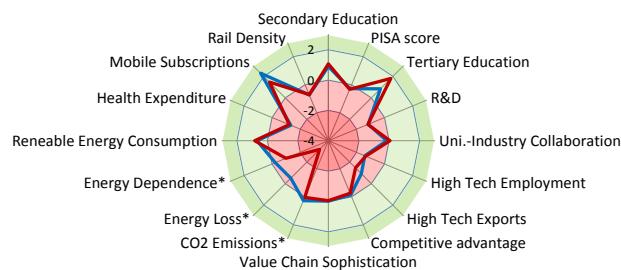
Hungary



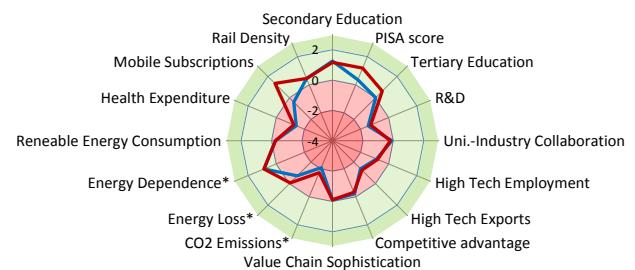
Latvia



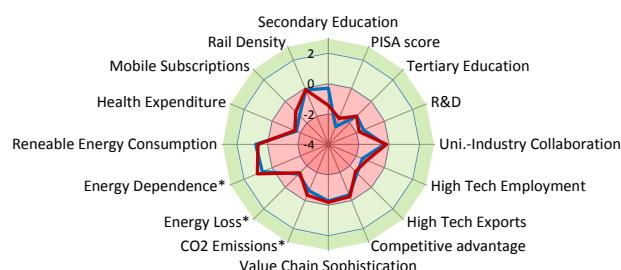
Lithuania



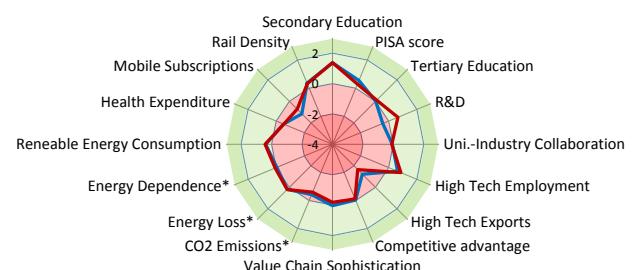
Poland



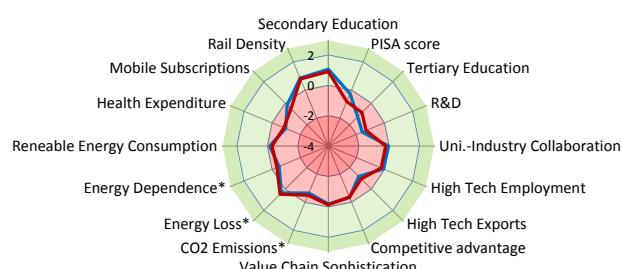
Romania



Slovenia



Slovakia



Legend:

— : Before the crisis (06/07/08)

— : After the crisis (latest data point available 2011-2015)

* in line with other indicators a negative figure means a worse performance than the benchmark

Table A.3 Indicator details

Competitiveness Indicator	Source	Explanation	Aggregate
Secondary Education	Eurostat	Secondary school attainment, calculated as the reverse of 'Early leavers from education and training' of persons aged 18 to 24.	
PISA score	OECD	Combined score: Mathematics, Science, Reading.	
Tertiary Education	Eurostat	The share of population aged 30-34 years who have successfully completed university or university-like (tertiary-level) education.	Human capital
R&D	Eurostat	Private and public R&D expenditure (% of GDP)	
Uni.-Industry Collaboration	WEF	Global Competitiveness Index, University-industry collaboration, survey based index (1-7)	
High Tech Employment	Eurostat	Employment in technology and knowledge-intensive sectors at the national level (% of total employment)	
High Tech Exports	Eurostat	Exports of high technology products as a share of total exports (%)	
Competitive advantage	WEF	Global Competitiveness Index, Nature of competitive advantage, survey based index (1-7)	
Value Chain Sophistication	WEF	Global Competitiveness Index, Value chain breadth, survey based index (1-7)	Innovation capacity
CO2 Emissions	World Bank	CO2 emissions (kg per 2011 PPP \$ of GDP)	
Energy Loss	World Bank	Electric power transmission and distribution losses (% of output)	
Energy Dependence	World Bank	Energy imports, net (% of energy use)	
Renewable Energy Consumption	World Bank	Renewable energy consumption (% of total final energy consumption)	
Health Expenditure	World Bank	Health expenditure per capita, PPP (constant 2011 international \$)	
Mobile Subscriptions	World Bank	Mobile cellular subscriptions (per 100 people)	
Rail Density	World Bank	Rail density (km of rail per 100 sq. km of land area)	Strategic infrastructure



Economics Department

✉ economics@eib.org
www.eib.org/economics

Information Desk

📞 +352 4379-22000
📠 +352 4379-62000
✉ info@eib.org

European Investment Bank
98-100, boulevard Konrad Adenauer
L-2950 Luxembourg
📞 +352 4379-1
📠 +352 437704
www.eib.org