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TRANSITION REPORT 2017-18

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ABOUT THIS REPORT

The EBRD seeks to foster the transition to an open market-oriented economy and to promote entrepreneurship in its countries of operations. To perform this task effectively, the Bank needs to analyse and understand the process of transition. The purpose of the *Transition Report* is to advance this understanding and to share our analysis with partners.

The responsibility for the content of the report is taken by the Office of the Chief Economist. The assessments and views expressed are not necessarily those of the EBRD. All assessments and data in the online country assessments are based on information as of late October 2017.

COUNTRY ABBREVIATIONS

Albania	**ALB**	Kyrgyz Republic	**KGZ**	Turkmenistan	**TKM**
Armenia	**ARM**	Latvia	**LAT**	Ukraine	**UKR**
Azerbaijan	**AZE**	Lebanon	**LBN**	Uzbekistan	**UZB**
Belarus	**BEL**	Lithuania	**LIT**		
Bosnia and Herz.	**BOS**	Moldova	**MDA**	(Other countries)	
Bulgaria	**BUL**	Mongolia	**MON**	China	**CHN**
Croatia	**CRO**	Montenegro	**MNG**	Czech Republic	**CZE**
Cyprus	**CYP**	Morocco	**MOR**	Israel	**ISR**
Egypt	**EGY**	Poland	**POL**	South Korea	**KOR**
Estonia	**EST**	Romania	**ROM**	United Arab Emirates	**UAE**
FYR Macedonia	**FYR**	Russia	**RUS**	United Kingdom	**UK**
Georgia	**GEO**	Serbia	**SER**	United States of America	**USA**
Greece	**GRC**	Slovak Republic	**SVK**		
Hungary	**HUN**	Slovenia	**SLO**		
Jordan	**JOR**	Tajikistan	**TJK**		
Kazakhstan	**KAZ**	Tunisia	**TUN**		
Kosovo	**KOS**	Turkey	**TUR**		

GLOSSARY

A glossary for this *Transition Report* is available at tr-ebrd.com

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EXECUTIVE SUMMARY

The *Transition Report 2017-18* focuses on the challenge of sustaining growth, with particular reference to the experiences of middle-income economies. The analysis in this year's report builds on various existing country-level, industry-level and firm-level datasets, as well as unique data on upgrades to road infrastructure and the performance of EBRD-supported infrastructure and energy projects. This report also provides an overview of progress in the area of structural reform and introduces a new assessment of the progress made by the countries of the EBRD region in their transition to sustainable market economies.

This report finds that middle-income economies tend, on average, to experience a slow down in productivity growth at income levels of between one-third and two-thirds of that of the United States of America. Furthermore, in many economies in the EBRD region, growth is lagging behind that of comparable middle-income countries elsewhere in the world. Having exhausted the advantages that used to underpin their strong growth performance in the past, the countries of the EBRD region now require a new growth model.

That model needs to be based on innovation, going beyond the importing of technology. The analysis in this report shows that the recent slow-down in the EBRD region's productivity growth partly reflects the fact that the region is home to many small firms, which remain small and relatively inefficient. Increased competition from imports, access to export markets and integration into global value chains can all encourage firms to raise efficiency levels through innovation and investment in modern capital stock.

This report estimates that investment in infrastructure accounts for around 40 per cent of all capital needs in the EBRD region. Over the next five years, the region needs to invest €1.9 trillion in infrastructure in order to support its growth. Evidence from major upgrades to Turkey's road network suggests that improvements in market access generate new trade links and broaden the range of products available to consumers, while the resulting rise in employment can reduce emigration from previously isolated regions. Thus, in addition to contributing to competitiveness and integration, transport infrastructure can also help to create opportunities for income growth in historically disadvantaged regions.

Despite significant progress since the 1990s, emission levels across the EBRD region are still substantially higher than those seen in comparable emerging markets elsewhere in the world, raising concerns about the long-term sustainability of growth. Stronger policies are needed in order to meet the commitments made under the Paris Agreement, starting with the elimination of energy subsidies.

BEYOND THE MIDDLE-INCOME TRAP

Middle-income countries appear to experience weaker productivity growth, with this slow-down happening at income levels of around one-third to two-thirds of that of the United States of America. As economies' incomes rise, productivity growth fails to keep up, with countries finding it difficult to switch from a growth model based on investment and the adoption of technology to one involving innovation and the development of new technology. This is one reason why episodes of strong growth have, historically, been difficult to sustain for more than a decade or two. Moreover, more than 40 per cent of all long periods of strong growth end in protracted periods of poor growth performance.

Middle-income economies also tend to have the most carbon-intensive production structures (in terms of emissions per US dollar of GDP), as these countries tend to have established manufacturing industries, but their firms may not yet be using the most advanced environmentally friendly technology. Chapter 4 looks in more detail at the challenge of increasing energy efficiency and cutting emissions in middle-income economies.

Having achieved middle-income status, many economies in the EBRD region are now in need of a new growth model. In the 1990s and the 2000s, the region's economies consistently outperformed comparable emerging markets elsewhere in the world. In sharp contrast, however, the region's average performance has consistently been weaker than that of its emerging market peers since the 2008-09 financial crisis.

While the region's growth prior to 2008 was driven predominantly by rising productivity, the main contribution to growth in recent years has come from the accumulation of fixed capital. And yet, in virtually every country in the EBRD region, investment still lags far behind the levels seen in comparable economies elsewhere in the world. The cumulative capital stock gap between countries in the region and other emerging markets is now estimated at €2.2 trillion (equivalent to 18 per cent of the region's total capital stock). Increasing investment in infrastructure could give growth in those countries a much-needed boost, as discussed in Chapter 3.

Analysis of recent episodes of sustained strong growth shows that investment, the availability of domestic savings in order to finance it and the quality of infrastructure play by far the most important role in explaining episodes of both strong and weak growth. Indeed, most sustained periods of income convergence, such as that seen in South Korea, involve rapid capital accumulation, often leveraging earlier advances in productivity. The quality of economic and political institutions also plays a major role when it comes to explaining growth performance, as do the development of equity markets and demographic variables.

http://2017.tr-ebrd.com/beyond-the-middle-income-trap

FIRM DYNAMICS AND PRODUCTIVITY

Chapter 2 takes an in-depth look at the factors underlying productivity slow-downs in the EBRD region and other emerging markets. It discusses the effectiveness of various policies in terms of avoiding such a slow-down as countries transition from low-income to high-income status.

This chapter introduces the Schumpeterian growth framework, which regards market competition and the establishment, growth and exit of firms as the building blocks of economic development. This framework forms the basis for a discussion of how market incentives affect firm-level innovation and aggregate productivity growth. Most importantly, it shows how countries' policy priorities should change at different stages of their development, building on a number of stylised facts about businesses across Europe.

First of all, when compared with EU countries in western Europe, the transition economies of the EBRD region have disproportionate numbers of small and non-innovative firms, which lag far behind larger firms in terms of productivity. Second, firms in the EBRD region often fail to grow. Third, while larger firms in the region have achieved higher rates of productivity growth relative to their counterparts in developed economies, smaller firms have not caught up to the same extent.

The fact that small firms are failing to grow is translating into lower levels of aggregate productivity. This phenomenon can be seen in industry-level data across the EBRD region. This chapter shows that productivity growth within individual industries can be supported by increasing cross-border integration. In particular, increased competition from imports and access to foreign markets through exporting can help industries to achieve and maintain higher rates of productivity growth. Greater integration into global value chains can also help countries to sustain productivity growth as a country's GDP per capita rises. Furthermore, this chapter also shows that more productive industries in the EBRD region are more likely to create than destroy jobs, thus emphasising the need to reallocate capital and labour away from inefficient sectors.

Replacing obsolete capital with modern equipment is crucial when it comes to raising firms' productivity levels. In line with the Schumpeterian view of the world, one of the key messages that emerge from the analysis in this chapter is that physical investment should be accompanied by innovation. Moreover, policies aimed at improving the quality of economic institutions should also be adopted, in order to enable small productive firms to drive economy-wide growth.

http://2017.tr-ebrd.com/firm-dynamics-and-productivity

INFRASTRUCTURE AND GROWTH

High-quality infrastructure connects people and markets, facilitating the efficient allocation of resources, while inadequate infrastructure hinders productivity. Most of the countries in the EBRD region have basic infrastructure, but there is still room for improvement in terms of sanitation and the supply of energy in poorer countries, and most of the region is lagging behind in terms of access to broadband internet. Meanwhile, firms in many EBRD countries of operations regard poor transport infrastructure as a major constraint on their business.

Estimates of country-specific infrastructure gaps reveal that infrastructure investment totalling €1.9 trillion is needed over the next five years in order to support the region's growth. Those investment needs, which equate to annual expenditure totalling 9 per cent of the region's GDP over that five-year period, vary widely across countries. Some economies require large amounts of investment in order to bring their infrastructure up to the levels that one would normally expect of countries with such economic characteristics, while other economies need to focus on maintaining their large existing networks and expanding them in order to support future population and income growth.

Evidence from major upgrades to Turkey's road network suggests that improvements in transport infrastructure boost domestic trade, with new trade links allowing firms to obtain inputs from different sources and broadening the range of products available to consumers. Improvements in market access lead to increases in employment and reduce outward migration from previously isolated areas. These findings suggest that comprehensive infrastructure upgrades have the potential to improve economic prospects in underperforming regions.

Infrastructure investment programmes should be designed in the context of the relevant country's needs, taking account of complementarity between infrastructure sectors such as telecommunications and roads. Many countries will need to look beyond their domestic economies in order to finance such investment. Recent research points to the existence of large pools of private savings in search of longer-term investment opportunities, and countries will need to tap into those sources of finance.

International financial institutions can facilitate such investment by providing region-specific expertise and by helping governments to design tender procedures that increase transparency and reduce the likelihood of costly overruns and corruption. In addition, a study of 46 completed infrastructure projects with EBRD involvement shows that the way in which project finance is structured has a major impact on a project's success. For instance, greater government involvement in projects is associated with delays in completion, while dispersed ownership of special-purpose vehicles underpinning project finance is associated with higher cost overruns.

http://2017.tr-ebrd.com/infrastructure-and-growth

GREEN GROWTH

At the start of the transition process, the EBRD region was an outlier in terms of its very high levels of greenhouse gas emissions, which were partly a result of polluting industries accounting for a large percentage of economic output. Aggregate greenhouse gas emissions have fallen since the 1990s, but they remain above the levels observed in comparable emerging markets elsewhere in the world. Moreover, declines in emissions have been driven mainly by improvements in energy efficiency, rather than reductions in the carbon intensity of energy production.

Stronger policies are required in order to put the region's economies on the path to green growth, starting with the elimination of energy subsidies. As long as electricity and fuel are cheap, firms will choose more energy-intensive production structures. When energy is appropriately priced, well-managed firms respond to price signals and reduce their emissions. The transition to a green economy will be especially challenging for major exporters of fossil fuels, which tend to have high energy subsidies. However, other parts of the EBRD region are relatively well placed to enjoy success in the low-carbon economy, exhibiting strong potential in the area of green innovation, albeit many countries continue to lag behind the frontier in terms of emissions, green manufacturing processes and the production of green goods and services.

While volumes of green goods and services are still relatively small, they are growing rapidly. Among publicly listed firms, green revenue typically accounts for a larger percentage of total revenue in smaller, younger firms. Those firms tend to have higher valuations, despite their returns on equity being lower than those of non-green peers. This suggests that investors expect higher future returns in this sector and place a premium on firms' environmental performance. The analysis in this chapter also shows that equity instruments are better suited to supporting green investment, while banks tend to provide funding for mature, older technology. As a result, increases in the development of stock markets relative to bank credit are associated with declines in pollution across industries and countries.

Channelling investment to cleaner and more productive firms will require effective regulation. The removal of energy subsidies and the pricing of carbon emissions are priorities in this regard, but countries will also need to embrace measures such as efficiency standards (in order to encourage energy savings), as well as subsidies promoting low-carbon technology. Additional measures (such as more comprehensive social safety nets and retraining opportunities) may also be required in order to soften the structural impact of transition to a low-carbon economy.

http://2017.tr-ebrd.com/green-growth

MACROECONOMIC OVERVIEW

After five consecutive years of economic slow-down, the average annual growth rate in the EBRD region rose to 1.9 per cent in 2016. Nevertheless, that growth rate remains below that observed in a group of comparator economies.

The stronger growth recorded in 2016 continued in the first few months of 2017, with all countries bar Azerbaijan and FYR Macedonia reporting positive growth. This improved growth performance reflects recoveries in the prices of oil and other commodities, which have supported growth in Russia, Central Asia, and eastern Europe and the Caucasus. Growth in central Europe and the Baltic states also accelerated in the first half of 2017, boosted by stronger investment activity in several countries.

In contrast, declining revenue from tourism, partly owing to security concerns and geopolitical risks, is continuing to weigh on the economic outlook for the southern and eastern Mediterranean. Growth in the EBRD region is expected to strengthen further in 2017 and 2018.

http://2017.tr-ebrd.com/outlook

STRUCTURAL REFORM

In light of the challenges that countries currently face in trying to achieve sustainable growth, the EBRD has reviewed its transition concept. Under that updated interpretation of transition, a sustainable market economy is regarded as being competitive, well governed, green, inclusive, resilient and integrated. Looking at reform efforts across the region over the past year, it is noticeable that many relate to competitiveness and resilience. Improving the competitiveness of businesses and sectors and strengthening financial systems seems to be a concern for many countries in the EBRD region. In addition, a number of countries have implemented reforms in order to improve aspects of governance – an area where the EBRD's new transition scores suggest that many countries have room for improvement.

http://2017.tr-ebrd.com/reform

FOREWORD

In this year's *Transition Report*, we discuss the challenge of sustaining economic growth in the EBRD's countries of operations. This challenge is threefold. First, while the countries of the EBRD region enjoyed strong growth and convergence with their richer neighbours prior to the global financial crisis of 2008-09, since the crisis their growth rates have consistently been lower than those of similar emerging markets elsewhere in the world. Second, many of those countries have now reached middle-income status and have to overcome the problem of the "middle-income trap". And lastly, in order to ensure that growth is sustainable in the long run, those countries need to develop environmentally friendly growth models.

The term "middle-income trap" is used to describe the marked slow-down in economic growth that is observed as emerging market economies reach middle-income levels. There is no consensus as to whether this trap is a universal phenomenon or whether it occurs at a specific income level. But the middle-income trap is a useful concept that qualitatively describes the experiences of many emerging markets in terms of the evolution of their growth models.

While transition from low to middle-income status is usually based on industrial development, most of which is concentrated in low-value-added sectors, further convergence involves the establishment of high-value-added industries and knowledge-based services. Whereas earlier stages of the convergence process require the adoption of existing technology and investment in basic education and physical capital, later stages are dependent on higher levels of education, research and development, and innovation.

Consequently, moving beyond middle-income status involves transition to a new set of political and economic institutions that provide incentives to develop new products and services. Such institutional changes may be hard to bring about – for example, because they run counter to the interests of incumbents that are benefiting from the existing growth model. Countries' failure to move to a new growth model lies at the very heart of the middle-income trap.

The nature of the middle-income trap in the EBRD region is somewhat different from that observed in other emerging markets. Most post-communist countries already had high levels of education, urbanisation and industrial development when they embarked on the transition process. Prior to 2008, their strong convergence with more advanced economies tended to be driven not by the accumulation of factors of production (capital, labour and human capital), but by increases in total factor productivity (that is to say, the efficiency with which those factors of production were used). However, as the inefficiencies inherited from the central planning era have been eliminated, those countries have encountered the typical challenges posed by the middle-income trap. This year's *Transition Report* uses country-level, industry level and firm-level data to examine those challenges in detail.

We start by documenting the post-crisis slow-down that has been observed in the EBRD region. In recent years, those countries' growth rates have not only been below the levels recorded prior to the crisis, they have also lagged behind the rates seen in comparator countries with similar levels of development. In this sense, the countries of the EBRD region have certainly faced greater middle-income growth challenges than other emerging markets.

The other distinguishing feature of the middle-income trap is the "environmental Kuznets curve". On average, middle-income countries tend to have higher levels of pollution per unit of GDP than both poorer countries (which have not yet established polluting industries) and advanced economies (which have moved on and developed greener post-industrial growth models).

This issue is especially salient in post-communist countries that inherited an industrial base with disproportionately high pollution levels. As part of their transition to market economies, the countries of the EBRD region have reduced their pollution levels substantially, but they remain significantly less green than other middle-income countries.

In order to free themselves from this environmental element of the middle-income trap, the countries of the EBRD region need to adopt environmentally friendly economic policies (with the removal of energy subsidies featuring high on the list of priorities) and develop institutions that will help to finance investment in the green economy. Green debt instruments (such as green bonds) have a key role to play in this regard, but so do equity markets. By definition, equity investors have a stake in the long-term value of the assets that they hold. They therefore have incentives to select projects that will not be "stranded" in the future once every country has adopted a green policy mix.

Our analysis shows that listed companies where green revenue accounts for a larger percentage of total revenue already have higher equity values per US dollar of current profits than other firms – that is to say, that equity markets are optimistic about the future profits of green companies. Of course, well-functioning equity markets require strong political and economic institutions. Improving governance at both country and firm level is an essential part of breaking free from the middle-income trap.

Sustaining growth in transition economies will not be easy. There is no silver bullet – no one-size-fits-all solution. However, the experiences of countries that have successfully achieved the transition to high income levels provide grounds for optimism. By strengthening their institutions, supporting firm dynamics and innovation, integrating their firms into the global economy and investing in sustainable infrastructure, the countries of the EBRD region should be able to complete their transition to sustainable market economies.

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Chief Economist
EBRD

MOVING BEYOND MIDDLE-INCOME STATUS INVOLVES TRANSITION TO A NEW SET OF POLITICAL AND ECONOMIC INSTITUTIONS THAT PROVIDE INCENTIVES TO DEVELOP NEW PRODUCTS AND SERVICES.

BEYOND THE MIDDLE-INCOME TRAP

Middle-income economies tend to experience weaker growth in total factor productivity than low-income and high income economies. Furthermore, following a long period of strong economic growth, more than 40 per cent of countries experience a marked slow-down. Today, many economies in the EBRD region have reached middle-income levels in terms of GDP per capita, but have lost much of their growth momentum. Having exhausted the advantages that used to underpin their strong growth performance in the past, these economies now require a new growth model. That new model needs to facilitate innovation, going beyond the importing of technology. It could also involve the upgrading of infrastructure, which has the potential to give investment a much-needed boost.

18%
OF CAPITAL STOCK
ESTIMATED CAPITAL STOCK GAP IN THE EBRD REGION

BETWEEN ONE-THIRD AND TWO-THIRDS OF US INCOME PER CAPITA:
INCOME LEVEL AT WHICH PRODUCTIVITY GROWTH TENDS TO WEAKEN SIGNIFICANTLY

6
TOTAL NUMBER OF OUTPERFORMANCE EPISODES LASTING FOUR DECADES OR MORE

Introduction

The *Transition Report 2013* asked whether the EBRD region had become "stuck in transition".[1] Since then, the post-crisis slow-down in income convergence has become even more protracted, mirroring developments in other emerging markets around the world (see Chart 1.1). This raises two important questions. First, is this recent slow-down part of a broader phenomenon whereby the EBRD region has become trapped at middle-income levels?[2] And second, has the region's recent growth performance been weaker than that of other emerging markets? This chapter addresses these two questions in turn.

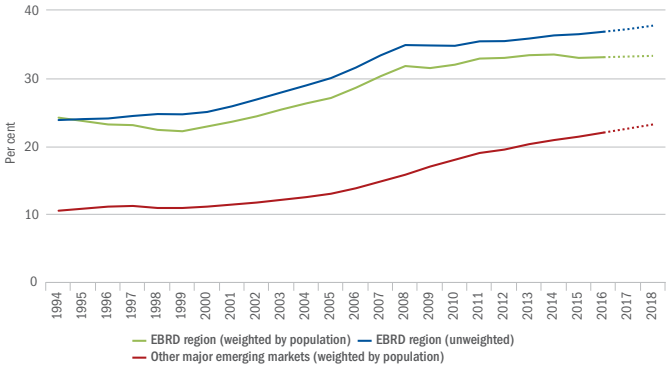
The term "middle-income trap" was originally coined by Indermit Gill and Homi Kharas to refer to the marked slow-down seen in South-East Asia's economic growth following the 1997-98 financial crisis.[3] This followed Danny Quah's earlier observation that countries' income levels tend to form "twin peaks", with fewer economies having middle-income levels.[4] The term "middle-income trap" is now used more broadly to refer to a slow-down in growth observed when an economy approaches the upper/middle-income level. The question of whether there is a middle-income trap at a specific level of income remains an issue of great debate.[5]

Instances of economies growing strongly for a decade or more and then suddenly hitting a period of weak growth are not uncommon. Over a period of 10 to 20 years, such economies tend to exhaust the comparative advantages that used to underpin their strong performance, with the original drivers of growth running out of steam. This happens for a variety of reasons. In many cases, the country's original comparative advantage rested on relatively cheap labour and its ability to effectively import existing technology. In other cases, a decline in commodity prices results in a reversal of fortunes.

This chapter does not identify a particular income level at which marked slow-downs in economic growth or reversals of fortunes occur. However, middle-income countries do appear to experience weaker productivity growth and exhibit lower lower levels of total factor productivity. This productivity slow-down happens at income levels of around one-third to two-thirds of that of the United States of America (USA) – and can thus be thought of as the middle-income productivity trap – even if economies' headline growth remains supported by the rapid accumulation of capital or labour growth. In particular, as economies' incomes rise, productivity growth fails to keep up, with countries finding it difficult to switch from adopting technology to innovating and developing new technology.

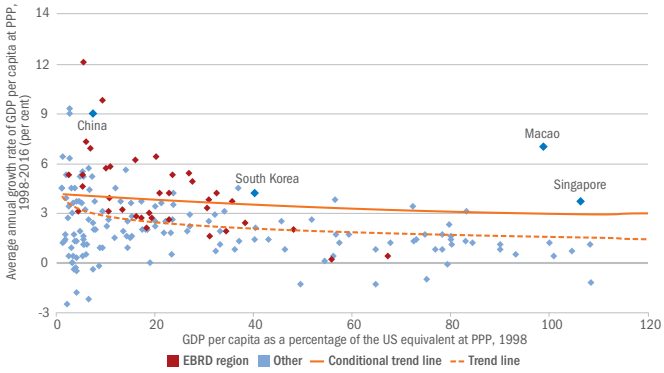
Many of the economies in the EBRD region now find themselves in such a situation. In the 1990s and the 2000s, the region's economies consistently outperformed comparable emerging markets elsewhere in the world. Since the 2008-09 financial crisis, however, the region's average growth performance has consistently been weaker than that of its emerging market peers. Having exhausted the advantages that used to underpin their strong growth performance in the past,

CHART 1.1. Average GDP per capita as a percentage of the US equivalent at PPP



Source: International Monetary Fund (IMF) and authors' calculations.
Note: "Other major emerging markets" comprise G20 emerging market economies outside the EBRD region. Figures for 2017 and 2018 are based on EBRD and IMF projections as at 1 October 2017.

CHART 1.2. Initial GDP per capita and average annual growth in GDP per capita, 1998-2016



Source: IMF, World Bank and authors' calculations.
Note: The trend line is based on a logarithmic fit for all countries. The conditional trend line is based on the regression of the growth rate of GDP per capita on initial values for the log of capital stock per worker, a human capital index and a number of other variables.

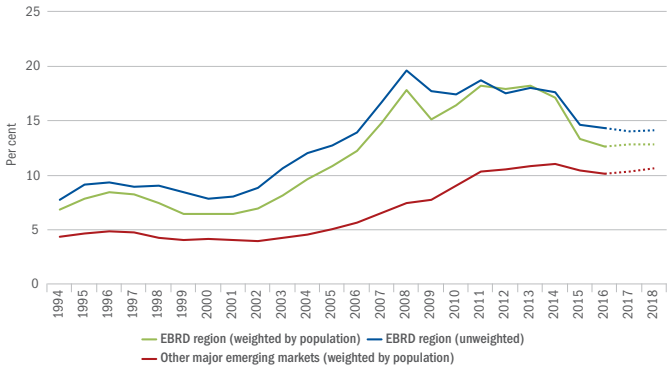
[1] See EBRD (2013).
[2] See ADB (2017) for a discussion of the middle-income trap in relation to Asia.
[3] See Gill and Kharas (2007).
[4] See Quah (1996).
[5] See, for instance, Eichengreen et al. (2014).

the region's economies now require a new growth model – one that goes beyond the imitation and importing of technology, and facilitates innovation. That model could also involve the upgrading of infrastructure, which has the potential to give investment a much-needed boost.

Analysis of recent episodes of sustained strong growth shows that investment, the availability of domestic savings in order to finance it and the quality of infrastructure play by far the most important role in explaining episodes of both strong and weak growth. The quality of economic and political institutions also has considerable explanatory power, as do the development of equity markets and demographic variables.

This chapter begins by revisiting the concept of the middle-income trap and presenting key stylised facts about the long-term growth performance of middle-income economies and the challenge of improving productivity. It then looks at the EBRD region's growth performance over the past two decades from a comparative perspective, showing that the region outperformed its peers prior to the 2008-09 financial crisis, but has since underperformed. It then examines episodes of consistently strong and consistently weak growth across countries and over time, looking at their key characteristics. While episodes of strong growth need not necessarily be followed by underperformance, reversals of fortunes are not uncommon. In contrast, it is rare for countries to achieve sustained growth over more than two decades. This chapter discusses various reasons for this pattern, before drawing a number of conclusions.

CHART 1.3. Average GDP per capita as a percentage of the US equivalent at market exchange rates



Source: IMF and authors' calculations.
Note: "Other major emerging markets" comprise G20 emerging market economies outside the EBRD region. Figures for 2017 and 2018 are based on EBRD and IMF projections as at 1 October 2017.

The middle-income trap: myth or reality?

Many of the countries in the EBRD region have reached or are approaching middle-income levels.[6] Do countries get trapped in a cycle of weak growth at this particular stage of their development? We can start by looking at countries' growth performance at various levels of income per capita.

No trap at a specific income level

The relationship between average growth in GDP per capita since 1998 and the initial level of GDP per capita does not point to growth weakening at a specific level of income (see Chart 1.2). Rather, the long-term income convergence performance of economies with a given level of income follows a law of diminishing returns. As income rises, economic growth tends to slow – a conjecture that is central to modern growth theories.[7] A similar picture emerges if the estimation of the relationship between the income level and growth takes account of a country's initial capital stock, its initial human capital and a number of other variables. The convergence of middle-income economies with the income levels of higher-income economies also holds for other time periods, as can be seen from Chart 1.1.

The picture is more nuanced if one looks at convergence in terms of GDP per capita at market exchange rates (see Chart 1.3). When measured in this way, there has been little convergence between the income levels of emerging markets worldwide and those of the USA since 2011. Moreover, when measured on the basis of market exchange rates, average income per capita in the EBRD region (whether weighted or unweighted) is lower today as a percentage of the US equivalent than it was in 2007. Benchmarking against the G7 as a whole (that is to say, Canada, France, Germany, Italy, Japan, the United Kingdom and the USA) produces the same result, with average income per capita in the G7 remaining remarkably consistent at around 85 per cent of the US equivalent.

AROUND
40%
OF THE REGION'S CAPITAL STOCK GAP IS DUE TO INSUFFICIENT INFRASTRUCTURE

[6] The analysis in this chapter refrains from using specific income thresholds. If one defines "middle" incomes as one-third to two-thirds of US income per capita, we are talking about incomes of between US$ 19,000 and US$ 38,000 at purchasing power parity (PPP) or market exchange rates in 2016. In contrast, the World Bank defines upper/middle incomes as US$ 7,650 to US$ 19,800 at PPP.
[7] However, the conclusion that the income levels of poor countries rise towards those of rich economies is sometimes questioned (see World Bank, 2017).

Weaker productivity growth in middle-income countries

Differences in convergence trajectories reflect the fact that many middle-income economies have fairly low income per capita at market exchange rates relative to their income levels at PPP (see Chart 1.4, which compares the two calculation methods for 2016). Differences between the two are more pronounced at income levels of between one-third and two-thirds of the US equivalent at PPP. The two measures tend to be aligned in the case of high-income economies, with the notable exception of the oil-rich Gulf economies.[8] This overall pattern implies that labour and many services (the "non-tradeable sector") remain relatively cheap as middle-income economies develop.

This, in turn, is indicative of sustained low levels of productivity in the "tradeable" sectors of these economies (primarily manufacturing), in line with the Balassa-Samuelson theory.[9] In an economy with properly functioning labour markets, wages in manufacturing and service sectors are expected to be comparable.[10] Wages in the competitive manufacturing sector reflect the marginal product of labour, or labour productivity, while the prices of services that cannot easily be traded across borders reflect domestic wage levels. If service prices remain relatively low, labour remains relatively cheap in both manufacturing and service sectors, implying weak productivity growth in the manufacturing sector. One manifestation of the "middle-income trap" that can be seen in the data is middle income economies' struggle to raise productivity levels in tradeable sectors.

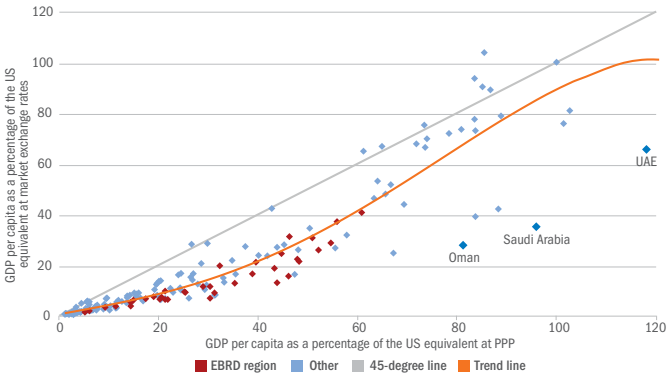
Most of the economies in the EBRD region – including those with higher levels of income – fall within the range where nominal incomes and incomes in PPP terms differ substantially. None are to the right of the point (at around two-thirds of US income) where the two measures start to converge.

In addition, the growth pattern of total factor productivity (TFP) around the world since 1998 indicates that middle-income economies find boosting TFP particularly challenging (see Chart 1.5). TFP refers to the efficiency with which factors of production – capital, labour and human capital – are combined to produce added value. In growth accounting, it represents the residual growth once the contributions of capital, labour and human capital have been identified. Total factor productivity and labour productivity are related: weaker growth in total factor productivity translates into weaker growth in output and hence into weaker growth in output per worker, or labour productivity.

As economies grow richer and approach the technological frontier, growth in total factor productivity tends to slow down. However, this slow-down is particularly pronounced in countries where GDP per capita is around one-third to two-thirds of the US equivalent. This income range is remarkably similar to the range where incomes at PPP and incomes at market exchange rates diverge (see Chart 1.4).

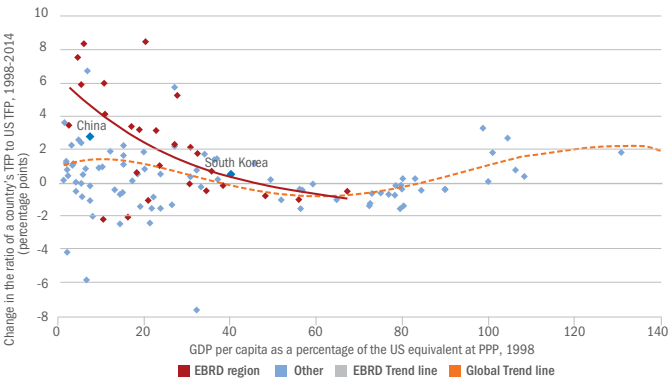
Indeed, we can see that advanced economies have, on average, enjoyed stronger productivity growth over this period than middle-income economies. Although EBRD economies have recorded significantly stronger TFP growth than other economies with similar income levels, further analysis will show that this is

CHART 1.4. Relative GDP per capita in 2016 at PPP and at market exchange rates



Source: IMF and authors' calculations.
Note: The trend line is based on a polynomial fit.

CHART 1.5. Initial GDP per capita and TFP growth, 1998-2016



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Trend lines are based on a polynomial fit.

[8] See also Ravallion (2013) for a recent discussion of income comparisons at PPP. Some of these differentials may also be due to PPP estimates failing to fully catch up with actual increases in price levels in middle-income economies. In this case, income per capita measured at PPP may overstate the true level of economic development.
[9] See Balassa (1965). The tradeable sector also includes services that are subject to international competition, such as call centres.
[10] For instance, an abundance of unskilled labour, coupled with shortages of required skills, may result in substantial wage differentials between the tradeable sector and low-skilled services. Investment in physical and human capital can be expected to reduce such differentials over time.

entirely accounted for by the period prior to the financial crisis.

This middle-income "productivity trap" may reflect the changing nature of the factors needed to boost productivity as countries approach the technological frontier. In a neo-Schumpeterian framework, countries further away from the frontier can rapidly improve productivity, predominantly by importing and imitating technology developed in more advanced economies.[11] However, as the transfer of existing knowledge nears completion and labour costs in recipient countries rise, such economies increasingly need to develop new technology themselves (and potentially export it to lower-income countries).[12]

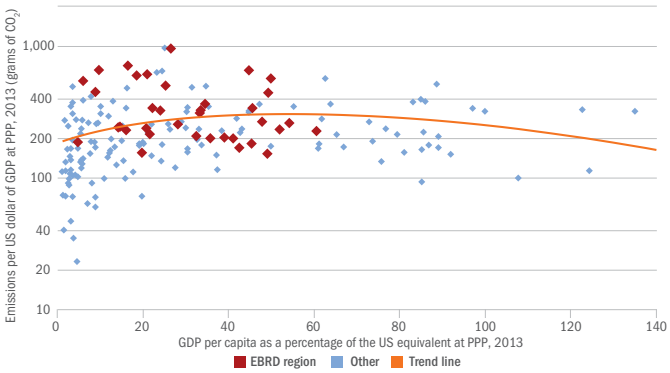
In other words, as countries develop and approach the technological frontier, their focus should shift from imitation to innovation. Similarly, their growth models and their priorities in terms of reforms need to change accordingly. Chapter 2 uses firm-level data to look in more detail at the challenge of raising productivity in middle-income economies.

The combination of modest growth performance and weak productivity growth suggests that, in recent decades at least, a number of middle-income economies may have been able to compensate for weaker TFP growth by means of strong growth in capital or labour and by keeping service prices and wages relatively low. Analysis later in the chapter shows that sustained periods of strong growth performance tend to be capital-intensive, coinciding with elevated investment levels. Indeed, most sustained periods of income convergence involve rapid capital accumulation, often leveraging earlier advances in productivity (see Box 1.1, which discusses the case of South Korea).

Interestingly, the strong slow-down in productivity growth also coincides with the income range where production tends to be the most carbon-intensive. Indeed, pollution per unit of GDP peaks when countries reach 35 to 60 per cent of the US income level, before starting to decline (see Chart 1.6). In other words, making growth more environmentally sustainable appears to be particularly challenging for middle-income economies (see Chapter 4 for a more detailed look at the issue of green growth).

Having established several facts about growth in middle-income economies in general, this chapter now turns to the second question – that of the relative performance of the EBRD region.

CHART 1.6. GDP per capita and emissions in 2013



Source: World Resources Institute, IMF and authors' calculations.
Note: The trend line is based on a polynomial fit.

Growth from a comparative perspective

Has the EBRD region's growth performance been different from that of other emerging markets? Or have EBRD countries of operations developed in line with expectations, given that average income per capita in the region is now approaching one-third of the US equivalent?

We can evaluate the region's growth performance from a global perspective by comparing the performance of economies in the region with that of similar economies in the same year. This approach takes account of global trends affecting the growth of all economies (such as the 2008-09 financial crisis), as well as the slowing speed of convergence as income per capita rises. For each year, each country's growth figures are contrasted with the average growth performance of a group of comparable economies, which are weighted on the basis of their similarity in terms of GDP per capita and population size.

This is effectively a modified synthetic control approach.[13] Large comparator groups are used to ensure the stability of comparisons: each reference group has a minimum of 15 countries, and no country has a weight of more than 15 per cent in any reference group. For instance, the countries with the largest weights in Tunisia's comparator group include Ecuador, Indonesia and Sri Lanka. The comparator for the EBRD region as a whole is, in turn, a weighted average of the synthetic comparators constructed for the various countries in the EBRD region. When constructing comparators, we focus on income and population in order to explain economic performance with regard to various other country characteristics such as financial development (this analysis is presented later in Chapter 1).

ONLY
17%
OF OUTPERFORMANCE EPISODES LAST TWO DECADES OR MORE

[11] See Baldwin (2016) for a discussion of globalisation and the transfer of technology and Acemoğlu et al. (2006) for a discussion of the neo-Schumpeterian growth framework.
[12] See Akamatsu (1962) for a discussion of the "flying geese paradigm".
[13] See Abadie et al. (2010). As this chapter does not focus on a specific event, synthetic matching is performed for each individual year.

Recent underperformance relative to comparators

Even taking global growth patterns into account, the EBRD region enjoyed 10 years of exceptionally strong growth between 1998 and 2008. The region consistently outperformed its synthetic comparator in that period (see Chart 1.7). Indeed, by the end of that period, the region's output was around 15 percentage points higher than would typically be expected of economies with that level of development.[14]

In contrast, average growth in the EBRD region consistently lagged behind that of its comparators in the period 2008-16, with that cumulative underperformance totalling 9 percentage points of GDP.[15] The overall trends are broadly similar when growth is analysed in per capita terms. The growth performance of central Europe and the Baltic states (CEB) is stronger in per capita terms, reflecting weaker population growth in those economies relative to other emerging markets. In contrast, the relative growth performance of economies in the southern and eastern Mediterranean (SEMED) region is considerably weaker when looked at in per capita terms (see Chart 1.8).

Slow-down in terms of productivity growth

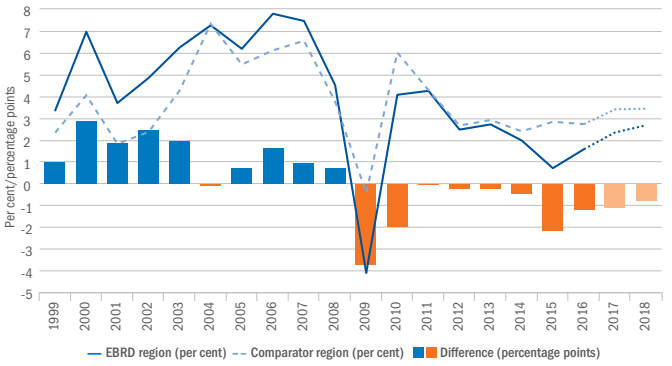
The closing of the gap in terms of TFP was a major factor in the strong growth seen between the mid 1990s and the 2008-09 financial crisis (see Chart 1.8). Factors of production had been combined inefficiently under central planning, and the region's economies embarked on the transition process with much lower TFP levels than would normally be expected in economies at that level of development. Market reforms helped to boost productivity and close that gap. While the region experienced higher levels of investment between 1998 and 2008 than it did before and after that period, the speed at which capital stock was accumulated was broadly in line with that seen in comparator countries.

By the time of the 2008-09 financial crisis, the differential between TFP in the EBRD region and TFP in other emerging markets had disappeared, as discussed in the *Transition Report 2013*. In the post crisis years, TFP growth has been slow and in many cases negative (see Chart 1.10), with a consistent pattern across subregions (see Chart 1.11). Productivity growth has also slowed across the global economy as a whole, although it has generally held up in emerging Asia.

In some cases, the decline in TFP growth reflects a reduction in the utilisation of capacity following the crisis (for which good cross-country data are not available). In Greece, for instance, capacity utilisation declined from 76 per cent in 2008 to 68 per cent in 2014 and 67 per cent in 2016. However, the average decline in capacity utilisation across countries covered by Eurostat has been relatively small at just 3 percentage points.

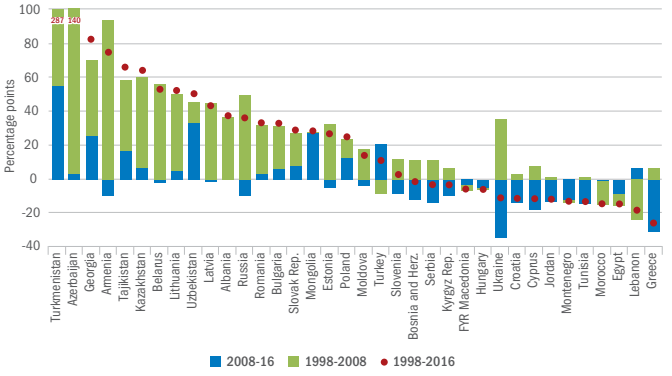
The contribution made by labour force growth has been modest, reflecting a combination of rapid population ageing and emigration in many of the countries in the EBRD region. The weak contribution made by human capital growth reflects the fact that levels of human capital were already relatively high (in terms of years of schooling, at least).

CHART 1.7. Average annual growth rates in the EBRD region and a comparator region



Source: IMF and authors' calculations.
Note: Weighted on the basis of GDP at PPP. Figures for 2017 and 2018 are based on IMF and EBRD forecasts as at 1 October 2017.

CHART 1.8. Growth in GDP per capita relative to comparator countries



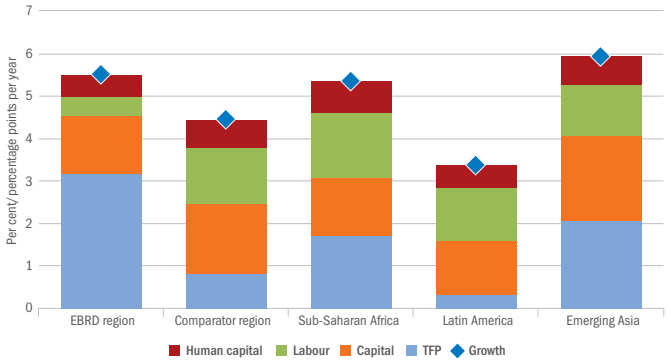
Source: Penn World Tables, IMF, World Bank and authors' calculations

The capital stock gap

Although post-crisis growth has been driven largely by the accumulation of capital, the rate of fixed capital investment has been considerably lower than in comparator economies. This investment gap, which was first documented in the *Transition Report 2015-16*, can be seen in Chart 1.12.[16] Gaps can be observed for all countries except Azerbaijan, Belarus, Bulgaria, Turkey and Turkmenistan. In Latvia, for instance, the capital stock increased by around 20 percentage points less over the period 2008-14 than would be expected on the basis of trends in comparator economies.

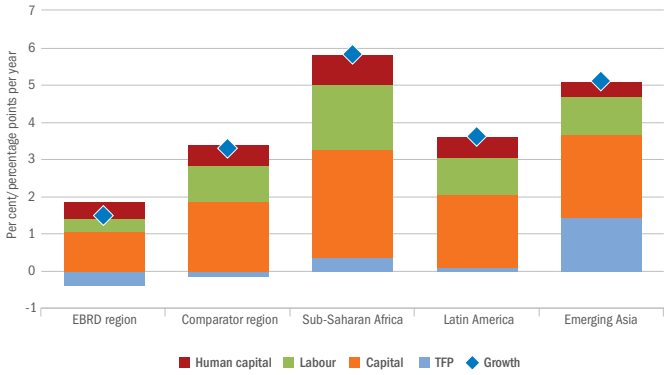
[14] This cumulative result is calculated as the chain product of the ratios of an economy/region's real GDP relative to its comparator's real GDP in a given year, where for both the economy and its synthetic comparator the level of GDP in the preceding year is normalised to 100. It is expressed in percentage points.
[15] In this calculation, the comparators are reset each year. Similar results are observed if comparators are chosen on the basis of any specific year between 1999 and 2016.
[16] See EBRD (2015).

CHART 1.9. Decomposition of sources of growth, 1998-2008



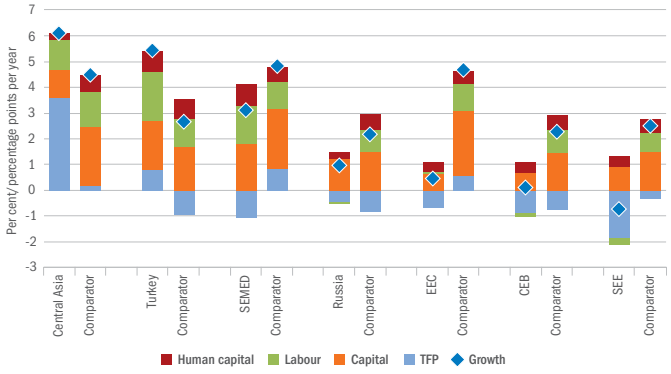
Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Simple averages across countries. Estimates for Latin America and sub-Saharan Africa are based on six large representative economies in each case.

CHART 1.10. Decomposition of sources of growth, 2008-14



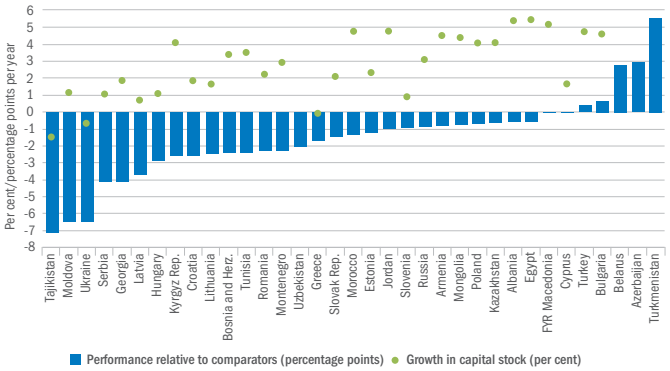
Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Simple averages across countries. Estimates for Latin America and sub-Saharan Africa are based on six large representative economies in each case.

CHART 1.11. Sources of growth by subregion, 2008-14



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Simple averages across countries.

CHART 1.12. Average annual growth in capital stock, 2008-14



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: In Azerbaijan, Belarus, Turkmenistan and Uzbekistan, average annual growth in capital stock exceeded 6 per cent in the period 2008-14.

In 2014, the EBRD region had a total estimated capital stock deficit of €2.2 trillion relative to other economies at a similar level of development, of which around €500 billion was on account of lower levels of investment during the period 2008-14.[17] According to the estimates presented in Chapter 3, around 40 per cent of that gap was accounted for by insufficient infrastructure, with the remaining 60 per cent corresponding to other forms of capital stock, such as machinery and equipment, buildings and intellectual property. That gap is equivalent to 18 per cent of the region's total capital stock and 47 per cent of the region's annual GDP.

Other factors also contributed to the EBRD region's strong growth performance in the 2000s and the subsequent reversal of fortunes. For instance, the commodities boom of the 2000s gave a major boost to commodity exporters and countries with strong economic ties to Russia. In the CEB region and south-eastern Europe (SEE), meanwhile, EU accession served as a solid anchor for reforms and helped to attract large inflows of foreign direct investment (FDI), as well as other capital flows. In addition, technological change facilitated these economies' integration into European and global supply chains.

Is it possible that this kind of pattern (that is to say, a decade of exceptionally strong growth, followed by a prolonged period of weak performance) is in fact common and in some ways inevitable? The next two sections identify episodes of strong and weak growth, look at their determinants and discuss the reasons why reversals of fortunes are indeed common – albeit not inevitable – occurrences.

[17] Grela et al. (2017) also find that the recent decline in investment rates is the main factor explaining the slow down in convergence in central and eastern Europe.

Episodes of exceptionally strong and weak growth

Defining growth episodes

Episodes of sustained strong and weak growth play a key role in shaping countries' long-term income trajectories.[18] Using synthetic comparators, we can look at instances where countries consistently achieve higher (or lower) rates of growth than would be expected on the basis of their income per capita and prevailing global economic conditions. In this chapter, an "outperformance episode" is defined as a period in which an economy outperforms its synthetic comparator at least 90 per cent of the time for at least eight consecutive years (allowing for brief – but only brief – dips in performance).[19] Countries' growth rates must exceed those of their comparators by an average of at least 1 percentage point per year over that period. "Underperformance episodes" are defined symmetrically.

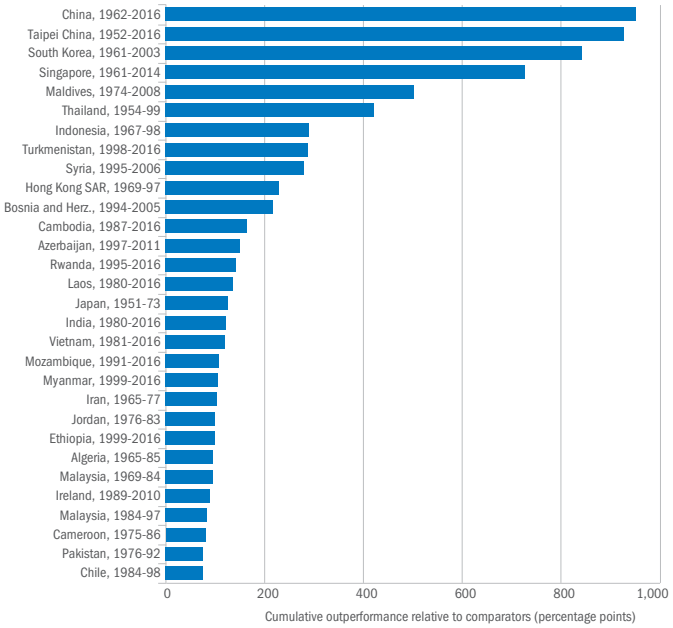
Periods of outperformance and underperformance differ from the periods of strengthening and weakening growth that are typically analysed in economic studies in several respects. For example, this measure takes account of global events such as the oil price shock of 1973-74 and the global financial crisis of 2008-09 (see Box 1.2 for an illustration based on the United Kingdom's performance before and after its accession to the European Communities).

Changes to an economy's income level also matter for its *relative* performance: although China's growth rate has fallen by several percentage points since the mid-2000s, its outperformance has remained remarkably consistent at around 4 percentage points per year over this period. In fact, China's contribution to global GDP growth is roughly the same today as it was 10 years ago, when its economy was smaller (as discussed in the Macroeconomic Overview).

In the period since 1951, the world's strongest outperformance episodes have been observed in China, Taipei China, South Korea and Singapore (see Chart 1.13). While many instances of fast convergence relate to emerging Asia, examples can be found all over the world (for instance, Chile, Ethiopia and Syria) and in virtually all time periods.

Some of these historical data are reassuring. A number of economies have succeeded in adjusting their economic policies and quickly growing beyond the middle-income level. Examples include South Korea (see Box 1.1), Taipei China and Israel (which has had a total of three outperformance episodes). At a lower level of income, Mauritius has undergone several structural shifts, leveraging comparative advantages first as an exporter of agricultural goods and quality apparel (supported by its preferential access to the European market), and then as a tourism destination and an offshore financial centre serving India. Mauritius's outperformance episode spans the period from 1981 to 2003, and the economy has also consistently outperformed its comparators since 2012.[20]

CHART 1.13. Episodes of strong long-term growth performance



Source: IMF, World Bank and authors' calculations.
Note: Cumulative outperformance is calculated relative to hypothetical growth trajectories based on comparators' growth each year.

Outperformance episodes: where and when?

What do these periods of strong growth have in common? To answer this question, this section looks at the determinants of outperformance and underperformance episodes in a large sample of countries over the period 1995-2016 (and over the period 1951-2016 where data are available).

The modified synthetic control method is well suited to studying the characteristics of recent growth episodes. Traditional approaches to the identification of outperformance look for structural breaks in data or instances where a country's growth rate rises by, say, 2 percentage points relative to the preceding period.[21] In recent years, however, such increases in growth rates have been few and far between. Indeed, China could, if anything, be classified as having experienced a period of weakening growth, as opposed to a sustained period of remarkable growth.[22] In contrast, focusing on performance relative to similar economies allows us to take account of global trends and identify sustained periods of strong growth performance that started only recently.

Importantly, looking at more recent episodes allows us to use richer sources of data on the quality of economic institutions, the quality of infrastructure (see Chapter 3 for more details) and other relevant country-level characteristics. It also helps to identify the most relevant drivers of outperformance today. This is important, because some drivers may have changed

[18] See, for instance, Pritchett (2000).
[19] In some ways, this is similar to the approach employed by Aiyar et al. (2013), who look at growth residuals using regression analysis.
[20] See Svirydzenka and Petri (2014) for a discussion of Mauritius's growth performance.
[21] Many recent studies are based on the approach suggested by Hausmann et al. (2005). With this approach, a growth episode occurs where a country's growth rate picks up markedly relative to earlier trend levels, reaches a certain threshold (such as 3.5 per cent) and is sustained for a certain number of years. Other studies look for structural breaks in growth series (see Ben-David and Papell, 1998; and Berg et al., 2012).
[22] See Plekhanov and Stostad (2017) for further discussion and analysis.

TABLE 1.1. Determinants of outperformance and underperformance

	Outperformance			Underperformance		
	(1)	(2)	(3)	(4)	(5)	(6)
Method	Probit RE		Linear FE	Probit RE		Linear FE
Investment (% of GDP)	0.018***	0.026***	0.025***	-0.006***	-0.004**	-0.008***
	(0.004)	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)
Current account (% of GDP)	0.009***	0.014***	0.014***	-0.004***	-0.003**	-0.008***
	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)
Infrastructure (LPI index)	0.014	-0.003	0.058	-0.077**	-0.038*	-0.180***
	(0.036)	(0.068)	(0.063)	(0.032)	(0.022)	(0.052)
Economic institutions	0.121**	0.124*	0.140**	-0.167***	-0.079*	-0.273***
	(0.051)	(0.074)	(0.070)	(0.052)	(0.040)	(0.058)
Political institutions	0.053	0.082	0.111**	-0.044*	-0.002	-0.154***
	(0.035)	(0.050)	(0.047)	(0.023)	(0.011)	(0.039)
Old-age dependency (%)	-0.004**	0.0001	0.003	0.001	-0.001	-0.001
	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)
Population growth	0.224	-0.144	-1.135	-0.928	-0.390	0.033
	(0.507)	(0.815)	(0.850)	(0.735)	(0.411)	(0.699)
Human capital growth	0.304	-0.097	-1.226	0.760	-0.335	-2.048
	(1.302)	(2.219)	(1.853)	(0.953)	(0.488)	(1.525)
Merchandise trade (% of GDP)	0.0004	0.0001	0.001	-0.001***	-0.001	0.001
	(0.0003)	(0.001)	(0.001)	(0.0005)	(0.001)	(0.001)
Financial openness index	0.009	0.042	0.025	-0.038	-0.043*	-0.118***
	(0.039)	(0.056)	(0.055)	(0.035)	(0.023)	(0.046)
GDP per capita at PPP (log)	-0.154***	-0.086	-0.097	0.112***	0.022	-0.022
	(0.048)	(0.069)	(0.090)	(0.034)	(0.018)	(0.074)
Private sector credit (% of GDP)		-0.002***	-0.001***		0.001**	0.001***
		(0.001)	(0.001)		(0.001)	(0.001)
Stock market capitalisation (% of GDP)		0.001***	0.001***		-0.001	-0.001
		(0.0004)	(0.001)		(0.001)	(0.001)
Observations	2,786	1,682	1,682	2,786	1,682	1,682
Number of countries	129	97	97	129	97	97

Source: Penn World Tables, IMF, World Bank, Polity and authors' calculations.
Note: Estimated using panel probit regression with random effects and linear probability model regression with fixed effects. All regressions report marginal effects. Standard errors are reported in parentheses, and *, ** and *** denote values that are statistically significant at the 10, 5 and 1 per cent levels respectively.

over time – for instance, as economies have become more open and less reliant on industrialisation as a motor of economic development.[23]

In the analysis that follows, the existence of an outperformance or underperformance episode in a given year and country is explained by a variety of factors, with an emphasis on differences across countries. In line with the approach used by Lee (2017), the regressions are estimated using probit with random effects (see Table 1.1 for a summary of the results).

Outperformance episodes are characterised by high investment-to-GDP ratios. A 5 percentage point increase in a country's investment-to-GDP ratio is associated with an increase of approximately 10 percentage points in the likelihood of experiencing an outperformance episode. Furthermore, outperformance is more likely to be sustained where investment is financed using domestic savings and, accordingly, current account balances are higher as a percentage of GDP.

CHINA'S ANNUAL GROWTH RATE IS AROUND
4
PERCENTAGE POINTS HIGHER THAN THAT OF A GROUP OF COMPARATOR ECONOMIES WITH SIMILAR CHARACTERISTICS

[23] Industry's share of employment peaks at a lower level in countries that develop later (see Sposi et al., 2017).

The results for underperformance tend to be symmetrical, with a few nuances. In particular, high quality infrastructure, as captured by the Logistics Performance Index (LPI), makes underperformance episodes significantly less likely. An improvement from Armenia's LPI level to that of Croatia, corresponding to 1 standard deviation in the sample, is associated with a 4 percentage point decline in the probability of underperformance.

While increased openness to trade (as reflected in high levels of exports and imports as a percentage of GDP) is generally associated with stronger outperformance,[24] this relationship appears to have weakened in recent years, partly because increased openness to trade – and capital account openness – may make growth more volatile. That said, economies that are closed to trade and/or financial flows are much more likely to experience underperformance episodes.

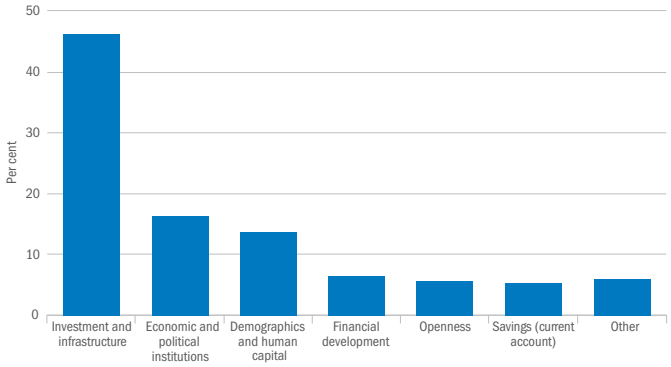
Outperformance episodes are more likely to occur in the presence of high-quality economic institutions (as captured by the average of the Worldwide Governance Indicators measuring control of corruption, the rule of law, regulatory quality and government effectiveness). A 1 standard deviation improvement in this average score (from Ukraine's level to that of Romania, for example) is associated with a 12 percentage point increase in the likelihood of achieving a sustained period of strong growth.

Countries are also more likely to experience strong growth (and thus less likely to underperform) when their political institutions are strengthened.[25] This can be seen from columns 3 and 6, where country fixed effects are included, so the coefficient highlights the differences between episodes of strong or weak growth and periods of mixed performance in the same country. A 1 standard deviation improvement in the quality of political institutions (from Morocco's level to that of Mongolia, for example) makes the onset of a period of weak growth 14 percentage points less likely.

Financial development, meanwhile, has a mixed impact. Outperformance episodes are more likely to occur in countries with better-developed stock markets, but higher domestic credit-to-GDP ratios tend, on average, to make sustained periods of growth less likely (by making growth more volatile). In addition, the term structure of credit may be more important than the volume of credit when it comes to facilitating sustained growth (see Box 1.3). Demographic factors also matter in some specifications. Although changes in the human capital index (based on the number of years of schooling) are not statistically significant, higher levels of human capital are already reflected in higher levels of income per capita.

The frequency of outperformance episodes in the EBRD region is roughly average once various determinants of outperformance and underperformance have been taken into account. Indeed, when the corresponding dummy variable is included, the coefficient is small and not statistically significant.

CHART 1.14. Determinants of outperformance: a Shapley decomposition



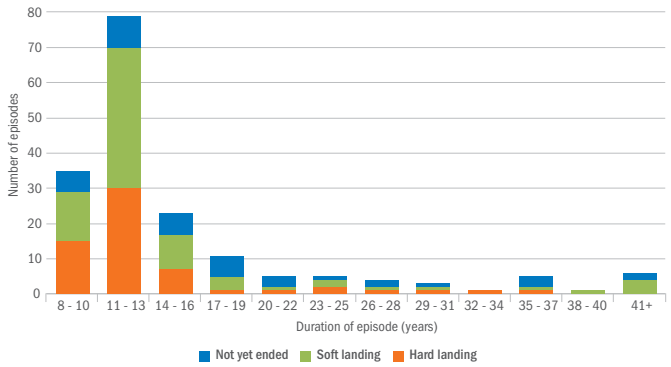
Source: Penn World Tables, IMF, World Bank, Polity and authors' calculations.
Note: Based on the average Shapley decomposition of pseudo R^2 from pooled probit regressions and R^2 from linear regressions for episodes of outperformance and underperformance, using the same variables as in Table 1.1.

Relative importance of the various factors

When it comes to the determinants of outperformance, a Shapley decomposition indicates that investment in capital stock (including infrastructure) plays by far the most important role (see Chart 1.14).[26] The quality of economic and political institutions also has considerable explanatory power, as do demographic and financial variables. Indeed, economic institutions, financial development and economic openness may be even more important to the extent that these variables have a major impact on investment and thus, indirectly, on growth performance.

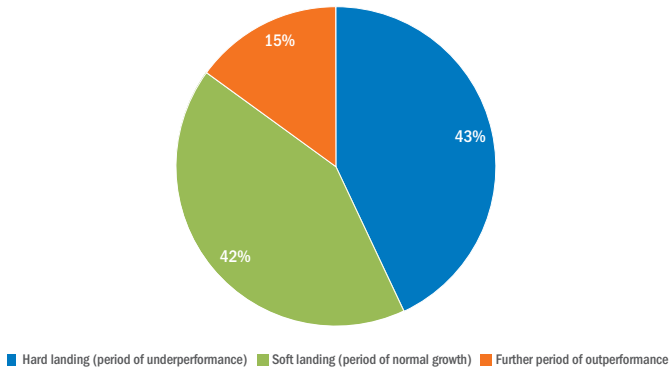
[24] See Lee (2017).
[25] Political institutions are captured by the average of the Worldwide Governance Indicators measuring "voice and accountability" and "political stability and lack of violence".
[26] A Shapley decomposition takes the total explained variation in a dependent variable (here, the existence of a certain type of growth episode) and breaks it down into the variation explained by the various determinants (see Shorrocks, 1982).

CHART 1.15. Breakdown of outperformance episodes by duration



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: "Hard landings" are outperformance episodes that are followed by an eight-year period with cumulative underperformance totalling at least 8 percentage points.

CHART 1.16. How outperformance episodes end



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Based on outperformance episodes that ended prior to 2009.

43%
OF OUTPERFORMANCE EPISODES RESULT IN HARD LANDINGS

Avoiding reversals of fortunes

Reversals: common, but not inevitable

Outperformance episodes are rarely sustained for a long period of time. Of the 180 or so episodes in the global sample, only 17 per cent (30 episodes) lasted two decades or more (see Chart 1.15). Only six were sustained for over 40 years (namely, the episodes observed in China, Taipei China, South Korea, Singapore, Thailand, and the Turks and Caicos Islands).

Hard landings – where outperformance is almost immediately followed by a prolonged period of weak performance – are also relatively common. If we look only at outperformance episodes that finished prior to 2009, 43 per cent of those episodes were followed by an eight-year period with cumulative underperformance totalling 8 percentage points or more. However, a positive outcome is still more likely than a negative one, with 42 per cent of economies experiencing a soft landing (that is to say, performing broadly in line with expectations following an outperformance episode) and a further 15 per cent embarking on another period of outperformance shortly afterwards (see Chart 1.16). All in all, the hard landing suffered by the EBRD region as a whole is fairly common, but not inevitable.

There are various reasons why countries struggle to sustain growth episodes for a long period of time and experience hard landings, as the following sections explain.

Success erodes countries' comparative advantages

First and foremost, fast-growing economies tend to exhaust their competitive advantages. For example, economies that initially benefit from cheap skilled labour (such as those in emerging Asia) see their workers' wages rise quickly. Thus, economic growth gradually erodes the very advantage on which the country's fast convergence has been built. The analysis above suggests, moreover, that many of these economies struggle to compensate for wage rises by raising productivity in manufacturing – for instance through better management practices and innovation.[27]

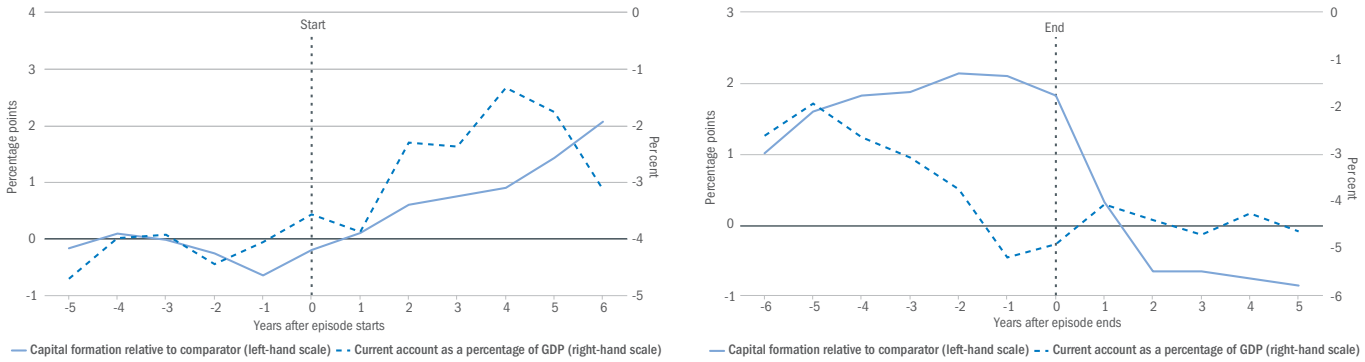
These middle-income economies risk getting trapped in a low-wage, low-productivity growth model, with all the obvious limitations that this entails. In order to sustain growth in the absence of productivity improvements, countries may be forced to rely on very high levels of investment, which may lead to excess capacity in certain sectors, or labour force growth, often on the back of high levels of immigration.

The TFP-led growth episode experienced by the economies of emerging Europe and Central Asia was something of a rarity. The combination of abundant capital stock, large quantities of skilled labour, initially poor management practices and low levels of technological development enabled these economies to grow quickly for a number of years by improving their TFP. However, these advantages were exhausted within a decade or so.

While TFP-led episodes are not common, episodes of outperformance are strongly associated with elevated levels of investment. In a typical growth episode, the average rate of

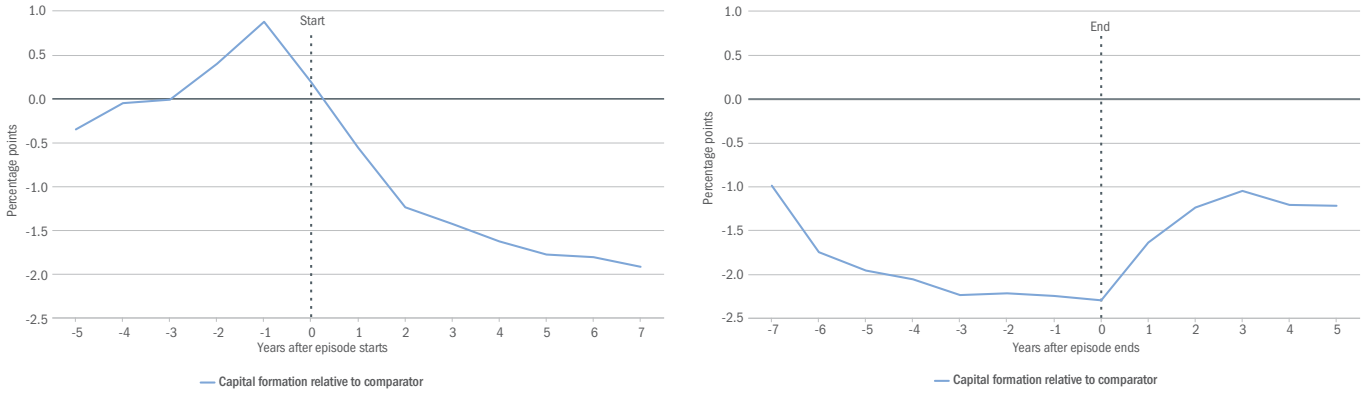
[27] See EBRD (2014).

CHART 1.17. Capital formation: relative performance during outperformance episodes



Source: IMF, World Bank and authors' calculations.

CHART 1.18. Capital formation: relative performance during underperformance episodes



Source: IMF, World Bank and authors' calculations.

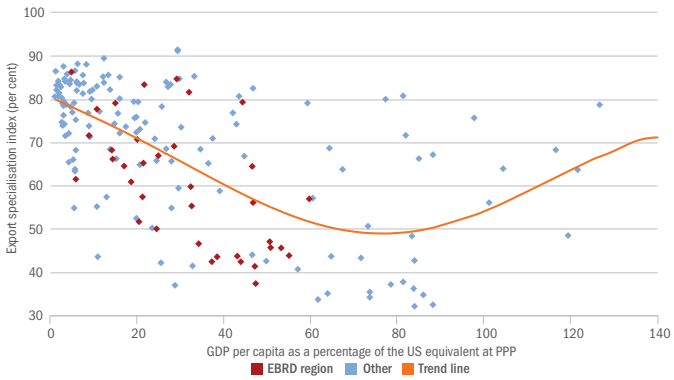
capital formation exceeds that of peer economies by around 1.5 percentage points. Investment typically responds to an improving outlook, rather than preceding a growth episode, and it quickly drops back to its baseline level at the end of the growth episode (see Chart 1.17).[28]

Likewise, underperformance episodes tend to be "investment-light" and end when investment rises. At the same time, investment fails to fully recover afterwards, possibly owing to the impact that a protracted period of weak economic performance has on business confidence (see Chart 1.18).

One way to boost investment in the short term is to increase spending on infrastructure, taking advantage of favourable financing conditions and low interest rates globally. Panama, for instance, has achieved impressive growth over the past 15 years, becoming one of the highest-income economies in Latin America and the Caribbean. The expansion of the Panama Canal, which took place between 2006 and 2016, played a key role in this. Chapter 3 looks in more detail at the case for increased infrastructure spending in the EBRD region.

[28] Similarly, Jones and Olken (2008) note that growth episodes tend to start with increased openness to trade, leading to higher levels of investment, and end with a decline in investment.

CHART 1.19. Export specialisation index and GDP per capita



Source: United Nations Conference on Trade and Development (UNCTAD), IMF and authors' calculations.
Note: This export specialisation index measures the difference between a country's export structure in 2015 and the average global export structure in that year. Higher values correspond to greater specialisation.

ECONOMIC DIVERSIFICATION HELPS TO MATCH DOMESTIC PRODUCTION TO GROWING DOMESTIC DEMAND AND DEVELOP A BROADER SKILLS BASE

The external environment and changing patterns of economic diversification

Patterns of economic diversification also play a role in explaining the productivity challenge that middle-income economies face. As countries develop, achieving per capita income in excess of 10-15 per cent of that of the USA, they initially tend to diversify, and the structure of their exports becomes more similar to the structure of global exports (see Chart 1.19). Diversification helps to match domestic production to growing domestic demand and develop a broader skills base, which is a prerequisite for stronger productivity growth. Indeed, increased diversification of exports tends, on average, to be associated with a substantial growth premium.[29] However, as countries get closer to the technological frontier, developing new technology increasingly requires large amounts of highly specialised human capital and equipment.

As a result, when income levels reach one-third of that of the USA, diversification starts to slow down. And when income levels reach two-thirds of the US level, countries start to specialise again – typically in new areas – and their export structure starts to move away from the average global export structure again. So, production and exports initially become less concentrated in particular industries as incomes rise, but then measures of concentration stabilise and begin to increase again.[30] This is another reason why economies may experience weaker growth on reaching upper/middle-income levels and need to readjust their development models, shifting from the diversification of production and skills to the adoption of strategies to promote smart specialisation.

In some cases, relatively undiversified economies may enjoy strong growth owing to external factors such as rising prices of oil and other commodities. This has been observed in Azerbaijan, Kazakhstan, Mongolia, Russia and Turkmenistan, as well as many Latin American and African economies. However, once commodity prices start to decline, undiversified economies face strong headwinds.[31] As a result of globalisation, the global economic environment has been having an increasingly large impact on growth levels in emerging market economies.[32]

Demographics

Demographics tend to create tailwinds as economies move towards middle-income status, only to produce strong headwinds later on. As low-income economies develop, the birth rate tends to fall and per capita spending on human capital rises. This boosts productivity growth. In addition, the labour force may initially rise as a percentage of the overall population as the number of children per adult falls.

As economies develop further, however, improvements in the standard of living and health care translate into rising life expectancy. As a result, populations age and the labour force starts to decline rapidly as a percentage of the total population, while pension obligations necessitate increases in taxation, public debt and/or long-term interest rates. Most of the countries

[29] See Al-Marhubi (2000).
[30] See Imbs and Wacziarg (2003). Both the general pattern and the income threshold at which specialisation begins to dominate are robust across time periods, country samples and industry breakdowns (see Hesse, 2008).
[31] See Guriev et al. (2012).
[32] See IMF (2017) for analysis of recent developments in this regard.

in the EBRD region have now entered this "mature demographics" phase (see Macroeconomic Overview).

Going forward, strong growth in middle-income economies will become increasingly reliant on workers' ability to stay employed for longer.[33] To facilitate this change, policies will need to focus more on life-long learning and the accumulation of human capital – perhaps at the expense of tax subsidies promoting the accumulation of physical capital (and thus the automation of production). In addition, workplaces and working practices will need to adapt to the ageing workforce.

Internal divisions

Rapid income growth often exacerbates income inequality. Indeed, emerging Europe and emerging Asia have both experienced substantial increases in inequality since the late 1980s.[34] Rising inequality may aggravate pre-existing divisions in society, such that external shocks then trigger a backlash against reforms or spark armed conflict, leading to periods of weak growth.[35] In order to be sustainable, growth needs to make societies more cohesive and lead to rising living standards across the board.

Crises and complacency

Fast-growing economies often struggle to recover from banking and currency crises. On average, the probability of an outperformance episode ending in a given year is around 5 per cent, but in the three years following the 1997-98 financial crisis this termination rate averaged 11 per cent. The 2008-09 financial crisis also led to termination rates spiking, albeit at lower levels of around 7.5 per cent. This suggests that many of the world's top performers weathered the 2008-09 crisis fairly well relative to an "average" economy. The EBRD region was a notable exception, however, since six of the nine outperformance episodes that ended in 2008-09 were in EBRD countries.

Crises have the potential to disrupt supply chains and burden corporations and banks with non performing loans, which may take a long time to clear, depressing growth for years to come.[36] As economies develop and their financial systems deepen, crises become more disruptive and their legacies become harder to overcome. For instance, at the time of the 1997-98 crisis, bank credit totalled just 9 per cent of GDP in Russia. By the time of the 2008-09 crisis, it exceeded 40 per cent. Meanwhile, outstanding bank loans in an advanced economy will typically total more than 100 per cent of GDP. The larger the financial sector, the greater the impact on the real economy in the event of a financial crisis.

Those economies that have sustained impressive long-term growth have not been immune to financial crises. It should be noted, for instance, that South Korea's GDP contracted by 5.5 per cent in 1998. Rather, they have been successful at cleaning up the balance sheets of banks and corporations in an expedient manner and swiftly moving on. South-East Asia's economies recovered relatively quickly following the 2008-09 crisis and have continued to outperform their peers.

In contrast, analysis indicates not only that the EBRD region was hit particularly hard by the 2008-09 crisis, but also that the subsequent recovery has been slow. This partly reflects the fact that a large percentage of the strong investment seen in the region in the 2000s was financed using foreign savings. This is not typical of outperformance episodes: current account deficits do not normally increase significantly, as increases in investment are usually financed using domestic savings.[37]

Not all crises are triggered by external events or international contagion. Indeed, many have domestic origins. Policy-makers have a tendency to become complacent following a period of strong growth, which may also explain reversals of fortunes. Moreover, while a crisis may initially lead to reforms, resulting in improvements in growth performance, such improvements can themselves breed complacency and lead to a new crisis, trapping a country in a CRIC (crisis-reform-improvement-complacency) cycle.[38]

[33] See OECD (2014) for a discussion of this issue.
[34] See EBRD (2016).
[35] See, for instance, Rodrik (1999).
[36] See Balgova et al. (2016) for estimates of this impact.
[37] Buera and Shin (2017), for example, show that savings tend to rise faster than investment following liberalisation reforms.
[38] See Feldman (2003).

Conclusion

While economic growth naturally slows as countries grow richer, there is no evidence that economies fail to approach or surpass a particular income threshold. However, middle-income countries do tend to experience slow-downs in the growth of total factor productivity.

This can be thought of as the middle-income productivity trap, as the slow-down in productivity appears to occur as income levels surpass one-third of that of the USA. The resulting declines in productivity levels can be detected by comparing countries' income per capita at PPP and at market exchange rates. While it may be possible to offset weaker productivity growth with higher levels of investment, increases in the labour force or low wages, raising productivity is essential if countries are to achieve income levels comparable to those of the G7 economies. In addition, middle-income economies tend to have the most carbon-intensive structures of production (in terms of emissions per unit of GDP).

Historically, episodes of strong growth that are capable of propelling countries to high levels of income have proved difficult to sustain. Fast-growing economies tend to exhaust their drivers of growth after a decade or two, requiring a change of growth model. In some cases, countries manage to adapt to these changing circumstances (as in the case of South Korea, Taipei China and Israel, for instance). In many other cases, however, economies lack the flexibility to do so, and more than 40 per cent of outperformance episodes end in hard landings.

In the case of emerging Europe and Central Asia, the closing of the gap in terms of TFP was a major factor in the strong growth performance that was observed between the mid-1990s and the 2008-09 financial crisis. Moreover, for a number of those economies, the commodities boom also played an important role. In central and south-eastern Europe, the prospect of joining the EU and EU accession itself played a significant role in terms of anchoring structural reforms and facilitating large inflows of FDI and non-FDI capital. In addition, technological changes enabled these economies to become heavily integrated in global supply chains.

Today, the circumstances are different. While growth has slowed across emerging markets, the slow-down in the EBRD region has been sharper than those seen elsewhere. Between 1998 and 2008, average growth in the EBRD region was consistently stronger than that recorded in comparable emerging markets. Since 2009, however, the region has, on average, underperformed similar economies elsewhere in the world. While productivity growth drove the region's growth prior to 2008, fixed capital accumulation has been the main contributor in recent years.

However, in virtually every one of the EBRD's countries of operations, investment has lagged far behind the levels seen in comparator economies. Indeed, the region's capital stock is estimated to be 18 per cent smaller than one would expect on the basis of its level of development. Insufficient infrastructure accounts for around 40 per cent of this gap, with the remainder being accounted for by equipment, buildings and intellectual property.

The economies of the EBRD region are now in search of new sources of growth – a growth model that goes beyond the imitation and importing of technology, and facilitates innovation. Cross-country analysis of past episodes of outperformance points to a number of fairly intuitive factors supporting faster convergence. Investment (including investment in infrastructure) plays by far the most important role in this regard. The quality of economic and political institutions and demographic variables also have considerable explanatory power, as do the development of equity markets and economic openness.

The remaining chapters of this report focus on the particular challenges faced by middle-income economies and several new sources of growth brought about by the new economic order of the 21st century. The second chapter looks at the challenge of raising productivity, basing its analysis on firm-level data, while the third chapter focuses on infrastructure investment, which is particularly attractive given that financing costs are at record lows. Upgrading infrastructure is one way of giving investment a much-needed boost and reinvigorating growth. The subject of Chapter 4 is green growth, which is both an important source of productivity improvements in middle-income economies and key to sustaining growth over the longer term.

Box 1.1. South Korea's outperformance episode

South Korea boasts one of the five longest outperformance episodes in post-war history.[39] That episode lasted more than four decades, spanning the period from 1961 to 2003, and by the mid 2000s South Korea's output was almost 9.5 times greater than if the country had followed the kind of growth trajectory that was typically experienced by its peers during that period. In recent years, South Korea's economic performance has generally remained strong, despite no longer formally qualifying as a period of outperformance.

South Korea's transition process stands out on account of its balanced growth trajectory. All factors – capital, labour, human capital and TFP – contributed strongly to the country's outperformance. The progress made in terms of human capital (measured by years of schooling) has been particularly impressive from an international perspective. During the early years of the outperformance episode, TFP increased rapidly, facilitating the effective absorption of capital in the economy (see Chart 1.1.1).

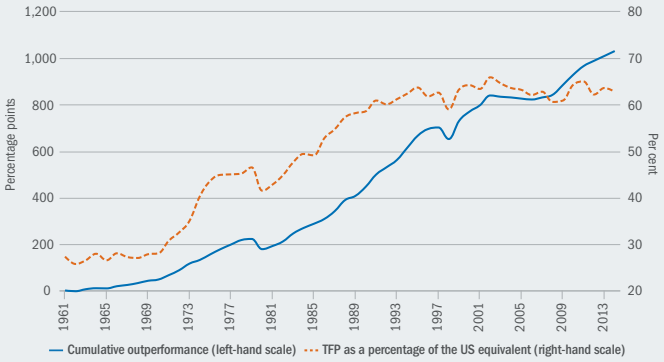
Investment in physical capital remained high throughout the outperformance episode – unlike in Japan, for instance, where it declined sharply. Investment was largely financed using domestic savings. FDI also played a role, but was, if anything, somewhat weaker than one might have expected. South Korea also invested heavily in infrastructure during its outperformance episode and has, for instance, remained a global leader in terms of its average broadband connection speed.

Sectoral shifts in labour and capital – notably away from agriculture – also played an important role. Productivity improvements at sectoral level were something of a mixed picture, with productivity in the service sector rising only slowly. In the early 1960s, manufacturing exports were well below average for a country at that level of development, but they went on to make a significant contribution to growth.

South Korea's exports target a specific niche – the lower end of a number of high-tech sectors (such as computers, electronics and cars) – with high volumes of exports, but relatively low unit values. It has been able to maintain that niche despite lower levels of country-wide productivity growth in more recent years. However, that has involved a gradual transition from the imitation and importing of technology to innovation and the exporting of technology, facilitated by rapid increases in human capital.

The country has not been immune to crises. The economy was hit particularly hard in 1971, 1980, 1991 and 2008, but on each occasion it recovered swiftly and maintained its high investment levels, even though it is common for crises to have a lasting impact on investment levels and suppress growth for three years or more.[40] Today, South Korea's GDP per capita stands at around 48 per cent of the US equivalent at market exchange rates and around 66 per cent of that level at PPP, with income convergence continuing.

Chart 1.1.1. Cumulative outperformance and TFP in South Korea



Source: Penn World Tables, IMF and authors' calculations.

AT THE END OF ITS 42-YEAR OUTPERFORMANCE EPISODE, SOUTH KOREA'S OUTPUT WAS ALMOST

9.5

TIMES LARGER THAN IF IT HAD FOLLOWED THE SAME GROWTH TRAJECTORY AS ITS PEERS

[39] This discussion of developments in South Korea draws heavily on Lee (2016) and Eichengreen et al. (2012).
[40] See Hong and Tornell (2005).

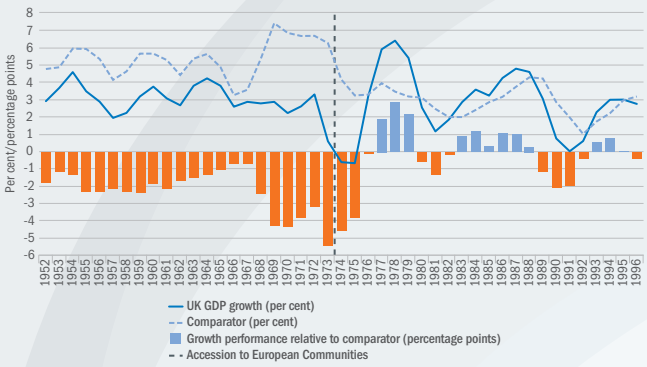
Box 1.2. The relative performance of the UK economy before and during European Union membership

In order to understand how trends in terms of economies' growth may differ from trends in terms of their performance relative to similar economies, let us consider the case of the United Kingdom. The UK's average annual growth rate between 1951 and 1973, the year of its accession to the European Communities (as the European Union was then known), was 3 per cent, compared with 2.7 per cent in the 20 years following accession. Its growth pattern exhibited no clear trends over this period (see Chart 1.2.1), and average growth was, if anything, somewhat weaker post-accession.

The picture is somewhat different if we look at the UK's growth performance relative to a synthetic comparator calculated as a weighted average of the growth rates achieved by economies with similar income levels and population sizes. In the 1950s and the 1960s, France, Germany and other advanced economies experienced stronger growth on average, reflecting demographic trends, post-war reconstruction and lower initial per capita incomes. During this period, the UK consistently underperformed relative to its synthetic comparator. By 1977, the UK's GDP was around 45 per cent lower than it would have been had the country performed on a par with its peers.

In contrast, from the mid-1970s onwards, the UK's growth performance was broadly in line with that of its comparator. Comparing the UK's performance with those of France and Germany (the two countries with the largest weights in its reference group) yields a similar picture. The turning point in the mid-1970s came shortly after the UK's accession to the European Communities and around the time that it started extracting North Sea oil.[41]

Chart 1.2.1. UK GDP growth and relative growth performance



Source: Penn World Tables, IMF and authors' calculations.
Note: Data represent three-year moving averages.

[41] Campos et al. (2014) use synthetic counterfactuals to make a similar point about the structural break around the time of the UK's accession to the European Communities.

Box 1.3. The maturity structure of corporate debt in emerging markets

The perceived lack of long-term finance for firms in emerging markets is a major concern for policy-makers. Long-term debt allows firms to pursue investments that take time to pay back. Moreover, a predominance of short-term liabilities – or "short-termism" – in corporate balance sheets can lead to costly financial crises if short-term debt becomes difficult to roll over.

However, there is little data available on the maturities of firms' liabilities across different stages of economic development. Most empirical evidence is based on a simple comparison of debt with maturities of less than and more than one year. The percentage of debt with a maturity of more than one year is typically lower in developing countries than in developed ones. Recent research sheds new light on the sources of short-termism in emerging markets by looking with greater granularity at the maturity at which firms borrow in primary debt markets (including domestic and international corporate bond and syndicated loan markets).[42]

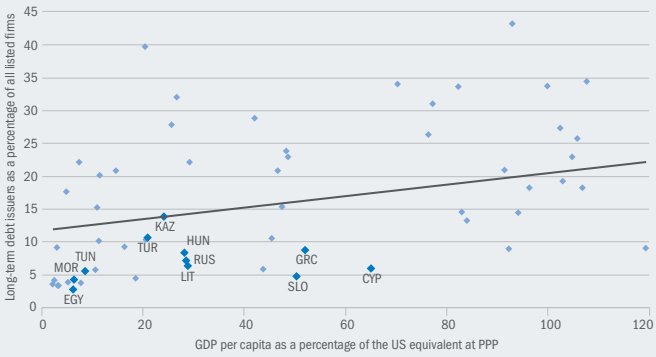
The evidence shows that firms in emerging markets and advanced economies borrow at similar maturities in corporate bond markets and syndicated loan markets. Indeed, the average maturity of debt at issuance is, if anything, shorter in countries with higher GDP per capita and higher private-credit-to-GDP ratios.

This surprising finding is driven by the composition of debt. The maturities of bonds issued domestically in emerging markets are, on average, 2.4 years shorter than those of equivalent bonds in advanced economies. However, domestic bond markets are less important in emerging markets (including the EBRD region),[43] as firms typically raise bond finance abroad and do so at significantly longer maturities. Furthermore, syndicated loans issued to borrowers in emerging markets often have longer maturities than those issued to borrowers in advanced economies. This stems, in part, from the fact that firms in emerging markets tend to borrow more for infrastructure projects, which entail long maturities (see Box 3.1).

Importantly, these long-term borrowing patterns apply mostly to a select group of large corporations that use corporate bond markets and syndicated loan markets. In fact, smaller borrowers in international markets are predominantly from advanced economies, while firms from emerging markets are less common in this segment.

While firms in emerging markets that do borrow in international markets do so at long maturities, the percentage of firms using long-term debt markets is smaller in emerging markets, and this is especially true in the EBRD region (see Chart 1.3.1). This explains some of the differences in the liability structure of firms' balance sheets. Smaller firms in emerging markets (which make up a larger percentage of total firms, as discussed in Chapter 2) have few options when they need long-term external finance in order to realise investment opportunities. Consequently, they may be forced to rely, at least for a while, on shorter-term instruments such as commercial paper or traditional bank loans.

Chart 1.3.1. Long-term debt issuers as a percentage of listed firms and GDP per capita



Source: Cortina et al. (2017).
Note: "Long-term debt issuers" are defined as firms issuing at least one bond or syndicated loan during the period 2003-11.

[42] See Cortina et al. (2017).
[43] See De Haas and van Horen (2017).

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FIRM DYNAMICS AND PRODUCTIVITY

Firm dynamics – the entry, growth, decline and exit of businesses – lie at the very heart of economies driven by creative destruction and productivity growth. This chapter shows that a lack of such dynamism is partly to blame for the recent slow-down in the EBRD region's productivity convergence. The region is home to many small firms, which remain small and relatively inefficient throughout their lives. Businesses in the EBRD region are finding it increasingly difficult to boost efficiency by importing existing technology as they approach the technological frontier. Instead, they should be aiming to extend the frontier through innovation. Increased competition from imports, access to export markets and integration into global value chains can all encourage firms to raise efficiency levels. Efficiency can be enhanced through innovation and investment in new capital where firms have sufficient access to credit.

4

AVERAGE STOCK OF PATENTS GRANTED PER 10,000 PEOPLE IN THE EBRD REGION IN 2015, COMPARED WITH AROUND 213 IN SOUTH KOREA

81%

AVERAGE PERCENTAGE OF FIRMS WITH FEWER THAN 10 EMPLOYEES IN CENTRAL AND EASTERN EUROPE

LESS THAN

1%

PERCENTAGE OF FIRMS INNOVATING AT THE TECHNOLOGICAL FRONTIER ACROSS THE EBRD REGION, EXCEPT IN SLOVENIA

Introduction

Developing economies typically experience a sharp slow-down in productivity growth as they reach middle-income levels (see Chapter 1). This chapter looks at the factors underlying differences in economies' growth rates as they move towards the technological frontier, examining the role that firms and industries play in the creation of jobs, technology and output.

It seeks to answer three related questions. First, what kinds of firm contribute to output and productivity growth across Europe? Second, how do the EBRD region's firm and industry growth dynamics differ from those of advanced economies? And third, what institutional factors and policies explain the variation observed in productivity growth across firms?

These questions are motivated by a growing body of evidence on the sluggishness of firms in developing economies. The analysis in this chapter highlights the abundance of small, non-innovative firms in the EBRD region. These firms have low productivity, and the convergence of their productivity levels with advanced-economy benchmarks is slower than in the case of large firms. These firms survive for many years, but fail to grow. As a result, economies become populated by small, mature firms that do not contribute to the country's productivity growth, leading to lower aggregate productivity levels.

This chapter also shows that cross-border integration can be a powerful driver of productivity convergence within individual industries. In particular, integration into global value chains (GVCs)[1] tends to significantly increase productivity.

Improving productivity requires costly investment in order to replace obsolete capital. However, investment alone is not enough. As a country's income per capita rises, there is an increasing need for investment to be accompanied by pioneering innovation.

Economic growth at firm level

What is "creative destruction"?

Neoclassical economic theory states that sustained long-term growth is a product of technological progress.[2] However, that theory does not explain the origins of technological progress itself. The Schumpeterian theory of economic growth, which seeks to fill that gap, is based on three main ideas.[3]

First of all, long-term growth is generated by innovations that extend the technological frontier. Innovation, in turn, is a product of many years of public and private investment in research and development (R&D) and human capital. It culminates in the introduction of products that are new to the global market (which are often protected by patents and licences) or improvements in production techniques.

Second, innovations respond to incentives shaped by market competition and economic institutions – the general rules of the game in the market. Initially, innovations are protected by patents that help innovators to recoup the fixed costs of developing new technology. Over time, however, technology dissipates and new firms challenge existing technology. Thus, high levels of product market competition and high firm entry rates encourage innovation.

Third, activities that become unprofitable need to be discontinued. If new firms with novel ideas fail to replace unproductive firms, economic growth suffers, as the economy's scarce resources are used inefficiently. In other words, growth involves creative destruction and constant conflict between incumbents and new entrants, resulting in turnover of firms and jobs.

An economy's aggregate productivity is ultimately determined by the number of innovative and non innovative firms. Economic growth occurs as existing firms innovate and become more productive or as resources move from less productive companies to more productive ones.

There are various studies documenting the importance of creative destruction and firm entry in advanced economies. Young businesses in those countries experience rapid productivity gains and make a substantial contribution to job creation.[4] Start-ups tend to experiment with new business models and products and thrive if successful, increasing their market share at the expense of less productive (and often larger) incumbent firms.

However, recent research suggests that the picture is less encouraging outside advanced economies.[5] First of all, there is an abundance of small firms in developing countries, with very few large, productive firms. Second, the majority of small firms fail to grow. Unlike in advanced economies, in developing countries there is no discernible relationship between firm size and age, and small firms exit the market less frequently. Lastly, developing countries suffer from persistent misallocation of factors of production, which hampers productivity and economic growth. As good firms do not expand and badly managed firms survive, scarce resources are not reallocated to more productive uses.

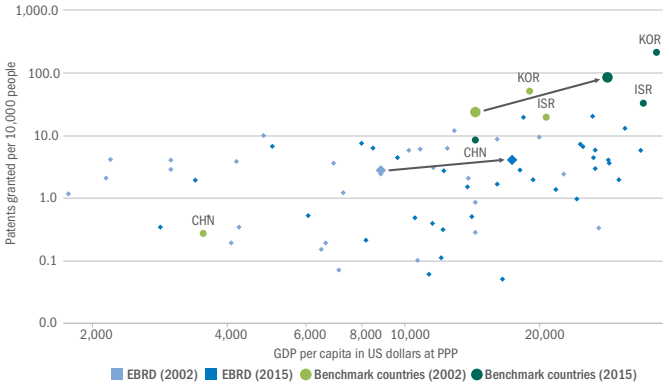
Implications for convergence

The Schumpeterian framework offers an important insight into how middle-income countries can catch up with advanced economies. It predicts three developments that will occur as a country becomes richer: innovative activity will become more ground-breaking; institutions will facilitate firm turnover, allowing innovative firms to enter the market and grow; and the reallocation of resources to more productive businesses will become ever more important.[6] In other words, middle-income countries need to pursue innovation-based growth if they want to become high-income countries. Relying solely on capital accumulation fostered by mature establishments and industries ceases to be a sustainable growth model in the long run.

Innovations that extend the technological frontier are often protected by patents.[7] The rate of patenting can therefore be used to assess whether countries in the EBRD region have increased their innovation rates over the past two decades. While EBRD countries of operations have, like other middle-income

[1] The term "global value chains" refers to arrangements in which the various stages that are required to create and sell a product or service are located in different countries.
[2] See Solow (1956).
[3] See Aghion et al. (2015) and Aghion (2017).
[4] See Haltiwanger et al. (2013) for the USA and Criscuolo et al. (2014) for OECD member countries. Recent research by Hsieh and Klenow (2017) for the USA suggests that most innovation comes from existing firms improving their products rather than from new entrants.
[5] See Hsieh and Klenow (2009), Bloom et al. (2013), Hsieh and Klenow (2014), Akcigit et al. (2016) and Peters (2016).
[6] See Acemoğlu et al. (2006).

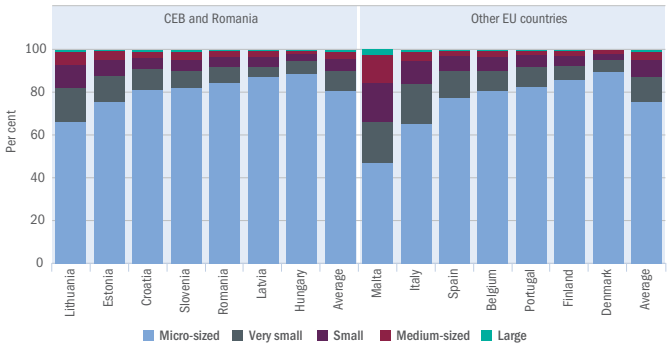
CHART 2.1. Growth in the EBRD region has been relatively "innovation-light"



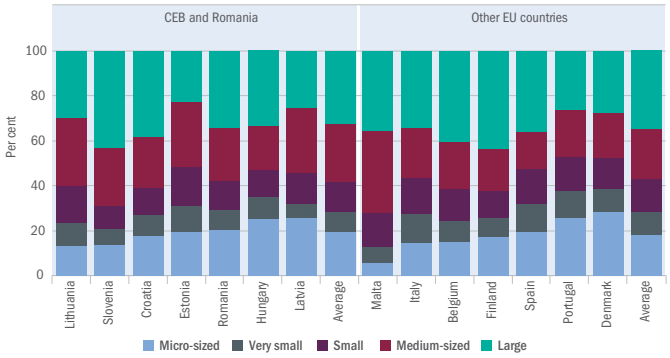
Source: World Development Indicators (WDI), World Intellectual Property Organization (WIPO) and authors' calculations.
Note: Larger diamonds indicate cross-country averages for the EBRD region. Larger circles indicate averages for China, Israel and South Korea.

CHART 2.2. There is an abundance of small firms accounting for less than half of all economic activity

Panel A: Breakdown of firms by size



Panel B: Breakdown of employment



Source: CompNet and authors' calculations.
Note: For the purposes of this analysis, micro-sized firms are defined as having fewer than 10 employees in a given year, very small firms 10-19 employees, small firms 20-49, medium-sized firms 50-249, and large firms 250 or more employees.

countries (such as China, Israel and South Korea), experienced significant increases in GDP per capita, they do not seem to have increased their innovation rates to the same extent (see Chart 2.1). In the EBRD region, the average stock of patents granted per 10,000 people grew by less than 50 per cent between 2002 and 2015, rising from 2.8 to 4.0. In China, meanwhile, that indicator rose from 0.27 in 2002 to 8.4 in 2015, while in South Korea it rose from 51.09 to 213.31 over the same period.

This may potentially explain the recent slow-down in productivity growth in the EBRD region following the productivity convergence observed prior to the 2008-09 financial crisis (see Chapter 1). Thus far, the region's productivity convergence has been driven primarily by the reallocation of resources from inefficient state-owned enterprises to more efficient private ones, a process that has not relied on ground-breaking innovation. In China, the entry of new firms with above-average productivity and the exodus of inefficient incumbents has made a major contribution to aggregate productivity growth following China's accession to the World Trade Organization (WTO) in 2001, according to recent research.[8] In the EBRD region, in contrast, the innovation rate has increased more slowly. A detailed look at the region's innovation patterns reveals only limited success when it comes to developing products that are new to global markets (see Box 2.1). If the Schumpeterian framework is right, this puts the region's productivity convergence at risk.

The remainder of this chapter examines the lack of dynamism in the region using firm-level data and discusses the role that GVCs and investment play in boosting productivity growth.

Microeconomic sources of growth

This section builds on a comprehensive database established by the Competitiveness Research Network (CompNet).[9] That database includes harmonised indicators based on firm-level data, which are aggregated at various levels for 20 European countries (of which 9 are EBRD countries of operations), mainly over the period 2002-13.[10] Those firm-level data come from administrative sources such as censuses or registers of firms and capture around 70 per cent of the EU's GDP.

A snapshot of firms across Europe

A breakdown of the total number of firms in each country by firm size shows that most countries of central Europe and the Baltic states (CEB),[11] and Romania, are home to many small firms and very few large firms (see Panel A of Chart 2.2). On average, around 80 per cent of firms in those countries have fewer than

[7] As discussed in the *Transition Report 2014*, not all innovations are patented, and the extent to which patents are commercialised may depend on local legal systems, local practices and the sectors in which a country specialises. Nevertheless, patents have the advantage of being universally comparable and are a common indicator of innovation at the technological frontier.
[8] See Brandt et al. (2012).
[9] CompNet was established in 2012 by the European Central Bank and now includes the European Commission, the EBRD, the European Investment Bank, a number of national central banks and national statistical institutes, and think-tanks such as the Halle Institute for Economic Research.
[10] The database covers Austria, Belgium, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, the Slovak Republic, Slovenia and Spain. For some of these countries, data go back to 1995.
[11] CompNet data are not available on micro-sized and very small firms in Poland and the Slovak Republic.

10 employees, compared with around 75 per cent of firms in the western European countries indicated. This is consistent with broader evidence on the prevalence of small firms in developing economies, even when sole proprietors are excluded.[12]

The distribution of employment across firms of different sizes matters. Smaller firms tend to invest less in human and physical capital and intellectual property. As a result, they tend to be less productive than larger firms.[13] Thus, having larger firms account for a larger percentage of employment can increase aggregate productivity.

While smaller firms in CEB and Romania employ a larger percentage of the labour force relative to the other EU countries, the differences are fairly small (see Panel B of Chart 2.2). On average, 32 per cent of the workforce are employed by the largest companies in this region, compared with an average of 35 per cent in the other EU countries.

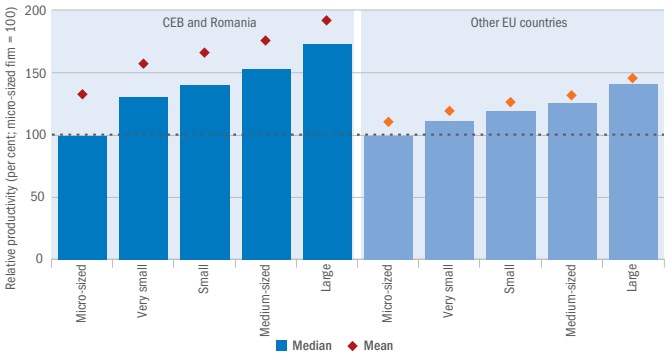
These differences are reflected in relative productivity figures. CompNet provides revenue-based data on total factor productivity (TFP) that are comparable across firm sizes and countries.[14] Strikingly, the median large firm in CEB and Romania is around 70 percentage points more productive than the median micro-sized firm, while the median medium-sized firm is around 50 percentage points more productive than its micro-sized counterpart (see Chart 2.3). The equivalent figures for the other EU countries are considerably smaller: 40 and 25 percentage points respectively.

Variation in terms of productivity within firm size classes is also greater in CEB and Romania, particularly for smaller firms. For instance, the mean productivity of micro-sized firms is 32 percentage points higher than that of the median micro-sized firm in these countries. In other EU countries, this differential stands at only 10 percentage points. This holds for other firm sizes as well. This pattern suggests that although a few highly productive firms within each size category boost the averages for these countries in CEB, and for Romania, their economies are dominated by unproductive firms, resulting in lower aggregate productivity.

A similar pattern can be observed at industry level, using Germany – an advanced economy with the highest TFP level in the CompNet database for most industries – as a benchmark. CEB countries and Romania have a high percentage of industries with low productivity (relative to Germany) and a low percentage of industries with high productivity (see Chart 2.4).

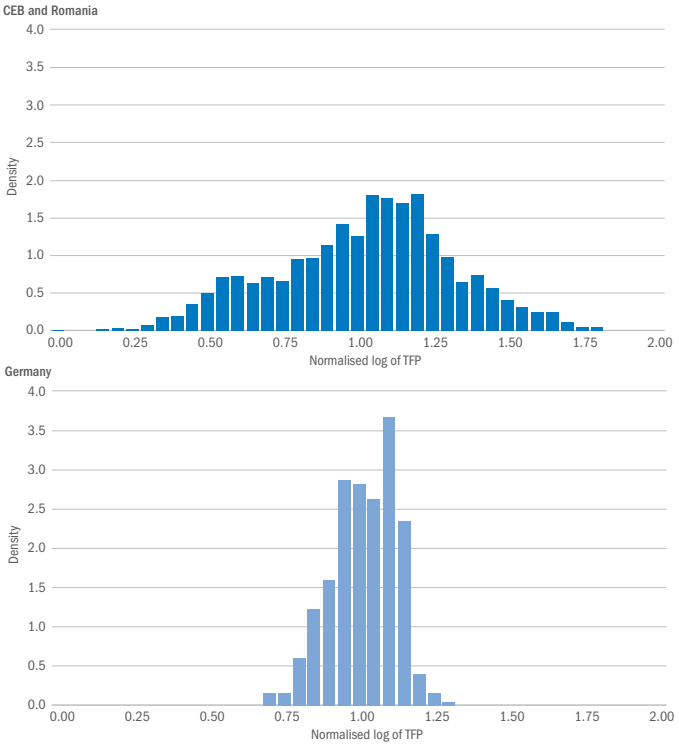
Chart 2.4 indicates that firms in CEB and Romania are, on average, less productive than those in Germany (as the distribution is skewed to the left) and productivity levels are more varied (as the distribution is less compressed). This, in turn, means that the median firm lags further behind the most efficient firms in its industry relative to Germany. This can be a result of both a lack of competition and insufficient diffusion of technology. In the absence of competition, firms may lack incentives to improve efficiency. In addition, firms with insufficient access to capital may not be able to undertake productivity-enhancing investment.

CHART 2.3. Smaller firms are less efficient, especially in CEB and Romania



Source: CompNet and authors' calculations.
Note: Productivity levels are normalised to 100 per cent for the median micro-sized firms in CEB and Romania and the other EU countries respectively. Ratios relative to those median micro sized firms are calculated for each size class, country and year, before calculating simple averages across countries and years.

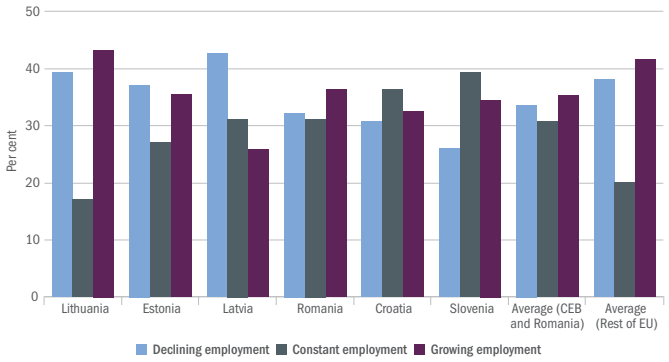
CHART 2.4. Considerable variation in productivity across industries



Source: CompNet and authors' calculations.
Note: Based on a combined industry-level sample, controlling for cross-country differences in industry composition. Density is calculated by dividing the relative frequency by the width of the class.

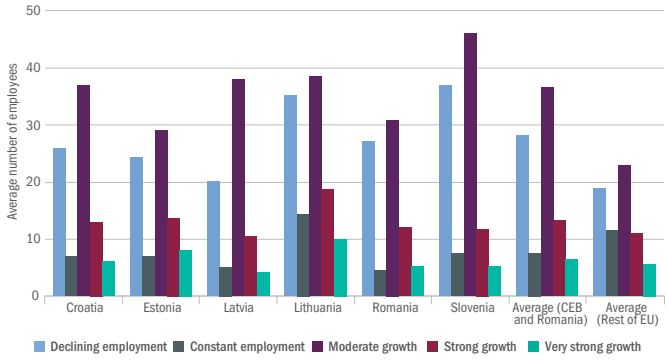
[12] See Bloom et al. (2014).
[13] See Hsieh and Klenow (2009), Bartelsman et al. (2013) and Restuccia and Rogerson (2008).
[14] These measures are based on the methodology employed by Wooldridge (2009) and Levinsohn and Petrin (2003). TFP measures the efficiency with which factors of production are combined to produce one unit of output.

CHART 2.5. Firms in CEB and Romania lack dynamism



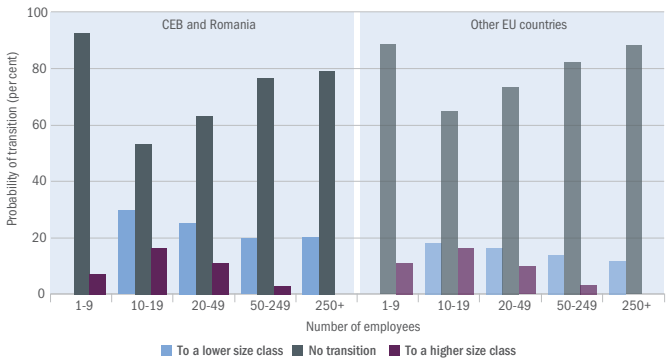
Source: CompNet and authors' calculations.
Note: Based on data for the period 2002-13. Growth rates are calculated on the basis of the number of full time employees over a three-year period for surviving firms. "Declining employment" means an average decline of more than 1 per cent per year, while "growing employment" means average growth of more than 1 per cent per year. All other cases are regarded as "constant employment". Data for Hungary are not available.

CHART 2.6. That lack of dynamism particularly affects smaller firms



Source: CompNet and authors' calculations.
Note: Based on data for the period 2002-13. Growth rates are calculated on the basis of the number of full-time employees over a three-year period for surviving firms. "Declining employment" means an average decline of more than 1 per cent per year; "moderate growth" means average growth of between 1 and 10 per cent per year; "strong growth" means average growth of between 10 and 20 per cent per year; and "very strong growth" means average growth in excess of 20 per cent per year. All other cases are regarded as "constant employment". These data are not available for Hungary.

CHART 2.7. Larger firms have a relatively high probability of declining in size in CEB and Romania



Source: CompNet and authors' calculations.
Note: Probabilities of transition are estimated for surviving firms in rolling three-year windows over the period 2002-13. These data are not available for Hungary.

Lack of dynamism

Where jobs are created matters for growth, particularly in the presence of very large differences in terms of firms' productivity levels, since a job at a more productive firm will contribute more to growth in value added. Thus, if more productive firms employ a larger percentage of the labour force, aggregate productivity will be higher.

Innovative and productive small firms should ideally be able to expand rapidly, replacing inefficient incumbents and putting competitive pressure on other large firms (which may have a greater ability to draw on retained earnings and external sources of funding in order to finance large-scale R&D projects).

This kind of dynamism seems to be missing from the EBRD region when compared with more advanced European economies. Chart 2.5 divides firms into three categories depending on whether the number of full-time employees declines, rises or remains broadly unchanged over a three-year period. Many firms in the EBRD region do not grow even if they are able to withstand market competition and survive for a number of years. In the six countries shown in Chart 2.5, the chances of an average firm increasing, reducing or maintaining its headcount in a given year are almost identical. In the other EU countries, by contrast, only one firm in five remains the same size. Of those firms that survive, more than 40 per cent increase their headcount, pointing to a much higher level of business turnover.

The lack of dynamism in CEB and Romania is greater among smaller firms. On average, firms in CEB and Romania that maintain their headcount employ fewer than 8 people, compared with 12 people in the other EU countries (see Chart 2.6). Thus, many firms in those countries never graduate from the micro-sized bracket. Consequently, larger firms make the biggest contribution to job creation. Indeed, firms with moderate headcount growth – that is to say, growth of between 1 and 10 per cent per year – employ an average of 37 people in CEB and Romania, compared with 23 in the other EU countries. Only 7 per cent of micro-sized firms grow to employ at least 10 people in a given year in CEB and Romania, compared with 11 per cent in the other EU countries (see Chart 2.7).

Chart 2.7 suggests that while micro-sized firms in CEB and Romania have a lower probability of growing in size relative to other EU countries, larger firms have a higher probability of declining in size. In each of the four relevant categories – very small, small, medium-sized and large firms – the likelihood of a firm moving to a lower category is higher in those EBRD countries of operations than in the other EU countries. Firms employing 10-19 people have, for instance, a 30 per cent chance of employing fewer than 10 people three years later, compared with only 18 per cent in the other EU countries. The tendency for larger firms in CEB and Romania to decline in size over time may, in part, be driven by emigration and population ageing, exacerbated by low employment rates for older workers.[15]

Why do small firms fail to grow? Recent evidence from India points to a few possible answers.[16] First of all, the majority of small firms are family-owned and run. A lack of trust and weak rule of law may prevent company owners from delegating tasks or hiring external managers – which is a prerequisite in order to grow beyond a certain size.[17] A lack of delegation often leaves firms with inadequate management and technical skills.

Second, defective infrastructure and imperfections in the credit market may also play a role. Small, innovative firms will find it especially difficult to access external capital given their lack of credit histories with lenders. Consequently, they may be particularly affected by credit market imperfections.

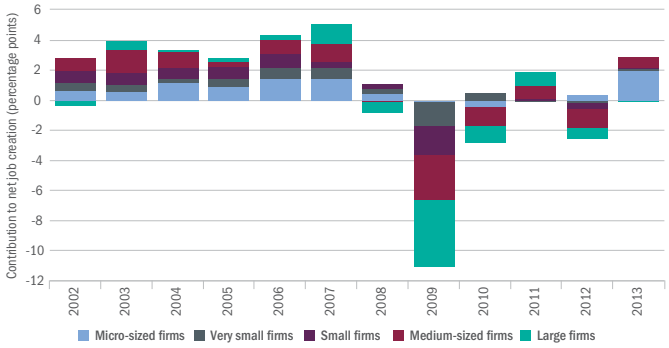
Third, institutional distortions also play a role. For instance, where business regulations are strict and enforcement is linked to the size of the company, productive firms may choose to forgo growth and remain "beneath the radar".

The fact that small firms lack dynamism does not mean that they are unimportant to the economy. On the contrary, small firms have made a substantial contribution to net job creation in CEB and Romania over the past two decades (see Panel A of Chart 2.8).[18] Up until the 2008-09 financial crisis, these firms typically contributed more than half of all growth in aggregate employment and around 40 per cent of all growth in aggregate value added. This points to robust levels of firm creation in the region during periods of rapid economic growth.

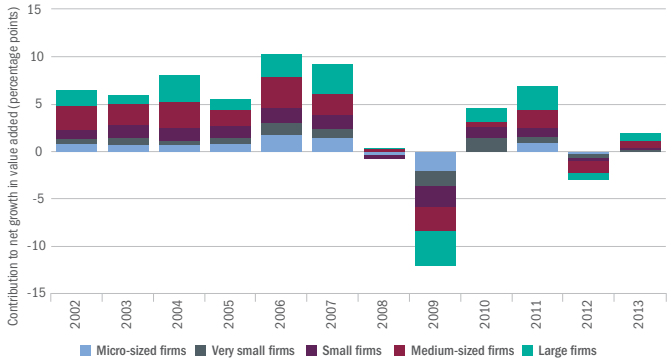
This is encouraging, since start-ups and young businesses have been shown to be the main drivers of job creation in advanced economies such as the United States of America (USA).[19] However, smaller firms have struggled to contribute to net job creation since the 2008-09 crisis, despite continuing to contribute to growth in value added in most years. At the same time, medium-sized and large firms contributed less to net job creation prior to the 2008-09 crisis, and they have contributed more to net job destruction since the crisis. Since economic growth is partly a result of the shifting of resources from less to more productive firms, this trend may have contributed to the slow-down observed in both aggregate productivity growth and overall growth in the region.

CHART 2.8. Smaller firms create jobs, while larger firms create value added

Panel A: Breakdown of net job creation



Panel B: Breakdown of net growth in value added

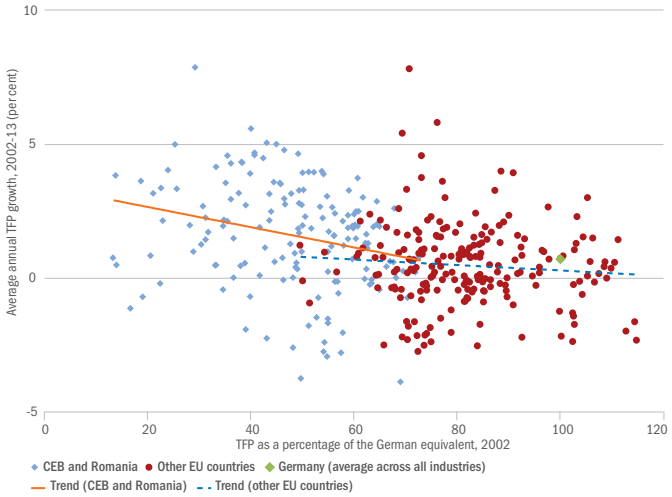


Source: CompNet and authors' calculations.

70
AROUND PERCENTAGE POINTS THE RELATIVE PRODUCTIVITY ADVANTAGE THAT LARGE FIRMS HAVE OVER MICRO-SIZED FIRMS IN CEB AND ROMANIA, COMPARED WITH 40 PERCENTAGE POINTS IN OTHER EU COUNTRIES

[15] See OECD (2014).
[16] See Bloom et al. (2013) and Akcigit et al. (2016).
[17] See Akcigit et al. (2016).
[18] In line with the approach adopted by Haltiwanger et al. (2013), net job creation and growth in real value added for country and firm size *i* in year *t* are calculated as $g_{it} = (E_{it} - E_{i,t-1})/X_{it}$, where $X_{it} = 0.5 * (E_{it} + E_{i,t-1})$. This approach is immune to mean-reversion dynamics. The contribution that each firm size *i* makes to total growth in value added or employment is calculated as $Contribution_{it} = \left(\frac{X_{it}}{X_t}\right) * g_{it}$
[19] See Haltiwanger et al. (2013).

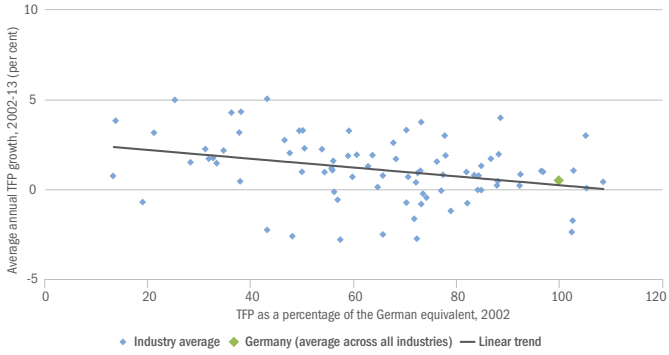
CHART 2.9. Firms experience stronger productivity growth away from the technological frontier



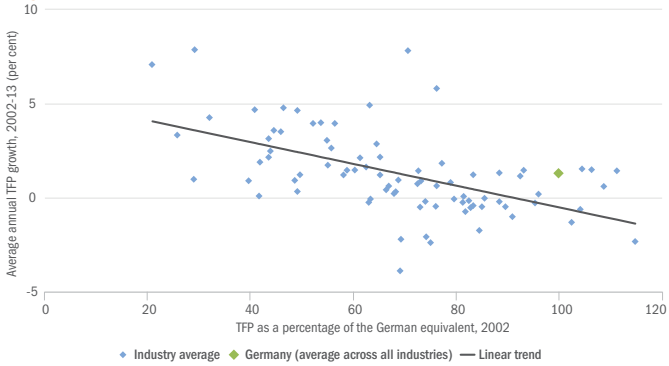
Source: CompNet and authors' calculations.
Note: Each observation is an average across firms of a certain size in a given sector in a given country. The German benchmarks are for the same industries and size classes. Estimates for Hungary and Romania are based on 2003 data.

CHART 2.10. Larger firms experience stronger convergence

Small firms



Large firms



Source: CompNet and authors' calculations.
Note: Each observation is an average across firms of a certain size in a given sector in a given country in CEB and Romania. The German benchmarks are for the same industries and size classes. Estimates for Hungary and Romania are based on 2003 data.

Productivity convergence by firm size

The Schumpeterian model suggests that productivity growth should be stronger away from the technological frontier, where it can be facilitated by the imitation and adoption of existing technology (see Box 2.1). Consequently, productivity growth should be stronger at earlier stages of a firm's development. Data from CompNet support this hypothesis (see Chart 2.9). The technological frontier in a given sector is defined here as the productivity level of firms of the relevant size in the relevant sector in Germany.[20] Thus, a firm's productivity level can be expressed as a percentage of the productivity of firms of the same size operating in the same sector in Germany. For instance, a proximity to the frontier of 0.5 indicates a TFP level that is half of that observed in Germany.

Between 2002 and 2013, average annual productivity growth was indeed stronger for firms that were further away from the technological frontier at the start of that period. In other words, less efficient firms moved more quickly towards the level of TFP observed in Germany, where productivity grew at an average rate of 1 per cent per year (see green diamond in chart). Chart 2.9 indicates that average productivity rises faster than in Germany in industries where TFP is less than 60 per cent of the level observed in Germany. Once industry-level productivity passes that point, average annual productivity growth falls below the rate seen in Germany and convergence ceases. In fact, there was, on average, little or no convergence between the most productive industries in CEB and Romania and their German counterparts in the period 2002-13.

Firms of different sizes adopt technology and improve their efficiency levels at different rates. In fact, the productivity levels of larger firms in CEB and Romania converged more quickly with those of their German counterparts relative to smaller firms in the period 2002-13 (see Chart 2.10). For instance, medium-sized and large firms which began that period at 40 per cent of Germany's TFP level experienced an average annual TFP growth rate of around 3 per cent, while very small and small firms in an equivalent position relative to their German counterparts experienced average growth of only 2 per cent per year. Raising productivity levels at small firms can be especially challenging, as a number of studies show.[21] A lack of capital investment is one of the main challenges facing the smallest firms (see Box 2.2).

[20] CompNet collects data on nine sectors, including manufacturing and wholesale and retail trade (see Box 2.3 for the full list).

[21] See Bloom et al. (2014).

What drives productivity convergence?

Convergence at industry level

Why do some firms and some countries experience faster convergence with the technological frontier than others? Do certain policies help to foster convergence? We can answer these questions with the aid of industry-level data from the World Input-Output Database (WIOD), in combination with CompNet data. WIOD data are now available for 40 countries around the world (including Poland, the Slovak Republic, and other EU countries where the EBRD works, plus Russia and Turkey) and 35 different industries.

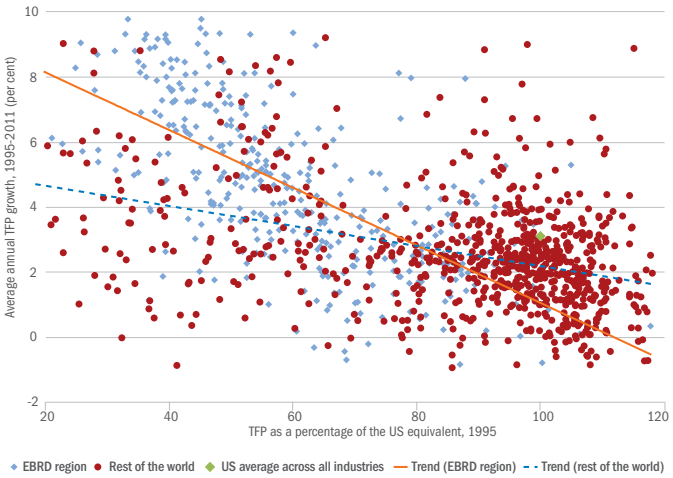
The relationship between industry-level productivity growth and proximity to the relevant industry's technological frontier also holds for this dataset (see Chart 2.11). Here, the technological frontier is defined on the basis of the TFP observed in the USA for each industry in 1995, as the country tends to enjoy the highest levels of productivity. In this case, average annual TFP growth is calculated over a longer period of time – the period from 1995 to 2011.

As before, industries further away from the technological frontier experienced higher rates of TFP growth over this period. This relationship is particularly strong in EBRD countries of operations, where industries with productivity levels between 40 and 60 per cent of the US benchmark experienced high rates of convergence, underpinning the strong growth performance that was seen in the region between the mid-1990s and 2008 (as discussed in Chapter 1). Productivity growth in these industries was not only stronger than in the USA (where growth averaged 3.1 per cent per year), it was also stronger than in most other emerging markets.

Regression analysis can be used to investigate this relationship in greater detail, using industry-level panel data for individual countries covering the period 1995-2001 (see Box 2.3 for details of the methodology). This takes account of unobserved characteristics of individual countries and industries, as well as shocks affecting all industries and all countries in a given year (such as the 2008-09 financial crisis).

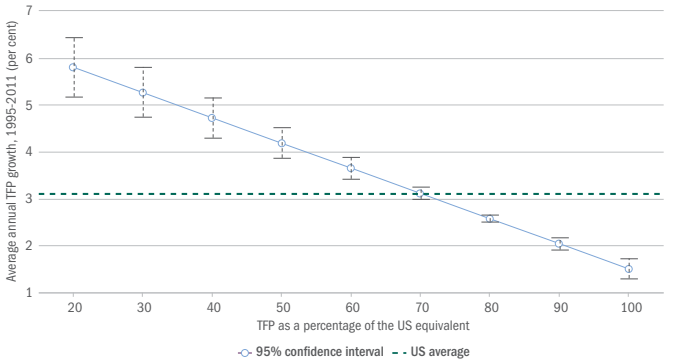
The results of this analysis suggest that an emerging market industry with a productivity level of just 40 per cent of the US equivalent in any given year experienced average annual TFP growth of 4.7 per cent over the next year, compared with 3.1 per cent in the USA. The differential between the two is the rate of productivity convergence. That rate remains positive for industries with productivity levels of up to 70 per cent of their US counterparts. At higher levels of productivity, convergence with the USA ceases, although industries continue to experience positive TFP growth.

CHART 2.11. Industries experience stronger productivity growth when they are further away from the technological frontier



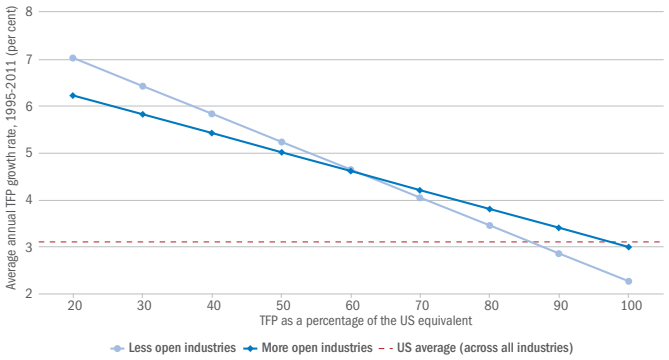
Source: WIOD and authors' calculations.
Note: Each observation is for a given industry in a given country. The US benchmarks are for the same industries.

CHART 2.12. Productivity convergence ceases when an industry reaches 70 per cent of US TFP



Source: WIOD and authors' calculations.
Note: These results represent average predicted TFP growth rates derived from a country and industry-level panel regression of TFP growth on TFP relative to the USA, with a lag of one period. Regressions control for country, industry and year fixed effects. Estimates below the line corresponding to average US productivity growth imply an absence of convergence.

CHART 2.13. Productivity convergence becomes more reliant on openness to trade as an industry approaches the technological frontier



Source: WIOD and authors' calculations.
Note: These results represent average predicted TFP growth rates derived from a country and industry-level panel regression of TFP growth on TFP relative to the USA, openness to trade and their interaction term, all with a lag of one period. Regressions control for country, industry and year fixed effects. "Less open industries" are industries where exports and imports have a combined total of less than 10 per cent of output, while "more open industries" are industries where they total more than 110 per cent of output. These figures correspond to the bottom and top deciles of the distribution of openness to trade. Estimates below the line corresponding to average US productivity growth imply an absence of convergence.

AROUND
1 IN 3
THE NUMBER OF FIRMS EMPLOYING ROUGHLY THE SAME NUMBER OF PEOPLE THREE YEARS FROM TODAY IN CENTRAL AND EASTERN EUROPE, COMPARED WITH 1 IN 5 IN OTHER EU COUNTRIES

Cross-border integration as a catalyst for productivity growth

This econometric analysis can be extended to study institutional settings that are more conducive to sustained productivity convergence as countries approach the technological frontier – potentially enabling industries to keep their annual TFP growth rates above 3.1 per cent until they reach the technological frontier, thereby completing the convergence process (see Box 2.3 for details). Analysis suggests that, within a given country, only industries that are sufficiently integrated into the global economy and have higher rates of investment manage to sustain convergence for longer.

According to the Schumpeterian framework, competition is the key to innovative activity – and thus productivity growth. Firms and industries that do not face competition from imports have fewer incentives to increase efficiency. In addition, the extent to which firms can reap the benefits of innovation may differ across industries and countries. If domestic markets are small and firms cannot increase their sales by reaching out to new markets abroad, they may be reluctant to undertake the costly investment projects needed to boost productivity.[22] Openness to trade fosters discipline as a result of competition from imports and provides access to export markets, both of which encourage firms to increase their productivity.

Regression analysis confirms that greater openness to trade – as measured by the ratio of exports and imports to total industry output – is associated with productivity convergence being sustained for longer (see Chart 2.13). Less open industries experience stronger productivity growth far away from the technological frontier, but they soon start to lag behind more open industries. This happens as their productivity reaches 60 per cent of the US equivalent. After this point, industries that are more open to international trade maintain stronger productivity growth and continue to converge with US productivity levels as they approach the frontier. In less open industries, by contrast, convergence ceases entirely at around 85 per cent of US productivity. A similar result is observed for average income per capita: the speed of income convergence decreases more rapidly as a country approaches the frontier where openness to trade is low.[23]

These results are indicative of associations in the data, rather than causal relationships. However, recent research confirms a causal link between exporting and productivity growth in Egypt.[24] In that study, a randomly selected group of rug producers were given the opportunity to export to high income countries. Those producers increased the quality of their products, their technical efficiency and their profitability relative to a similar group of producers that only served the domestic market. This suggests that access to export markets does have an immediate impact on productivity.

Following the rise of GVCs over the last few decades, international commerce today is dominated by trade in intermediate (as opposed to final) goods, with many firms sourcing numerous inputs from abroad and in turn exporting intermediate inputs. Greater import penetration is therefore an

[22] See Bustos (2011).
[23] See Acemoğlu et al. (2006).
[24] See Atkin et al. (2017).

indication not only of competition for domestic producers, but also of access to cheaper and higher quality production inputs.

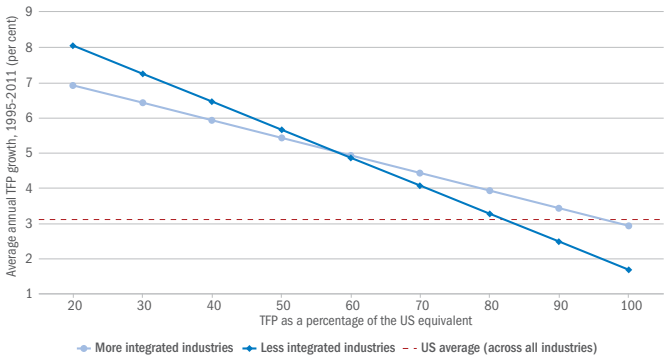
Indeed, greater integration into GVCs can help firms to raise their productivity in a number of ways. First of all, it incentivises firms' managers to upgrade production processes or acquire new technology in order to satisfy the strict requirements regarding quality and efficiency within those chains. The resulting innovation can help industries further away from the technological frontier to increase efficiency in a fast and cost-effective manner. Second, the upgrading of infrastructure to help meet just-in-time production targets and increased interaction with multinational companies can have positive spillover effects in terms of learning about new technology and customer preferences. Third, firms can gain access to new markets, thereby making it easier for them to recoup the fixed costs of investment aimed at expanding their productive capacity.

Regression analysis shows that industries that are more integrated into GVCs sustain productivity convergence for longer (see Chart 2.14). As a country enters middle-income territory, industries that rely primarily on domestic inputs start to experience much weaker productivity growth relative to other industries. This slow-down usually occurs at around 50-60 per cent of the productivity level of the relevant industry in the USA. On the other hand, an industry that sources the majority of its inputs from abroad is able to maintain productivity growth in excess of 3.1 per cent per year (that is to say, the US average) even as it approaches the technological frontier. In other words, the ability to source inputs globally becomes a key determinant of productivity convergence as countries climb the income ladder.

Although the extent of industries' integration into GVCs is partly a reflection of their geographical location, resource endowment and other factors that lie beyond the reach of economic policy, policy measures can help to support this process (for instance by improving the quality of roads, ports, airports and telecommunications systems). More generally, better infrastructure translates into greater market connectivity and increases competition between suppliers. It also enables firms to specialise more and achieve greater economies of scale.

As Chapter 3 shows, upgrading Turkey's transport network has significantly increased trade between the country's various regions and helped Turkey's firms to expand their markets (both domestically and internationally) and improve their performance. Another recent study has found that the upgrading of infrastructure in India has helped to boost aggregate productivity in the economy by directing more business towards more productive firms.[25] By the same token, better mobile and broadband connectivity enables consumers to learn about firms outside their local area, helping productive firms to gain market share at the expense of less productive competitors.

CHART 2.14. Integration into GVCs fosters productivity convergence

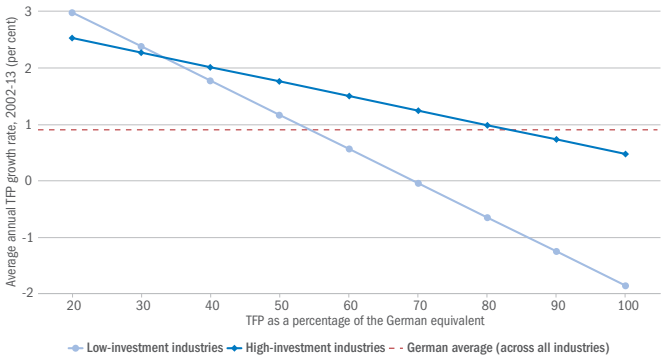


Source: WIOD and authors' calculations.
Note: These results represent average predicted TFP growth rates derived from a country and industry-level panel regression of TFP growth on TFP relative to the USA, the share of domestic value added and their interaction term, all with a lag of one period. Regressions control for country, industry and year fixed effects. "Less integrated industries" are industries that source less than 40 per cent of inputs from abroad. "More integrated industries" are industries where more than 80 per cent are sourced from abroad. These figures correspond to the bottom and top deciles of the distribution of reliance on non-domestic value added. Estimates below the line corresponding to average US productivity growth imply an absence of convergence.

ONLY
7%
OF MICRO-SIZED FIRMS GROW TO EMPLOY AT LEAST 10 PEOPLE IN A GIVEN YEAR IN CEB AND ROMANIA, COMPARED WITH 11 PER CENT IN OTHER EU COUNTRIES

[25] See Jensen and Miller (2017).

CHART 2.15. Capital investment is key to maintaining high levels of productivity growth



Source: CompNet and authors' calculations.
Note: These results represent average predicted TFP growth rates derived from a country and industry-level panel regression of TFP growth on TFP relative to Germany, the average investment rate and their interaction term, all with a lag of one period. Regressions control for country, industry and year fixed effects. "Low investment" and "high-investment" industries are industries with investment rates of less than 5 per cent and more than 20 per cent respectively. Estimates below the line corresponding to average German productivity growth imply an absence of convergence.

BANK LENDING
REMAINS THE MAIN SOURCE OF FUNDING UNDERPINNING BOTH INNOVATIVE ACTIVITY AND CAPITAL INVESTMENT IN THE EBRD REGION

The role of investment and access to credit

Greater access to international markets will only help firms to raise their productivity levels if they are able to make the necessary investment in machinery, equipment and intellectual property. The need for such costly investment applies to both innovating and non-innovating firms alike. For innovators, this is part of developing or adopting new technology. Even with an unchanged product, firms periodically need to replace physical capital that becomes worn out or obsolete.

The econometric framework from the previous subsection can be extended in order to study the role that investment plays in supporting firms' productivity growth. Imagine two hypothetical industries – one with a low average investment rate (5 per cent) and one with a high rate (20 per cent).[26] These figures correspond to the 25th and 75th percentiles of the distribution of investment rates across industries in the CompNet sample over the period 2002-13. Average TFP growth varies considerably across these industries, particularly as countries approach the technological frontier, which in this case is determined by the relevant German industry (see Chart 2.15).

In an industry with a low investment rate, productivity convergence ceases at around 55 per cent of the German industry's TFP level. However, in an industry with a high investment rate, convergence with German productivity levels is sustained for longer and does not end until productivity is around 85 per cent of the German equivalent.

The *Transition Report 2014* showed that credit constraints remain pervasive in the EBRD region, and where banks ease those credit constraints, firms respond by increasing the adoption of technology. Bank lending remains the main source of funding underpinning both innovative activity and capital investment in the region. We can investigate the impact that access to bank credit has on TFP differentials across countries and industries by modifying the regression analysis in order to compare an industry with limited reliance on external financing (one where the average firm has a debt-to-asset ratio of less than 10 per cent) with an industry with significant reliance on external financing (one with an average debt-to-asset ratio of more than 40 per cent). As before, these thresholds correspond to the 25th and 75th percentiles of the relevant distribution.

The results of this analysis (which are available on request from the authors) show that an industry where firms are able to access external finance experiences sustained productivity convergence until it reaches around 70 per cent of Germany's TFP level. However, in industries where the average firm does not or cannot take advantage of external financing, convergence ceases at productivity levels of around 55 per cent of the German benchmark. Since older and more established firms typically have higher debt-to-asset ratios, it appears that bank lending plays an important role in helping these firms to replace older equipment as it becomes a drag on productivity growth.

[26] This investment rate is defined as the ratio of the net increase in capital stock at time *t* to existing capital stock at time *t-1*.

Competition and allocative efficiency

Income convergence – that is to say, the closing of the gap between countries in terms of income per capita – can continue even after productivity convergence has ceased. This is because an economy's overall growth is shaped by how the factors of production available to an economy are combined. Even if productivity within individual industries remains unchanged, reallocating resources from less efficient industries to more efficient ones can boost the aggregate output of an economy. Such reallocation is an important determinant of cross-country differences in productivity.

In most countries, more productive firms tend to employ more people than less productive ones. Indeed, recent research shows that labour productivity in the average US manufacturing industry is 50 per cent higher than it would be if employment shares were allocated at random within that industry.[27] In western Europe, this productivity premium is estimated at around 20 to 30 per cent, and in central and eastern Europe, it is estimated at around 5 to 15 per cent.

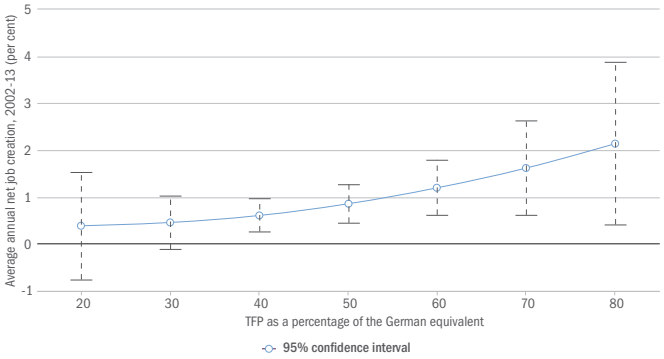
Econometric analysis can shed further light on job creation and the reallocation of labour across industries by looking at net job creation rates in European industries covered by CompNet data relative to their distance from the technological frontier. The results of this analysis show that more productive industries – those closer to Germany's productivity level – contribute more to net job creation (see Chart 2.16). They are typically able to attract labour from the rest of the economy, partly because of their ability to offer higher wages. For instance, an industry with 80 per cent of Germany's TFP increases employment by an average of 2 per cent per year, compared with 0.5 per cent for an industry with 40 per cent of Germany's productivity.

As the employment shares of industries that are further away from the technological frontier decline, they release resources that are redeployed to more productive industries. This represents creative destruction in action. Increased openness to trade and greater competition from imports can facilitate such creative destruction and improve the efficiency with which resources are allocated across industries. We can see this by looking at two types of industry – one that is relatively closed to trade and one that is very open (see Chart 2.17).

In a less open industry, employment grows at a rate of less than 1 per cent per year virtually regardless of how close the industry is to the technological frontier. In contrast, more open industries contribute more to job creation in the economy as their productivity rises. When these industries reach 80 per cent of the productivity levels of their German counterparts, they create jobs at a rate of around 2.5 per cent per year. Even when productivity is only modest, more open industries still contribute slightly more to job creation than closed industries.

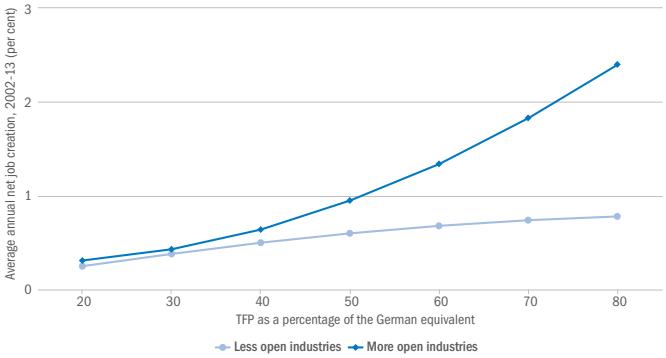
Likewise, a similar econometric exercise (the results of which are also available on request) confirms that greater integration into GVCs also helps to direct labour towards

CHART 2.16. More productive industries create more jobs



Source: CompNet and authors' calculations.
Note: These results represent average predicted growth rates derived from a country and industry-level panel regression of net job creation on TFP relative to Germany, with a lag of one period. Regressions control for country, industry and year fixed effects.

CHART 2.17. Openness to trade helps to reallocate jobs to more productive industries



Source: CompNet, WIOD and authors' calculations.
Note: These results represent average predicted growth rates derived from a country and industry-level panel regression of net job creation on TFP relative to Germany, openness to trade and their interaction term, all with a lag of one period. Regressions control for country, industry and year fixed effects. "Less open industries" are industries where exports and imports have a combined total of less than 10 per cent of output, while "more open industries" are industries where they total more than 90 per cent of output.

[27] See Bartelsman et al. (2013).

more productive parts of the economy. GVCs play a particularly important role in boosting aggregate productivity when they go beyond simple assembly and enable firms to acquire technological know-how and managerial expertise. Involvement in more skill-intensive parts of a chain – such as marketing to end-consumers or the production of high-tech components involving intensive R&D – encourages firms to innovate more. Economic policy needs to take these distinctions into account. A good example of a strong positive relationship between GVC entry and productivity is the development of the automotive industry in Hungary, the Slovak Republic and other central and eastern European economies. Productivity levels in these sectors have risen strongly following local firms' integration into GVCs, out-performing economy wide productivity growth.

Conclusion

This chapter has made a number of empirical observations about the entry, growth and exit of firms in the EBRD region. First of all, there is an abundance of small firms, which lag some way behind larger firms in terms of their efficiency levels. Second, there is a lack of dynamism, which is reflected in firms' inability to grow. And third, the region's productivity convergence at firm level has been driven primarily by larger firms (which, at the same time, face a significant risk of declining in size).

The presence of large numbers of small, inefficient firms is leading to lower aggregate productivity levels in the EBRD region. This has important implications for policies designed to support small and medium-sized enterprises (SMEs). Policy-makers should not concern themselves with the number or percentage of SMEs in the economy as such. Many SMEs may remain stagnant, with no incentives to innovate. Instead, policy-makers should focus on establishing a level playing field which helps those young firms that do innovate and want to grow to expand their market shares and enter new markets. This will strengthen competition in the economy and put pressure on other firms to raise their productivity levels (which they can achieve through greater integration in trade, for example). A successful economy is one in which the most productive SMEs eventually become large firms by attracting resources away from less productive incumbents.

The empirical analysis presented in this chapter is fully consistent with the Schumpeterian framework, which highlights the role that creative destruction and institutions play in fostering economic growth. This framework is highly relevant for the EBRD region. It indicates, in particular, that a larger percentage of businesses need to engage in R&D activities and ground-breaking innovation in order for the region's income growth to regain momentum. In the past, the region's growth was driven largely by the reallocation of resources from inefficient firms to more efficient competitors. In future, a larger contribution will need to come from productivity improvements at existing businesses, driven by innovation.

This chapter's detailed analysis of productivity convergence within the Schumpeterian framework points to several policy implications. First of all, economic institutions and policies that support the growth of firms and industries need to evolve as a country climbs the income ladder. As a country gets richer, smaller and more innovative firms will play a larger role in creating jobs and raising overall productivity. Policies should prioritise better access to capital and technology for these firms. As discussed in the *Transition Report 2015-16*, this may require some rebalancing of financial systems, improving the availability of specialist sources of finance such as venture capital and private equity.

Second, policy-makers need to focus more on flexible labour and capital markets and better competition policies in order to facilitate the efficient reallocation of resources. Leveraging the power of creative destruction and reallocating labour and capital from less productive jobs to more productive ones is a major challenge in any economy. Success in this area means lowering barriers to the entry of new firms while improving the economy's institutional quality and regulatory infrastructure. Creating a business environment that hastens the exit of less productive firms and fosters the growth of more productive ones is essential in order to speed up the reallocation process. This may require some rethinking of bankruptcy laws and competition legislation. More generally, transparent tax systems and improvements to the rule of law can help productive firms to increase the scale of their operations without fear of expropriation.

Third, governments can help firms and industries to improve their performance by supporting greater trade integration with the rest of the world. Trying to pick productive – or potentially innovative – firms and industries will inevitably create a non-competitive business environment. Instead, governments should let competition determine market leaders at the domestic level, while assisting exporters in their efforts to reach out to international markets with new products and services. Importantly, the creative destruction that accompanies greater competition creates both winners and losers. The reallocation of resources as a result of openness to trade and greater competition in the domestic market may lead to rising inequality and social tensions. Policies that promote inclusion, support retraining and provide a social safety net have a key role to play in ensuring that the reallocation of resources within the economy is relatively smooth, efficient and socially sustainable.[28]

Greater integration into GVCs should undoubtedly be a priority for policy-makers looking to improve their economies' productivity growth. Businesses of all sizes benefit from the adoption of industry best practices, product specialisation and the access to high-quality inputs that is necessary in order to be part of a GVC. However, some GVCs are better at supporting a country's transition to an innovation-based economy than others. In particular, businesses at the top and bottom ends of the chain, which develop new products and provide after-sales services, require more skills and innovation than those in the

[28] See EBRD (2016).

middle part of the chain, which focus on simple assembly-related tasks. Although involvement in assembly creates jobs and boosts output in the short run, policy-makers should help businesses to learn from their experience of being part of a GVC with a view to moving up the value added chain over time and developing original products.

Improving the quality of domestic infrastructure and logistics is probably the most effective way of making host economies attractive targets for GVCs. However, the benefits of high-quality transport and telecommunications networks extend far beyond facilitating participation in GVCs. Improvements to infrastructure reduce market frictions by limiting the likelihood of delays to the delivery of production inputs and improving firms' ability to reach out to potential customers located further away, as discussed in Chapter 3. This, in turn, can help firms to specialise in the production of original parts and equipment. All of these aspects are particularly important in terms of fostering the growth of small firms and helping a country to achieve a "bottom-up" transition to an innovation-based economy.

Box 2.1. Innovation and competition in the EBRD region

The Schumpeterian growth framework associates innovation with cross-cutting technological progress and R&D, culminating in patents and products that are new to the world. As was emphasised in the *Transition Report 2014*, however, innovation has many faces, and the relationship between innovation and competition can be a complex one. This box revisits the relationship between innovation and competition, with a particular focus on the experiences of middle-income countries.

In middle-income economies, some innovative activity takes the form of imitating and adapting globally available technology. Although it does not advance the technological frontier, this type of innovation can still boost firm-level productivity. Indeed, customising and upgrading products that have been developed abroad and introducing them to a local market can be the most productivity enhancing form of innovation.[29] Similarly, introducing internationally recognised management practices can also significantly improve productivity.[30]

However, if countries aspire to become high-income economies, the adoption of existing technology ceases to be sufficient. As countries become richer, this kind of innovation becomes less prevalent (including in the EBRD region). Instead, firms spend more on R&D with a view to introducing products that are not only new to their local economies, but also new to the world. In other words, they seek to extend the technological frontier. This type of innovation is associated with stronger productivity growth when countries reach upper/middle-income levels.

Firms in the EBRD region, however, have been struggling to extend the technological frontier (see Chart 2.1.1). As one would expect, the percentage of firms reporting expenditure on R&D has increased as income per capita has risen across the region. However, the rate at which those firms have introduced products that are new to the world has remained modest. Indeed, the percentage of firms innovating at the technological frontier is just over 2 per cent in Slovenia and less than 1 per cent in all other countries – significantly lower than in a comparator country such as the Czech Republic, for example. In some countries with relatively high levels of income per capita, such as Hungary and Lithuania, the percentage of firms innovating at the technological frontier remains tiny.

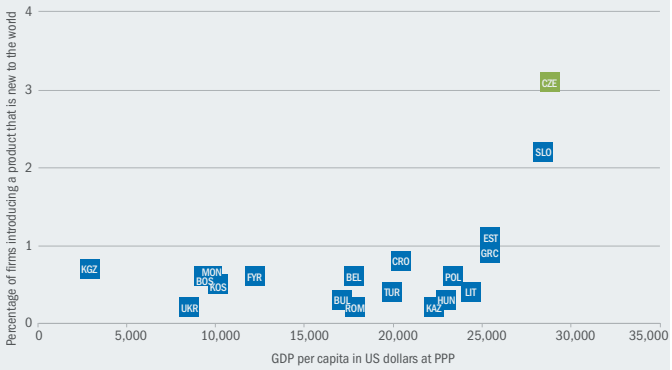
The role of competition

How does Schumpeterian theory link firm-level innovation with competition and macroeconomic growth? Imagine a new and highly efficient entrant in an industry. This new firm may offer a novel product, or it may use proprietary technology to substantially reduce its costs. Either way, this innovative competitor poses a threat to incumbent firms.

What happens to the rate of innovation and productivity growth in that economy will ultimately depend on how those incumbents respond. Incumbent firms with technology and productivity levels that are similar to the new entrant's ("frontier firms") will strive to innovate in order to preserve their market shares and reduce costs. In contrast, incumbents with far lower productivity levels ("laggard firms") may feel that they no longer stand any chance of reaching the technological frontier even if they do undertake costly investment. Thus, competition may actually discourage these firms from investing and innovating.

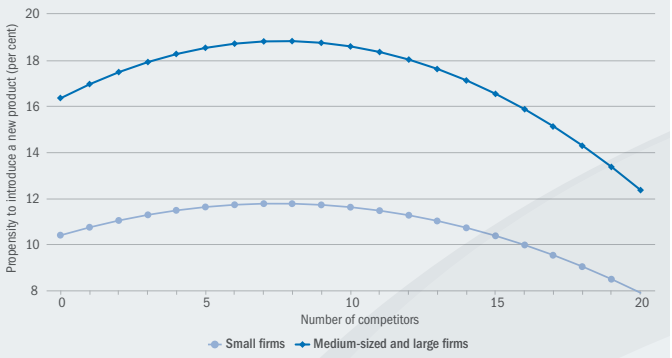
[29] See EBRD (2014).
[30] See Bloom et al. (2014). Increasing the quality of tax administration can also help improve the productivity of small and young firms (see Dabla-Norris et al., 2017).

CHART 2.1.1. Countries need to push back the frontier more as they get richer



Source: BEEPS, WDI and authors' calculations.
Note: Calculations are based on verified (as opposed to self-reported) indicators of innovation.

CHART 2.1.2. Too little or too much competition hurts innovation



Source: BEEPS and authors' calculations.
Note: These results represent estimates derived from a firm-level regression of innovation on the number of competitors, the number of competitors squared and a set of firm-level characteristics (including size, age, export status, ownership and credit constraints). Regressions control for main market, country and industry fixed effects.

In advanced economies, frontier firms typically outnumber laggard firms. In this case, increases in market competition and firm entry are beneficial for the industry's development. Indeed, in the absence of new entrants, incumbents may seek to protect their market shares and stop innovating. However, in industries with too many laggard firms, the entry of new businesses and increases in competition may actually suppress aggregate productivity growth.

Cross-country regression analysis shows that the relationship between the extent of innovation and the degree of competition is not a linear one (see Chart 2.1.2). Firms that only have a handful of competitors are less likely to introduce new products than firms with moderate levels of competition (defined as 5 to 15 competitors). Equally, firms with larger numbers of competitors are also less likely to innovate, possibly because they feel that competition will soon erode any advantages that may be gained through additional investment. What is more, innovation by medium-sized and large firms is especially sensitive to the degree of competition, with these firms tending to innovate more than small firms in the EBRD region.

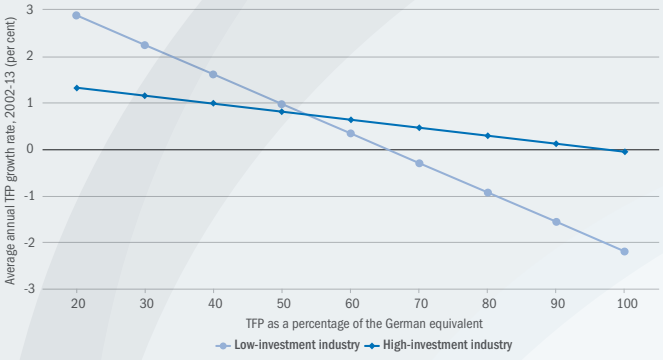
Box 2.2. The role of investment in small firms' growth

Smaller and younger firms often have a comparative advantage when it comes to introducing new products and disruptive technology.[31] Consequently, they have the potential to make major contributions to aggregate growth through their selection of entrepreneurial talent and their impact on competition. However, small and young firms are often the least productive companies in emerging markets. Why do small firms in emerging markets typically find it much more difficult to raise their productivity levels?

This box looks at one potential reason: a lack of physical investment. Small firms may lack incentives to undertake productivity-enhancing investment if they do not plan to grow, and there are a number of possible reasons why small firms might choose to remain small. Moreover, even sufficiently innovative firms may simply lack the resources that are necessary to grow. In particular, young innovative companies can face serious challenges when it comes to accessing credit,[32] given their weak cash flows and short credit histories. A lack of external finance can make it especially difficult for these firms to increase their capital stock.

The regression analysis in the rest of this chapter can be used to shed further light on the role that investment in capital stock plays in supporting the growth of small firms in Europe (see Box 2.3 for details of the methodology). The results of this analysis show that productivity growth at micro-sized and very small firms is crucially dependent on investment. In contrast, this relationship is weak where firms employ more than 20 people. In particular, a micro-sized firm in a sector with a low investment rate stops enjoying productivity growth when productivity in the sector reaches around 65 per cent of the corresponding level in Germany (see Chart 2.2.1). In contrast, a firm of a similar size in a sector with a high investment rate sustains productivity growth for a lot longer – all the way up to the point where it reaches the technological frontier.

CHART 2.2.1. Smaller firms achieve more sustainable productivity convergence in the presence of higher investment rates



Source: CompNet and authors' calculations.
Note: These results represent average predicted growth rates derived from a country and industry-level panel regression of TFP growth on TFP relative to Germany, the average investment rate and their interaction term, all with a lag of one period. Regressions control for country, industry and year fixed effects. "Low-investment" and "high-investment" industries are industries with investment rates of less than 5 per cent and more than 20 per cent respectively.

[31] See Pagano and Schivardi (2003).
[32] See EBRD (2015) for evidence on the EBRD region and Bloom et al. (2014) for evidence on other developing economies.

Box 2.3. Methodology

The main dataset used in this chapter was compiled by the CompNet research network, which was set up by the European Central Bank in March 2012. CompNet collects data from participating countries using the "distributed micro-data approach" developed by Bartelsman et al. (2004). This approach uses a common protocol to extract relevant information from existing firm-level datasets for each country and aggregate it at a level of interest (for instance, at sector level), while preserving the confidentiality of firms' data. The final dataset provides a rich set of economic indicators based on firm-level data, which are comparable across countries and years.

CompNet's industry classification is in line with NACE (the statistical classification of economic activities in the European Community) Rev. 2. The nine sectors covered are: manufacturing; construction; wholesale and retail trade; transport and storage; accommodation and food service activities; information and communication; real estate activities; professional, scientific and technical activities; and administrative and support service activities.

The second dataset used in this chapter is the 2013 release of the World Input-Output Database. WIOD data have much greater coverage than CompNet in terms of countries and years, as well as offering measures of openness to trade and shares in value added at industry level.

This chapter uses regression analysis to study productivity convergence at industry level. In the baseline equation, the growth rate of TFP, net value added or net job creation for each two-digit industry *i* in country *c* at time *t* is related to the relevant industry's proximity to the technological frontier in the previous period, while taking account of industry, country and year fixed effects:

$$y_{ict} = \alpha + \beta_1 Proximity\ to\ Frontier_{ict-1} + \gamma_i + \gamma_c + \gamma_t + \varepsilon_{sct}$$

The methodology is then extended in order to incorporate other industry-level measures (such as openness to trade or the average firm-level investment rate) into the baseline equation as follows:

$$y_{ict} = \alpha + \beta_1 Openness_{ict-1} * Proximity\ to\ Frontier_{ict-1} + \beta_2 Openness_{ict-1} + \beta_3 Proximity\ to\ Frontier_{ict-1} + \gamma_s + \delta_c + \delta_t + \varepsilon_{sct}$$

The results reported in this chapter represent predicted growth rates for various indicators derived from panel regressions estimated as described above. The same methodology is applied in Box 2.2, which also takes account of firm size.

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INFRASTRUCTURE AND GROWTH

Roads, railways, the reliable provision of electricity and clean water, and strong telecommunications networks provide the platform for economic activity. Access to infrastructure is good across most of the EBRD region, but there is room for improvement in terms of sanitation and the supply of energy in poorer countries. Most of the region continues to lag behind advanced economies in terms of access to broadband internet. Low-quality infrastructure may explain the perception that poor transport imposes major constraints on firms in parts of the EBRD region. Infrastructure investment totalling €1.9 trillion is needed over the next five years in order to support the region's growth. Evidence from major upgrades to Turkey's road network suggests that improvements in market access as a result of better transport infrastructure generate new trade links and broaden the range of products available to consumers. In addition, the resulting rise in employment can also reduce emigration from previously isolated regions.

€1.9 TRILLION
EBRD REGION'S ESTIMATED INFRASTRUCTURE INVESTMENT NEEDS OVER THE NEXT FIVE YEARS

17%
OF FIRMS IN THE SEMED REGION REGARD TRANSPORT PROBLEMS AS A MAJOR CONSTRAINT

64%
OF THE EBRD REGION'S TOTAL ESTIMATED INFRASTRUCTURE NEEDS ARE IN THE TRANSPORT SECTOR

Introduction

Infrastructure networks provide a platform for economic activity. The generation and distribution of electricity powers industry and homes; water and sanitation facilities make environments liveable and deliver health; information and communication technology (ICT) knits businesses and communities together; and roads and railways physically connect markets and people, both within countries and across borders. High-quality infrastructure helps to allocate resources efficiently, making people and firms more productive,[1] while a lack of infrastructure hinders productivity growth.

The EBRD region's infrastructure needs are a reflection of its history and geographical diversity. Several countries already provide almost universal access to key infrastructure such as electricity, roads, and high-quality water and sanitation facilities. Much of that infrastructure was inherited from central planning.[2] While the priorities for the region as a whole tend to be better access to broadband internet and improved roads, some countries, such as those in the southern and eastern Mediterranean (SEMED) region, also have room for improvement in terms of access to electricity. The first section of this chapter provides a detailed analysis of the current stock of infrastructure across countries and sectors, as well as reviewing recent investment in infrastructure.

The second section estimates the EBRD region's total investment needs in the area of infrastructure over the next five years. In order to support economic growth and help their income levels to converge with those of advanced economies, most countries in the EBRD region require either major investment with a view to expanding their infrastructure networks or investment in maintaining and upgrading existing infrastructure. The region's overall infrastructure needs are estimated at €1.9 trillion.

The third section of this chapter examines the impact of major coordinated upgrades to Turkey's road network. Prior to those upgrades, Turkey's road network was large but had limited capacity. Those upgrades have significantly increased domestic trade between provinces thanks to reduced transport times. This evidence from Turkey provides new insight into the considerable benefits that improvements in market integration can have for employment and development in more isolated regions.

Infrastructure stock

The EBRD region boasts a number of sectors where access to infrastructure is, on average, similar to that seen in advanced economies. Access to electricity, for example, has been comparable to that observed in western Europe since at least 2004. In 2014, that access rate stood at 86 per cent in Mongolia and 92 per cent in Morocco, with other countries enjoying rates of almost 100 per cent, according to the World Bank. Similarly, most countries in the EBRD region enjoy access to safe water, although access rates are lower in the West Bank and Gaza (61 per cent),[3] Mongolia (64 per cent) and Tajikistan (74 per cent). Access to high-quality sanitation facilities has risen across the region since 2005, although Moldova, Mongolia, Morocco, Romania and Russia continue to lag behind, with access rates of less than 80 per cent in 2014.

By the time countries achieve middle-income status, the quality of their core infrastructure (such as electricity, water, sanitation and roads) is often relatively high. However, such countries often find it difficult to improve their ICT and upgrade existing infrastructure (for example, when it comes to "greening" their energy supply, improving the reliability of energy provision and increasing the capacity of their road networks).[4]

Access to broadband internet, for instance, varies greatly across the EBRD region and tends to be lower than the levels observed in western Europe. Outside central Europe and the Baltic states (CEB), most countries had access rates of less than 25 per cent in 2005 (see Chart 3.1). Although access rates have now risen above 50 per cent in most of the EBRD region, countries in the SEMED region and Central Asia continue to lag behind, as do Georgia, Moldova and Ukraine.

Motorway networks remain limited across the EBRD region (with the exception of Croatia and Slovenia), with most countries having less than 100 km of motorway per million people in 2015. Upgrades to road networks can increase safety and improve the integration of markets, both within countries and across borders. The third section of this chapter, which examines recent upgrades to Turkey's road network, shows that improved market integration on the back of better road infrastructure provides multiple benefits to the economy.

Lagging behind advanced economies

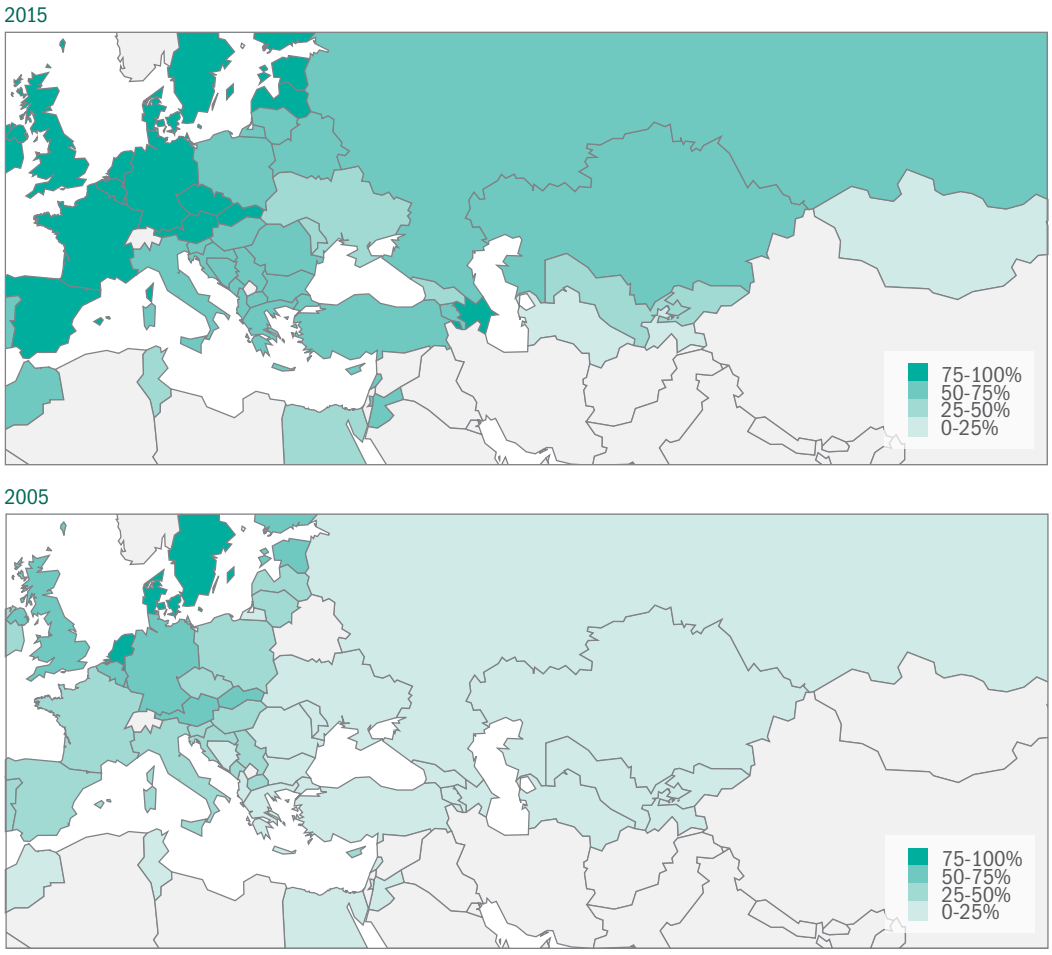
The EBRD region continues to lag behind advanced economies in terms of the overall quality of infrastructure, despite comparable access rates in certain sectors. While there are few reliable cross-country measures of the quality of infrastructure, available sources paint a consistent picture. The World Economic Forum's *Global Competitiveness Report* conducts annual surveys of business leaders to measure the perceived quality of infrastructure around the world. The perceived quality of the EBRD region's transport, electricity and communications infrastructure is very close to the global average, but substantially lower than the levels observed in advanced economies such as Japan, the United States of America and the EU-15 (see Chart 3.2).

A closer inspection reveals substantial variation in the quality of infrastructure across the EBRD region. The CEB countries all exceed the average for the region as a whole, as do Russia and Turkey, with their infrastructure scores comparable to that seen in China. Within south-eastern Europe (SEE), Greece and Cyprus stand out in terms of the quality of their infrastructure. Morocco and Jordan have the best infrastructure in the SEMED region, while Kazakhstan is some way ahead of its peers in Central Asia.

At sector level, scores are noticeably lower for railways and roads. In the road sector, the best performers include Croatia, Cyprus, Lithuania and Turkey, all of which have sizeable networks

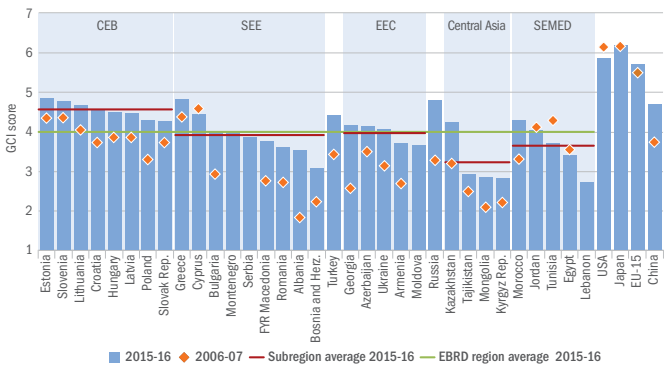
[1] See ADB (2017b); Dinkelman (2011) on electrification; Jensen (2007) on mobile phones; and the third section of this chapter, which looks at roads.
[2] See ADB (2017a, 2017b).
[3] In May 2017, the EBRD Board of Governors approved the Bank's engagement in the West Bank and Gaza for an initial period of five years. However, owing to insufficient data, the West Bank and Gaza only feature in Charts 3.1, 3.4 and 3.5 of this *Transition Report*.
[4] See Abiad (2017) and ADB (2017a).

CHART 3.1. Percentage of households with access to broadband internet in the EBRD region and western Europe



Source: World Bank.

CHART 3.2. Global Competitiveness Index – infrastructure



Source: World Economic Forum and authors' calculations.
Note: Scores are on a scale of one to seven, where higher numbers correspond to better infrastructure. Belarus, Kosovo, Turkmenistan and Uzbekistan are not included owing to insufficient data.

of motorways or expressways linking their main economic centres. Bosnia and Herzegovina, the Kyrgyz Republic, Moldova, Romania, Russia and Ukraine have the lowest scores in this sector. In the SEMED region, survey respondents indicate a deterioration over the past 10 years (with the notable exception of Morocco, where the perceived quality of the road network has improved substantially). The perceived quality of the EBRD region's railways is even lower, with the average for the region as a whole remaining below the global average.

While the perceived quality of infrastructure is still lower than that seen in advanced market economies, almost all countries in the EBRD region have made improvements in this respect since the Global Competitiveness Index (GCI) was launched in 2006-07. Indeed, the perceived quality of infrastructure has only worsened in four countries over the last 10 years: Cyprus, Egypt, Jordan and Tunisia.

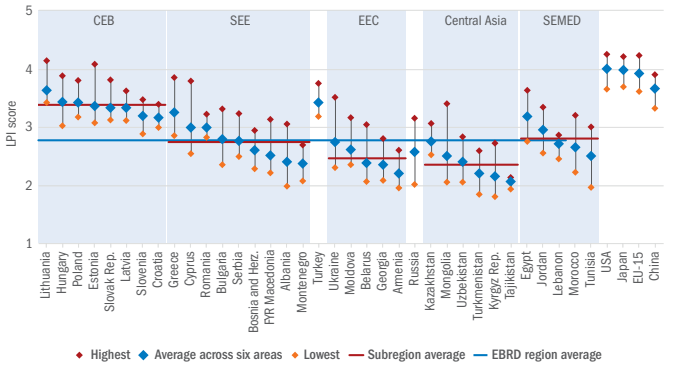
The Logistics Performance Index (LPI), an alternative global indicator of the quality of infrastructure services produced by the World Bank, paints a bleaker picture (see Chart 3.3). Once again, all the countries in the EBRD region score less than the advanced OECD economies. Here, though, they also score less than China. The CEB countries, Greece and Turkey have the highest scores, while the countries of the Western Balkans, Central Asia and the Caucasus have the lowest. In many countries, that poor performance is a result not only of low scores for infrastructure – which is just one component of logistics performance – but also of low scores in three other areas: customs, logistics competence and timeliness. Although every country in the EBRD region has improved its LPI score in the period since 2007, with the largest improvements being seen in Croatia, Kazakhstan and Lithuania, the average LPI score across the EBRD region as a whole continues to lag behind the global average.

Which infrastructure sectors are reported as being problematic by firms themselves?

The regular enterprise surveys conducted by the EBRD and the World Bank[5] show that while electricity is generally less of a concern in the EBRD region relative to other emerging markets, firms in some individual countries (such as those in the SEMED region) still face major constraints in relation to electricity. Firms in Albania, Egypt, Kosovo, the Kyrgyz Republic, Lebanon, Tajikistan, Uzbekistan, and the West Bank and Gaza report losses of between 2 and 7 per cent of output owing to electricity outages, which represents a significant burden (see Chart 3.4). Recent major investments in Egypt have expanded the country's generation capacity, reducing the frequency of such outages.

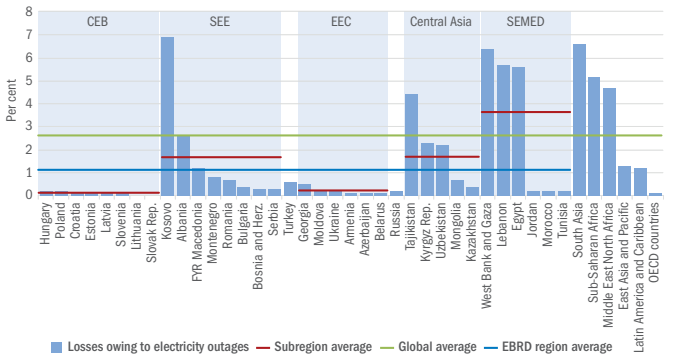
There is also considerable variation across the EBRD region in terms of the extent to which firms regard transport as a major constraint on their business. The West Bank and Gaza, Morocco, Kosovo and Romania all exceed, while Russia equals, the global average when it comes to transport-related constraints on firms (see Chart 3.5). An average of around 17 per cent of firms in the SEMED region report that transport represents a major constraint, compared with between 8 and 10 per cent in the SEE and CEB regions, eastern Europe and the Caucasus (EEC) and Central Asia. Overall, however, transport infrastructure in the EBRD region imposes fewer constraints on businesses than in other emerging markets.

CHART 3.3. Logistics Performance Index



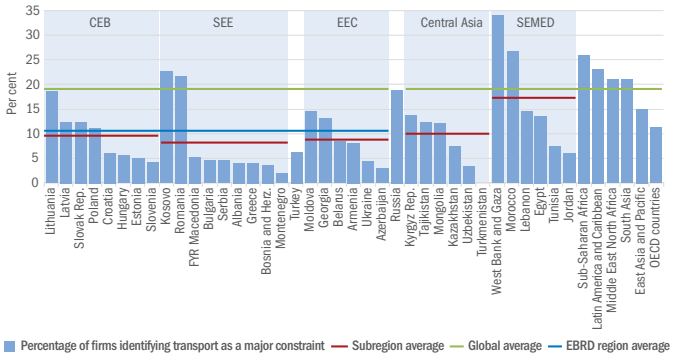
Source: World Bank.
Note: The index covers six areas: customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timeliness. Data for Kosovo are not available.

CHART 3.4. Losses owing to electricity outages, as a percentage of annual sales



Source: EBRD and World Bank enterprise surveys.
Note: Based on the 2013 survey or the latest available. Cyprus, Greece and Turkmenistan are not included owing to insufficient data.

CHART 3.5. Percentage of firms identifying transport as a major constraint



Source: EBRD and World Bank enterprise surveys.
Note: Based on the 2013 survey or the latest available. Cyprus is not included owing to insufficient data.

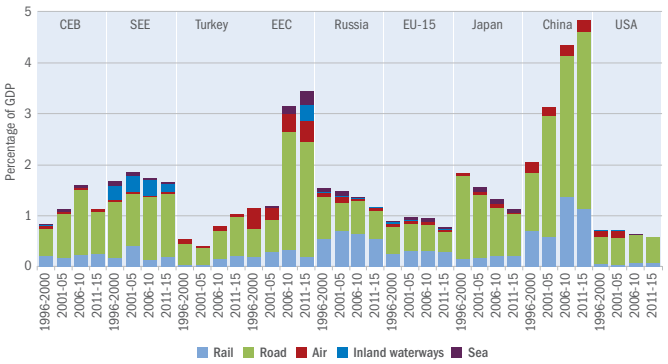
[5] See www.enterprisesurveys.org.

Infrastructure investment: past and future

The availability of data on infrastructure investment is generally poor. A combination of inconsistent accounting methods for investment in public infrastructure across countries and irregular reporting of infrastructure investment (for both state-owned enterprises and private firms alike) makes it difficult to construct reliable measures of investment.

The OECD's International Transport Forum stands out as one of the few sources that collect and publish data on infrastructure investment, providing annual data on investment in transport infrastructure by OECD member countries and associated countries. According to that data, the EBRD region invested more in transport infrastructure as a percentage of GDP than either the EU-15 or the USA over the period 1996-2015 (see Chart 3.6). This is not surprising, given that the region lagged so far behind advanced economies prior to that period. In fact, other emerging markets (such as China) invested substantially more. While Japan's investment in infrastructure is sometimes regarded as excessive,[6] and the sustained large flows seen in China may be difficult to replicate in countries where the state does not play such a strong role in the economy, investment totalling 1 to 1.5 per cent of GDP (the current level in the EBRD region) will probably prove insufficient if the region is to quickly close the gap relative to advanced economies in the area of infrastructure. Moreover, in the SEE region and Russia, investment in roads has actually been declining in recent years. In contrast, investment rates in Turkey have increased significantly, albeit from a low base (see the next section for more details). The particularly high investment rates seen in the EEC region in 2006-15 are largely the result of a major investment programme in Azerbaijan.

CHART 3.6. Average annual investment in transport infrastructure



Source: OECD and authors' calculations.

Estimating infrastructure investment needs

This section examines the EBRD region's investment needs in the area of infrastructure over the next five years (that is to say, the period 2018-22). The estimates in this section capture the investment that is needed in order to bring the region's infrastructure closer to levels consistent with those in advanced economies, support growth in populations and output, and replace ageing infrastructure lost to depreciation. These estimates are limited to network infrastructure – including roads and railways, electricity, water and sanitation facilities, broadband internet, landline telephone connections and mobile phones – and do not cover social infrastructure such as school buildings or hospitals.

All countries in the EBRD region have at least one infrastructure sector where infrastructure levels are lower than one would expect on the basis of country-level characteristics such as the level of development, population or population density in light of the experiences of advanced economies. These sectors are described as needing "catch-up investment" in order to bring their levels closer to those observed in advanced economies with a view to supporting income convergence.

In addition to that catch-up investment (which relates to desired levels based on current GDP and population figures and other characteristics), countries in the EBRD region will also need to invest in infrastructure in order to support anticipated future growth in GDP and population figures. These two components are complementary: investment supporting future growth in output and population figures will be needed whether catch-up investment takes place or not.

Lastly, investment is also needed in order to offset the deterioration of countries' existing infrastructure stock. Such investment needs can be calculated on the basis of depreciation rates for infrastructure in the various sectors and the unit costs of installing new infrastructure.[7] Importantly, maintenance costs also need to be taken into account. Box 3.1 discusses the methodology underlying all three sets of estimates and the assumptions made regarding unit costs and depreciation rates.

8
COUNTRIES
IN THE EBRD REGION HAVE ESTIMATED ANNUAL INFRASTRUCTURE NEEDS EXCEEDING 25% OF THEIR ANNUAL GDP

[6] See McKinsey Global Institute (2013).

[7] See ADB (2017a) and Fay and Yepes (2003).

Infrastructure investment needs in the EBRD region

The total investment needs of the EBRD region are estimated at €1.9 trillion.[8] Bridging this gap over a five-year period will involve expenditure totalling approximately 9 per cent of the region's GDP in each of those five years.[9] The cost of catching up with the levels expected on the basis of the experiences of advanced comparator economies accounts for 52 per cent of that total, while improving infrastructure to support future growth in GDP and population figures over the next five years accounts for 15 per cent. The remaining 34 per cent relates to replacement and maintenance requirements over that same time period.

Infrastructure investment needs and their composition vary greatly from country to country (see Chart 3.7). While Mongolia, Moldova and Jordan have the largest infrastructure needs relative to GDP, the biggest contributions to the EBRD region's total infrastructure needs come from the region's largest economies (such as Egypt, Turkey and Russia, which have infrastructure needs totalling €190 billion, €190 billion and €480 billion respectively).

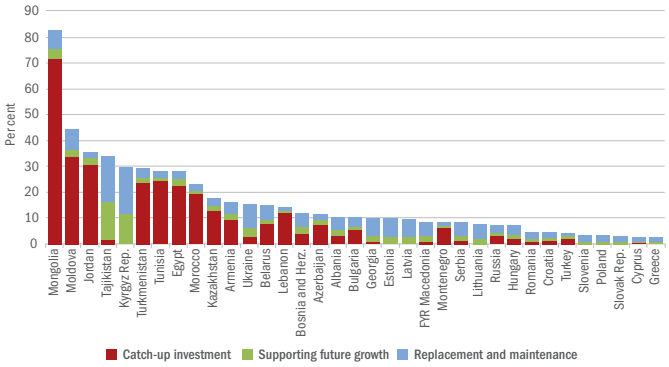
Higher-income countries in the EBRD region tend to have smaller investment needs as a percentage of GDP (see upper panel of Chart 3.8). In these countries, replacement and maintenance makes the largest contribution to overall investment needs. Of the 17 countries with the smallest investment needs as a percentage of GDP, there is only one – Turkey – where replacement and maintenance accounts for less than 50 per cent of total needs. In contrast, of the remaining 18 countries, there are only three – the Kyrgyz Republic, Tajikistan and Ukraine – where replacement and maintenance accounts for more than 50 per cent.

Likewise, catch-up investment tends to account for a smaller percentage of total investment needs in countries with higher GDP per capita (see lower panel of Chart 3.8). Poorer countries tend to have greater investment needs relative to GDP, mostly owing to relatively low levels of infrastructure at present.

Beyond these general trends, investment needs vary from country to country. Russia, for instance, already has significant infrastructure stock. Its catch-up investment needs are relatively modest and concentrated in the transport sector, reflecting the challenge of achieving sufficient connectivity in the world's largest country by land area. Overall, catch-up investment accounts for around 40 per cent of its total infrastructure needs. Russia's replacement and maintenance costs, on the other hand, are high precisely because of its large existing infrastructure stock. Supporting future growth also accounts for a sizeable percentage (albeit less than replacement and maintenance). In contrast, Egypt has much larger catch-up investment needs relative to its replacement and maintenance costs and the spending required to support the future growth of the economy.

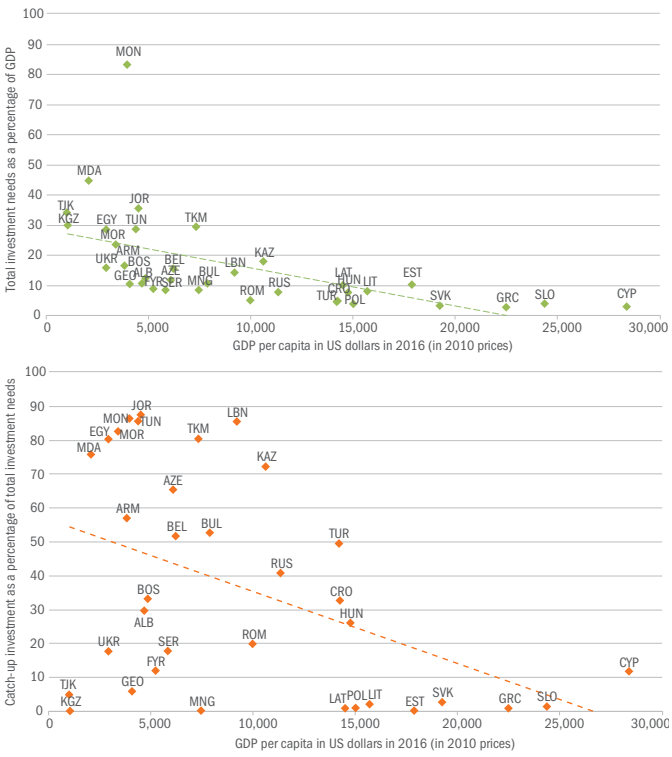
In most countries, infrastructure investment needs are dominated by either replacement and maintenance or catch-up investment. The cases of Poland and Morocco illustrate these two different profiles. Both countries have total estimated infrastructure needs in the order of €100 billion. However, just 1 per cent of Poland's infrastructure needs are accounted

CHART 3.7. Total investment needs for the period 2018-22, as a percentage of GDP per year



Source: WDI, IMF, US Energy Information Administration (EIA), Nunn and Puga (2012) and authors' calculations.
Note: Data are expressed as a percentage of 2015 GDP figures, in 2010 prices. Estimates for Montenegro exclude the railway sector owing to insufficient data. Data are not available for Kosovo or Uzbekistan.

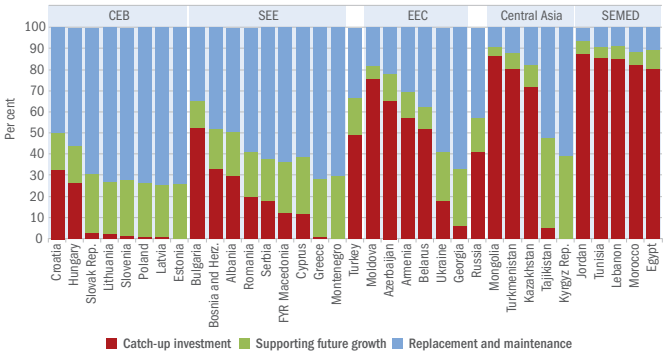
CHART 3.8. Investment needs and GDP per capita



Source: WDI, IMF, EIA, Nunn and Puga (2012) and authors' calculations.

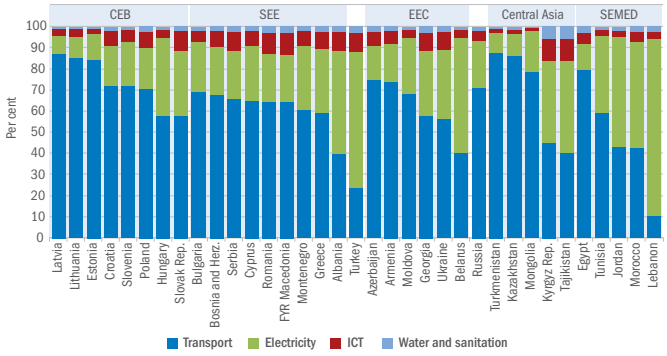
[8] These calculations are in 2010 prices and do not include Uzbekistan (owing to insufficient data).
[9] This calculation divides expenditure equally across the five years and is based on GDP figures for 2015.

CHART 3.9. Breakdown of estimated infrastructure investment needs



Source: WDI, IMF, EIA, Nunn and Puga (2012) and authors' calculations.
Note: Data are not available for Kosovo or Uzbekistan.

CHART 3.10. Sectoral breakdown of estimated infrastructure investment needs



Source: WDI, IMF, EIA, Nunn and Puga (2012) and authors' calculations.
Note: Data are not available for Kosovo or Uzbekistan.

for by catch-up investment, compared with 82 per cent in Morocco. In Belarus, Bulgaria and Turkey, however, investment needs are divided almost equally between catch-up investment and the sum of support for future growth and replacement and maintenance.

Countries in the same subregion tend to have similar profiles in terms of their infrastructure investment needs, albeit there are a number of exceptions in this regard (see Chart 3.9). Central Asia, the SEMED region and parts of the EEC region stand out as needing particularly large amounts of catch-up investment. In contrast, in the CEB and SEE regions – and, to a lesser extent, Russia – replacement and maintenance costs make a much larger contribution to total investment needs, with support for future growth also accounting for a sizeable percentage. With Turkey standing at the intersection of Europe and Asia, it is fitting that this country combines the typical investment needs of CEB economies with those of the SEMED region.

At sector level, transport infrastructure makes up an average of 64 per cent of total investment needs, followed by electricity (29 per cent), ICT (5 per cent), and water and sanitation (2 per cent). These estimates partly reflect the significant cost of building each new kilometre of roads and railways. Sectoral needs vary from region to region (see Chart 3.10). The SEMED region, for instance, requires higher levels of investment in electricity generation, as do Albania, Belarus and Turkey.

Economic impact of upgrades to Turkish roads

Transport is the largest contributor to infrastructure investment in other parts of the world as well (see Chart 3.6). It plays a vital role in modern market economies, enabling the smooth functioning of global value chains, facilitating domestic and international trade and maintaining the economic rhythm of modern cities. This section examines the benefits that major upgrades to transport infrastructure can have in middle-income economies by looking at the case of Turkey, which undertook major public investment in roads during the 2000s.[10]

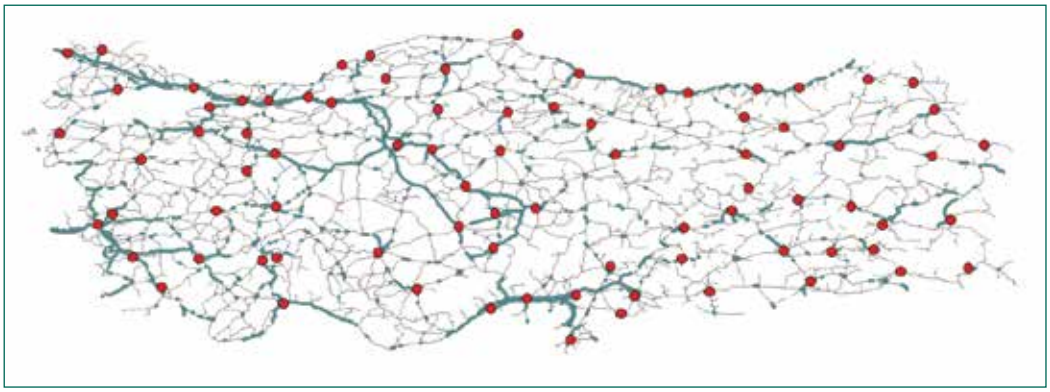
While Turkey's road infrastructure was already extensive prior to these upgrades, its capacity had long been considered inadequate. In 2005, the country's 81 provincial centres were already connected by a paved road network (see thin grey lines in Panel A of Chart 3.11). However, dual carriageways – divided multi-lane highways and expressways – made up only a small percentage of that network (see thick green lines).

Consequently, the Turkish authorities launched a large-scale public investment programme in 2002 "to ensure the integrity of the national network and address capacity constraints that lead to road traffic accidents".[11] That investment programme has resulted in a significant percentage of existing single carriageways (undivided two-lane roads) being turned into dual carriageways. By 2015, numerous arterial routes had been upgraded (see Panel B of Chart 3.11), with dual carriageways accounting for 35 per cent of inter-provincial roads, up from 10 per cent in 2002 (see Chart 3.12).

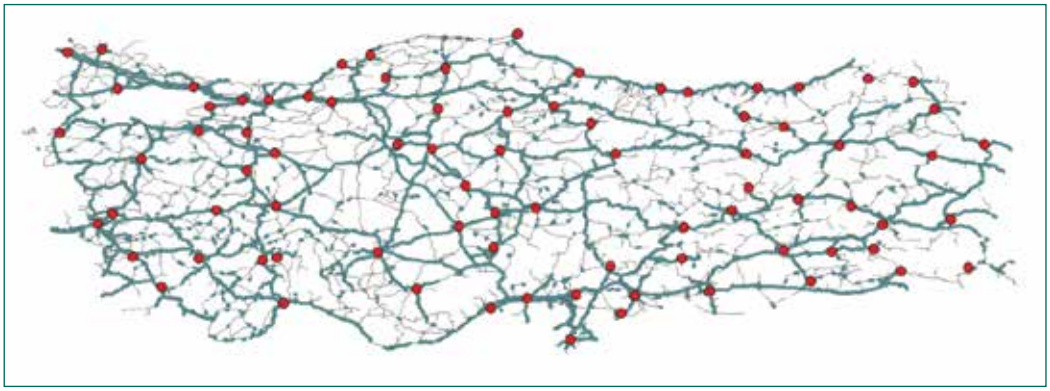
This section examines the extent to which this major increase in road capacity has affected domestic trade and regional economic outcomes in Turkey. High transport costs impede market access in isolated regions, both in terms of firms' ability to sell goods and in terms of their ability to buy the required production inputs. Thus, investment in transport infrastructure can improve growth prospects by facilitating both domestic and international trade.[12] But how large are these gains? In order to answer that question, this analysis first measures the impact of infrastructure upgrades on travel times between provinces and then links changes in travel times to changes in regional income levels, employment and migration patterns.

CHART 3.11. Turkey's road network

Panel A: 2005



Panel B: 2015



Source: Turkish General Directorate of Highways (GDH).
Note: Red nodes denote provincial centres, thin grey lines represent single-carriageway roads, and thick green lines represent dual-carriageway roads (highways and expressways).

[10] The analysis in this section is based on Coşar et al. (2017). Previous empirical work on the impact that transport infrastructure can have on development has focused on cross-country analysis, the impact of introducing the US interstate highway system and the construction or paving of new roads in middle-income countries. See, for instance, Limao and Venables (2001), Duranton et al. (2014), Allen and Arkolakis (2014) and Faber (2014).

[11] See GDH (2014).

[12] Coşar and Demir (2016) report that improvements made to Turkey's transport infrastructure in the 2000s significantly improved access to international markets for Turkish regions located a long way from the country's ports.

Upgrades to the road network have greatly improved transport outcomes

While dual carriageways account for slightly more than a third of Turkey's total road stock, they account for around 80 per cent of total traffic.[13] Spending on road upgrades during the period 2003-10, when the bulk of the investment was undertaken, totalled US$ 12.7 billion (at 2010 prices) or 1.7 per cent of 2010 GDP. Road safety has greatly improved, with the number of fatalities per kilometre travelled declining by 62 per cent since 2003.

The increase in capacity has allowed vehicles to travel more reliably at higher speeds, reducing accident rates and making arrival times more predictable. The average travel time between pairs of cities has been reduced by 1.5 hours (see Chart 3.13) relative to the average of 6.5 hours in 2005 (see Box 3.2 for methodological details). Time savings increase the further apart cities are, reaching five hours in the case of cities that are 1,500 km or more apart.

Transport and domestic trade

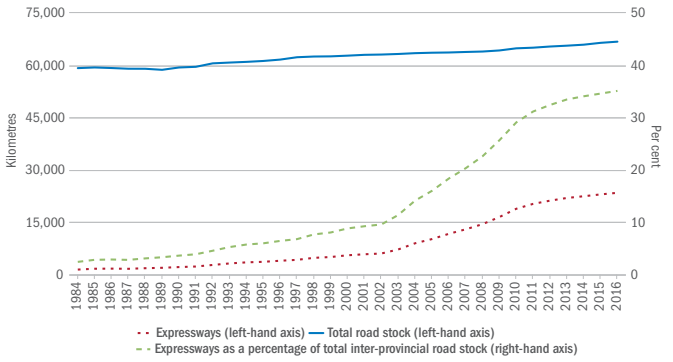
What impact have these time savings had on trade within Turkey? This subsection assesses that impact using firm-to-firm transaction data provided by the Turkish Ministry of Industry, which are based on value added tax (VAT) declarations by Turkish firms. Bilateral trade flows between provinces have been constructed by aggregating data on sales and purchases by individual firms (see Box 3.2 for details). Information on the road network is taken from the official road maps published by the GDH for 2005 and 2015. The digitised maps of single and dual carriageways that are shown in Chart 3.11 have been used to calculate the fastest possible travel times between the 81 provincial centres using geographic information system (GIS) software (see Box 3.2 for details). Data on provincial employment come from the Ministry of Industry, while migration data and information on provincial income per capita come from the Turkish Statistical Institute.

The reduced travel times resulting from the improvements made to Turkey's transport infrastructure between 2005 and 2015 are expected to have increased bilateral domestic trade flows between Turkish provinces. This impact is estimated using a gravity model of trade which relates changes in the volume of bilateral trade to changes in the economic size of trading partners and changes in the cost of bilateral trade (see Box 3.3 for details).

On the basis of the results reported in Box 3.3, a one-hour reduction in travel times between two provincial centres increases bilateral trade between those provinces by around 6 per cent. This effect is highly statistically significant and translates into a US$ 4.6 million increase in trade flows over 10 years for a typical pair of cities.

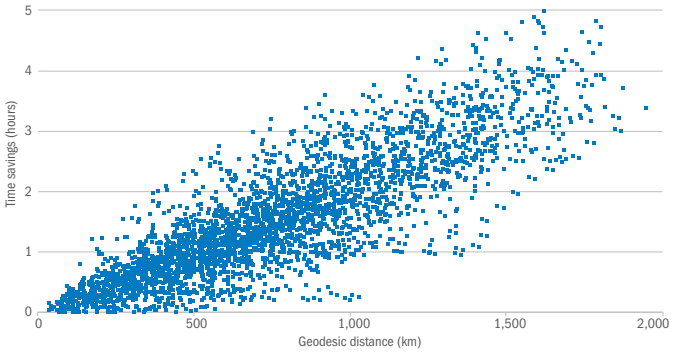
This represents a fairly large return on Turkey's investment. To see why, consider a hypothetical route with a distance equal to the average of the bilateral distances between the various pairs of cities. Assume that all 755 km of this route was on undivided single carriageway roads in 2006, resulting in a total travel time of approximately 11.6 hours. In order to reduce this travel time by

CHART 3.12. Turkey's roads over time



Source: GDH and authors' calculations.

CHART 3.13. Time saved on Turkey's roads



Source: GDH and authors' calculations.
Note: This chart plots declines in the fastest province-to-province travel times against distances as the crow flies. Each observation represents a pair of provinces.

1.5 HOURS
AVERAGE REDUCTION IN TRAVEL TIMES BETWEEN PAIRS OF TURKISH CITIES SINCE 2005 FOLLOWING ROAD UPGRADES

[13] Turkish parliament meeting records, 9 November 2016.

one hour, around 30 per cent of the route (234 km) needs to be transformed into divided dual-carriageway roads at a cost of US$ 26 million per year for 10 years (on the basis of the figures reported by the Turkish authorities). Thus, US$ 1 of investment in roads generates an extra US$ 0.18 in annual domestic trade between a pair of provinces, in addition to other benefits such as increases in international trade, reductions in the numbers of traffic-related fatalities and declines in overall travel costs.

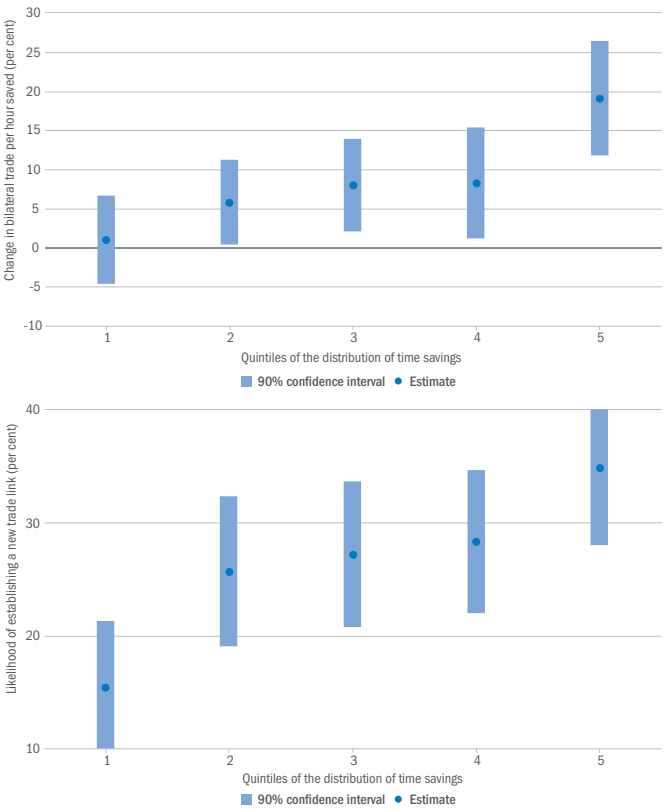
The impact of reductions in travel times is non-linear, with trade increasing more strongly in response to larger reductions in travel times. This can be seen from the upper panel of Chart 3.14, which shows estimated increases in domestic trade for city pairs corresponding to each quintile of the distribution of travel time saved (from shortest to longest). Thus, the fifth quintile comprises the city pairs that have gained the most in terms of time saved, which tend to be the furthest apart. The increase in trade that is seen for this group of city pairs is substantially larger than those observed for the rest of the sample. Indeed, a one-hour reduction in travel times increases trade by around 19 per cent where time savings are close to five hours. However, this does not necessarily mean that more trade is generated per US dollar of investment in roads, as the initial level of trade between remotely located trading partners tends to be fairly low.

Increases in trade also manifest themselves in the establishment of new trade links. Indeed, just 12 per cent of city pairs did not trade with each other in 2015, down from 43 per cent in 2006. In other words, Turkish provinces now source goods and services from a larger number of suppliers and consumers enjoy more variety.[14] A similar exercise is used to see whether that increase in the number of trade links is associated with the reductions in travel times between cities (see Box 3.3 for methodological details and results). This reveals that a one-hour reduction in travel times increases the probability of establishing a new trade link by 7 percentage points. As before, the estimated effect is much stronger for larger time savings. Indeed, the estimate more than doubles when moving from the first to the fifth quintile (see lower panel of Chart 3.14).

Impact on income, employment and domestic migration

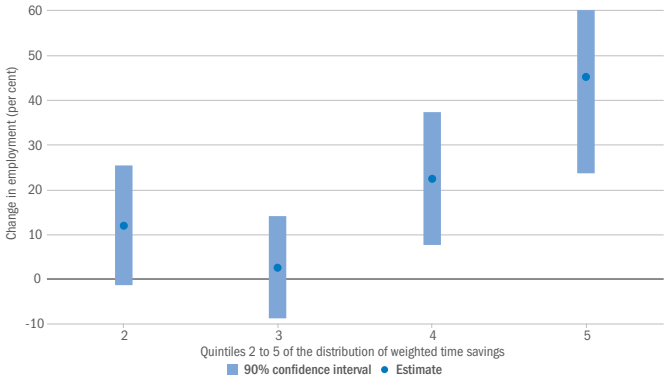
This subsection investigates the impact of the road improvement programme on provincial income, employment and domestic migration. First, this analysis looks at whether, within a geographical region, provinces that have experienced larger improvements in market access as a result of better roads have also posted stronger (nominal) income growth.[15] Improvements in market access are measured by calculating an average of the reductions in travel times experienced by a province when selling goods/services to other provinces, weighted by the GDP of trading partners (see Box 3.3 for details). Improvements in market access tend, on average, to be associated with stronger income growth, although the effect is not statistically significant. Estimates obtained separately

CHART 3.14. Time savings and change in domestic trade, 2006-15



Source: GDH, Turkish Ministry of Industry and authors' calculations.
Note: Based on regression analysis as defined in equation (2) in Box 3.3. Estimates are reported for each quintile of the distribution of travel time saved.

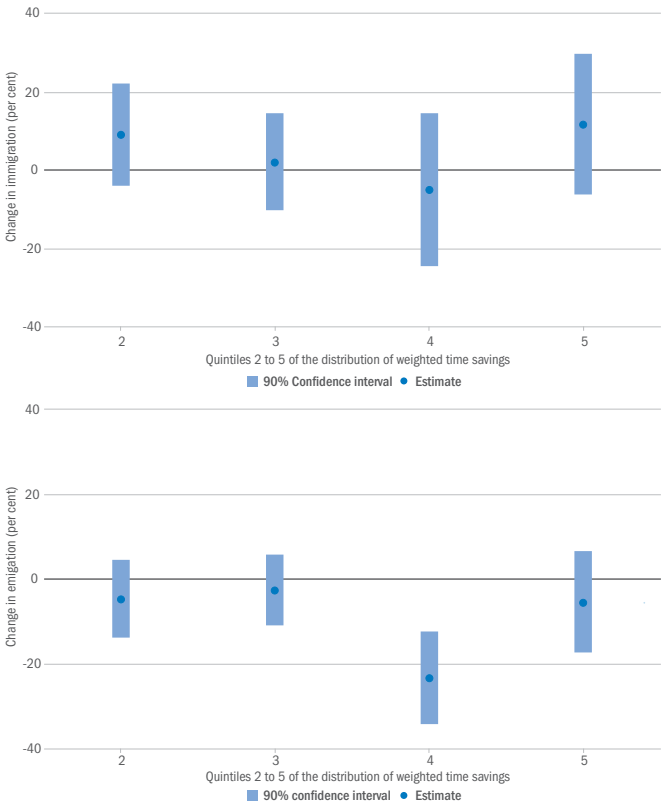
CHART 3.15. Time savings and change in regional employment, 2006-14



Source: GDH, Turkish Statistical Institute and authors' calculations.

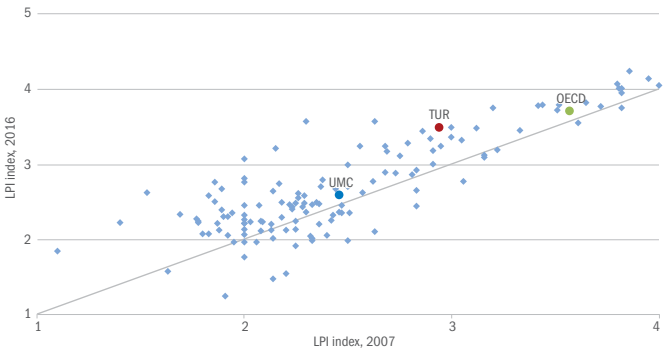
[14] Melitz and Trefler (2012) identify these outcomes as one source of gains from trade.
[15] To this end, Turkey is divided into seven geographical regions: Aegean, Black Sea, central Anatolia, eastern Anatolia, Marmara, Mediterranean and south-eastern Anatolia.

CHART 3.16. Time savings and change in domestic migration, 2007-15



Source: GDH, Turkish Statistical Institute and authors' calculations.

CHART 3.17. Changes in LPI scores



Source: World Bank and authors' calculations.
Note: "UMC" denotes the average score for upper/middle-income countries on the basis of the World Bank's classification.

for each quintile of the distribution of improvements in market access do not show statistically significant effects either. This is consistent with earlier findings regarding provincial income growth in China.[16]

However, improvements in domestic market access do have a positive impact on regional employment (see Chart 3.15). A one-hour reduction in average travel times from the provincial centre increases employment by 0.6 per cent. With 22 of Turkey's 81 provinces (making up 4.5 per cent of initial employment) experiencing average time savings of one hour or more, the impact on regional job opportunities is substantial. Furthermore, in those poorly connected provinces that experienced the largest improvements in terms of market access, the estimated impact on employment is 40 per cent above the average estimate.

Internal migration is one of the channels that could potentially lead to employment gains in previously poorly connected provinces. Indeed, this analysis finds that improved connectivity is associated with large reductions in outward migration from such regions. The lower panel of Chart 3.16 shows this effect to be particularly strong in the 40 per cent of regions with the largest gains in terms of time savings. This suggests that improvements in road links create employment opportunities that slow the depopulation of poorly connected regions. In contrast, there is no statistically significant evidence of changes in market access affecting inward migration (see the upper panel of Chart 3.16) or labour force participation, supporting the view that emigration is an important channel when it comes to explaining changes in employment patterns.

This evidence shows that infrastructure can help to enhance the economic prospects of underperforming regions. Regional infrastructure policy is important to policy-makers. For example, it comprised the single largest item in the EU's budget for the period 2014-20 (€352 billion out of a total of €1.1 trillion),[17] with a significant percentage of that amount being allocated to transport infrastructure "for the proper functioning of the internal market and for facilitating the circulation of people and goods within and beyond the EU" and "to spur growth in sparsely populated areas and the outermost regions of the EU". Evidence from Turkey, a large country with sizeable spatial income differentials, suggests that such policies can indeed be effective in facilitating regional convergence.

Noticeable improvements for firms

This analysis concludes by looking at whether improvements in terms of increased trade and employment can also be observed at the level of individual Turkish firms and citizens. This is important, as in some instances economic dividends detectable in province-level data may accrue to just a handful of firms, without benefiting small and medium-sized businesses.

LPI data, which are constructed on the basis of surveys of global freight forwarders and carriers, point to sizeable improvements in firms' perception of Turkish infrastructure. In 2007, Turkey was ranked 38th in terms of the LPI index, with a score of 2.94. By 2016, however, it was ranked 30th with a score of 3.49 – well above the average for upper/middle-income countries (see Chart 3.17). Over the same period, the OECD average (excluding Turkey) rose from 3.57 to 3.71, indicating that Turkey displayed significant convergence with higher-income

[16] See Banerjee et al. (2012).

[17] See European Commission (2014).

countries in terms of the perceived quality of logistics.

Moreover, Business Environment and Enterprise Performance Survey data indicate that road upgrades have benefited firms across the board. This survey asks the managers of manufacturing and service-sector firms about the extent to which transport represents an obstacle to their operations. The typical (median) firm taking part in the survey employs around 20 people. There are five possible responses: "no obstacle", "minor obstacle", "moderate obstacle", "major obstacle" and "very severe obstacle". In 2008, 12 per cent of respondents in Turkey regarded transport as a major or very severe problem. By 2013, this had dropped to 7 per cent. This holds when the various characteristics of the firms responding to the survey in 2008 and 2013 are taken into account. This improvement in terms of the perceived quality of transport infrastructure contrasts with BEEPS results for other countries, which show little change on average. This suggests that average firms in Turkey have indeed benefited from the country's road upgrade programme.

When it comes to interpreting estimates of the impact of road upgrades, one concern is whether those estimates truly reflect the causal impact of infrastructure on economic development. If roads were only upgraded in areas with good growth potential, the subsequent improvements in economic indicators could, in part, reflect pre-existing differences in economic potential, rather than the impact of new infrastructure. In the case of Turkey, several features of the country's ambitious investment programme serve to minimise such concerns. Those upgrades were spread across provinces, with no visible signs of concentration in particular regions. The long-term goal of establishing a comprehensive grid network spanning the country in order to improve connections between all provincial centres reduced the potential for upgrades to be used selectively to boost trade between particular regions. Moreover, the fact that this investment was planned centrally and financed entirely by the central government's budget limited the potential for local authorities to exert influence over its implementation.

Complementarity of infrastructure upgrades

Improvements to the flow of information as a result of investment in ICT can also lead to market integration, producing substantial economic benefits. As with the trade-related effects of road upgrades, more efficient diffusion of information on nearby markets can help to establish new links between consumers and firms.[18] Enhanced competition can, in turn, lead to stronger firm dynamics, fostering growth in high-productivity firms, encouraging underperforming firms to exit the market and supporting overall productivity growth, both within and across industries (as discussed in Chapter 2).

Upgrades to different types of infrastructure – roads and telecommunications, for instance – may also be complementary in terms of their impact. Better information on nearby markets is more useful if these markets can be reached without incurring excessive costs. Similarly, better use will be made of upgrades to transport networks when buyers and sellers have access to information about distant markets. Reductions in travel and search costs can also promote financial inclusion, as discussed in Chapter 4 of the *Transition Report 2016-17*. Thus, the benefits of infrastructure upgrades can spill over into many different sectors.

Conclusion

Firms and households across the EBRD region tend to have good access to basic infrastructure. However, in many countries the quality of this infrastructure still leaves a lot to be desired. This is reflected in firms' perception that inadequate infrastructure is having a detrimental impact on their day-to-day business. Improvements to the provision of electricity (primarily in the SEMED region), improvements in road capacity (across much of the EBRD region) and greater investment in ICT are all priorities in terms of upgrading existing infrastructure stock. Infrastructure investment totalling €1.9 trillion is required in the EBRD region over the next five years, which is the equivalent of spending 9 per cent of the region's GDP each year. Specific infrastructure needs vary widely across countries. Some, for example, require large amounts of investment in order to bring infrastructure into line with the levels that would be expected on the basis of country-level characteristics such as GDP per capita or population density. Other economies require major investment in order to support future population and income growth and maintain their existing infrastructure networks.

Detailed analysis of the major coordinated road upgrades that have been carried out in Turkey since the early 2000s indicates that increases in market integration can have a significant impact on local economies. Improvements in market access have generated new trade links, allowing firms to obtain intermediate inputs from new sources, and produced benefits for consumers in terms of the variety of available products. Improvements in market access have also led to employment gains, which have, in turn, been associated with reductions in outward migration from previously isolated areas. These findings suggest that comprehensive infrastructure upgrades can be effective policy tools with the potential to improve the economic prospects of underperforming regions.

Over time, greater integration into domestic and international markets leads to changes in production processes and increases in productivity. Increased competition in markets can make firm dynamics healthier, as discussed in Chapter 2, leading to stronger productivity growth.

Specific infrastructure projects should be decided on within the context of each country's economic environment and needs, taking account of any spillover effects for other sectors. The cost of expanding networks varies from sector to sector, as does the time required for construction, so the order and composition of upgrades could have an impact on the delivery of benefits in the short term. Coordinating investment across sectors and regions can be important in terms of optimising the impact of upgrades.

[18] See Jensen (2007), Aker (2010) and Jensen and Miller (2017).

The scale of the infrastructure investment needs estimated in this chapter suggests that many countries will need to look beyond their domestic economies when it comes to financing such projects. Indeed, public resources are likely to fall a long way short of what is required in order to meet countries' investment needs in the area of infrastructure. However, recent research points to a vast reservoir of private savings in search of longer-term investment opportunities.[19] International financial institutions such as the EBRD can help to facilitate investment by private funds in several ways. They can, for example, provide region-specific expertise and help to mitigate risks stemming from asymmetric information, which can be extensive in infrastructure projects. Acting as lead investors in syndicated loans is one way to do this, increasing the attractiveness of such deals for certain private investors.[20] They can also work with governments to improve the design and implementation capacity of public-private partnerships (see Annex 3.1 for details), as well as structuring deals involving project finance in order to better align incentives encouraging delivery on time and on budget (see Box 3.4 for details). Lastly, international financial institutions can help governments to design tender procedures for infrastructure projects with a view to reducing the likelihood of costly overruns and corruption, while at the same time delivering transparency and competitiveness.[21]

Box 3.1. Estimation methodology for infrastructure investment needs

Countries' needs in terms of catch-up investment and support for future growth are estimated in two different ways. Both estimations pool countries in the EBRD region with advanced comparator countries from around the world. Each method estimates physical expansion needs in terms of catch-up investment and support for future growth for each infrastructure sector in each country. A unit cost of infrastructure expansion is then applied to all sector-specific estimates in order to express them in monetary terms and add them up.

The catch-up investment component is estimated using a random effects model for the period 1990-2015.[22] This model takes account of countries' GDP per capita at PPP, their rural and total populations, the percentages of GDP that are accounted for by agriculture and manufacturing, their land area and a measure of their geography (a "ruggedness index").[23] The catch-up component is the difference between a country's predicted and actual values in terms of its infrastructure stock.

The future growth component is measured in a similar manner, but based on a fixed-effects model. This model takes account of all country-specific factors that do not change over time and might affect infrastructure, as well as factors that are common across all countries at a given point in time (year fixed effects). This model estimates the relationship between infrastructure levels and a country's population and GDP.

Population forecasts and GDP projections are taken from the IMF's *World Economic Outlook* for the period up to 2022. That projected GDP growth is cross-checked against the performance of each country's synthetic comparator, as constructed in Chapter 1. A country's desired growth rate is assumed to be that of its comparator or the country's future growth as projected by the IMF, whichever is higher, plus one percentage point per year. The resulting GDP projections and population forecasts are then used to estimate the increases in the stock of infrastructure that will be needed between 2018 and 2022 in order to sustain that projected growth.

This estimation assumes that the experiences of advanced economies will be indicative of the infrastructure requirements of the EBRD region as it seeks to achieve higher income levels.[24] It also makes simplified assumptions about unit costs and depreciation rates for infrastructure (see Table 3.1.1.), whereas these may in fact vary substantially across countries and over time. These estimates also ignore the fact that additional investment in infrastructure as part of the catching-up process may boost economic output, since reliable estimates of growth's response to infrastructure are not readily available and are likely to be sector and country-specific.

TABLE 3.1.1. Unit costs and depreciation rates for infrastructure

Sector	Unit	Unit cost (US dollars)	Annual depreciation rate (per cent)
Broadband internet	Connection	3.4	8
Landline telephones	Connection	261	8
Mobile phones	Connection	127	8
Water supply	Connection	161	3
Sanitation facilities	Connection	168	3
Electricity capacity	Kilowatt	2,513	2
Road	Kilometre	600,000	3
Rail	Kilometre	3,855,000	2

Source: ADB.
Note: Unit costs are reported in 2010 prices. The euro/US dollar exchange rate is set at €0.78 per US dollar for all calculations.

[19] See Arezki et al. (2017).
[20] See Carter et al. (2017).
[21] See Branzoli and Decarolis (2015).
[22] In some infrastructure sectors, data are only available for shorter time periods (such as the period 2000-11).
[23] See Nunn and Puga (2012).
[24] Lower and middle-income countries outside the EBRD region are not included in these regressions, as these countries often have insufficient infrastructure. The estimated high investment needs in Mongolia are due in part to the country's unique geography and low population density.

Box 3.2. The data underlying the analysis of Turkish road upgrades

How are travel times and road speeds determined?

Average speeds are calculated for trucks using a representative sample of road segments on the basis of data from the GDH. While the maps in Chart 3.11 show both divided expressways and highways as dual carriageways, travel times assume a speed of 90 km/h on expressways and 110 km/h on highways. The speed on single carriageways is assumed to be 65 km/h. For each pair of provincial centres in Chart 3.13, ArcMap software is used to calculate the shortest possible travel time for both years on the basis of the above assumptions regarding speeds.

A new dataset on inter-firm linkages

Turkey's Ministry of Industry provides firm-to-firm transaction data based on VAT declarations made to the Ministry of Finance by Turkish businesses. Since 2010, Turkish firms have been legally required to report, on a monthly basis, all purchases and sales exceeding TRY 5,000 (US$ 3,225) per buyer/seller, excluding VAT.

Sales and purchases are reported at firm level. However, this makes it difficult to identify the relevant location when firms have multiple plants. To help address this issue, the sample used in this estimation restricts the set of firms to (a) all single-plant firms, (b) all multi-plant firms with plants located in a single Turkish province and (c) multi-plant firms with plants located in multiple provinces, but at least 70 per cent of employment concentrated in a single province (which is then regarded as the firm's location).

With 81 cities, there are 6,561 pairs of cities that can potentially trade with each other as buyers or sellers. The data on the amount of goods and services travelling from each source province to each destination province can be used to calculate trade flows in a given year. Since the data also cover transactions between firms within the same city, the source and the destination can be the same. The percentage of city pairs exhibiting zero trade fell from 43 per cent in 2006 to 12 per cent in 2015. The calculation of the long-term growth rate of bilateral domestic trade flows between 2006 and 2015 takes this large increase in the extensive margin into account. The mid-point growth formula defines change in trade between a source province (s) and a destination province (d) as

$$ChangeTrade_{sd} = 2 \cdot \frac{trade_{sd}^{2015} - trade_{sd}^{2006}}{trade_{sd}^{2015} + trade_{sd}^{2006}} \qquad (1)$$

where $trade_{sd}^{2015}$ and $trade_{sd}^{2006}$ denote the value of trade between the source province and the destination province in 2015 and 2006 respectively.[25] This measure is constrained between -2 and 2. In the data, the long-term growth rate of bilateral domestic trade is well defined for 5,781 pairs that report trade in at least one of the years in question. Only 145 of these exhibit a decline in trade. For all other pairs, the growth rate ($ChangeTrade_{sd}$) is strictly positive.

[25] See Davis et al. (1996).

Box 3.3. Technical details relating to the analysis of Turkish road upgrades

Bilateral trade and travel times

The initial analysis estimates a gravity-type model using first-differences regression. In this regression, the dependent variable is the growth rate of bilateral domestic trade flows between Turkish provinces in the period 2006-15. The savings in terms of travel times between pairs of provinces are the independent variable. First-differences estimation eliminates all time-invariant characteristics of the source province, the destination province and their pairs that affect bilateral trade flows (such as the distance between provinces). This estimation also takes account of province-level characteristics that affect changes in trade in each province (with α_s and α_d representing source and destination fixed effects respectively):

$$ChangeTrade_{sd} = \beta_0 + \beta_1 TimeSaving_{sd} + \alpha_s + \alpha_d + \varepsilon_{sd} \qquad (2)$$

Standard errors are clustered at the source and destination levels (two-way clustering).

To test for non-linear effects, the continuous variable for time savings in equation (2) is replaced by indicator variables for each quintile of its distribution. Estimates are obtained in respect of trade flows within provinces (the omitted category).

To examine the effect on new trade links, a similar relationship is estimated for the probability of observing positive trade for a pair of provinces in 2015, provided that the pair had zero trade in 2006 (see column 2 of Table 3.3.1 for the results).

Looking deeper: income growth, employment and migration

This element of the analysis looks at whether provinces that experienced greater improvements in market access as a result of upgrades to roads also recorded stronger income or employment growth or experienced different domestic migration patterns. Improvements in market access are measured by calculating a weighted average of the reductions in travel times experienced by a province when selling goods to other provinces. Each province's time savings are weighted on the basis of destination provinces' GDP figures for 2005 as follows:

$$WTimeSaving_s = \sum_{d=1}^{81} \frac{GDP_{d,2005}}{GDP_{Istanbul,2005}} TimeSaving_{sd} \qquad (3)$$

The following equation is estimated for each outcome variable (such as income growth):

$$Change[OUTCOME]_s = \delta_0 + \delta_1 WTimeSaving_s + \alpha_r + e_s \qquad (4)$$

TABLE 3.3.1. Results of regression analysis

Dependent variable	Change in bilateral trade flows, 2005-15	New trade links in 2015	Change in GDP per capita	Change in employment	Change in immigration	Change in emigration
	[1]	[2]	[3]	[4]	[5]	[6]
Time savings (hours)	0.061*** (0.011)	0.072*** (0.010)				
Time savings weighted by GDP			0.001 (0.001)	0.006* (0.003)	0.001 (0.002)	-0.003* (0.002)
Fixed effects	Source and destination	Source and destination	Region	Region	Region	Region
No. of observations	5,781	6,561	81	81	81	81
R^2	0.217	0.222	0.160	0.461	0.089	0.190

Source: GDH, Turkish Ministry of Industry, Turkish Statistical Institute and authors' calculations.
Note: All regressions are estimated using ordinary least squares. Robust standard errors with two-way clustering at the level of source and destination provinces are indicated in parentheses. *, ** and *** denote values that are statistically significant at the 10, 5 and 1 per cent levels respectively.

where α_r denotes region fixed effects. Non-linear effects can be examined via a set of quintile indicator variables for the distribution of weighted time savings, as above. Data on provincial labour force participation are only available for the period 2008-13, and this analysis fails to find any impact on labour force participation as a result of changes in market access. As data on bilateral migration flows are not available, this analysis uses data on changes in population flows in and out of each individual province. The results are reported in Table 3.3.1.

Box 3.4. Project finance in the EBRD context

Infrastructure projects typically require large amounts of investment up front, long before any revenues materialise. They also tend to involve uncertainty regarding future demand. This means that firms implementing infrastructure projects are exposed to significant amounts of risk. A common way of mitigating such risk is the use of special-purpose vehicles (SPVs).

SPVs are set up for the sole purpose of carrying out a specific project. In order to ring-fence project-related risk, they are legally independent of the entity that created them. SPVs vary in terms of their legal structure, ownership, management and financing. While these arrangements can be analysed through the lens of a large body of literature on finance and contract theory, there is little empirical evidence indicating which arrangements work best in which circumstances.

The EBRD recently conducted a review of various infrastructure projects that it has financed in an effort to understand how the structure of SPVs affects project objectives. A joint team comprising EBRD staff and external researchers looked at a set of 46 infrastructure projects that were agreed between 1999 and 2014 and completed between 2003 and 2016. Those 46 projects span all aspects of infrastructure, with 21 projects involving power and energy infrastructure, 11 involving the transport sector, 9 involving natural resources and 5 involving municipal and environmental infrastructure. The projects were implemented in 16 different countries (including 10 in Russia, 8 in Poland and 7 in Romania).

The analysis focused on two project objectives: completion on time and completion on budget. Of the 46 projects in the sample, 14 were completed on time and on budget, 15 experienced both delays and cost overruns, 16 experienced only delays and 1 experienced only a cost overrun. Delays averaged around 16 months, with a standard deviation of 12 months for delayed projects, while cost overruns averaged 20 per cent of budgeted costs, with a standard deviation of 31 percentage points for projects going over budget.

The team's analysis suggests that government involvement in an SPV significantly increases the risk of delays. Of the projects that were completed on time, 67 per cent had no government involvement at all, while 55 per cent of all projects experiencing delays had some government involvement (see Chart 3.4.1). This difference is statistically significant at the 10 per cent level. Furthermore, the degree of government ownership averaged 16 per cent in projects that were completed on time and 40 per cent in projects that experienced delays.

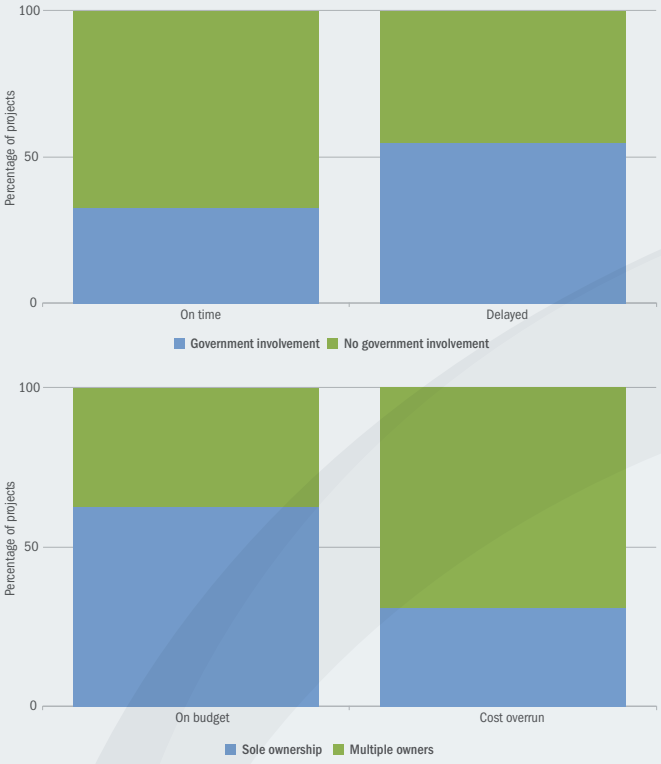
Moreover, regression analysis indicates that the dispersal of ownership within an SPV significantly increases the risk of cost overruns. SPVs with single owners had significantly smaller cost overruns than SPVs with highly dispersed ownership, with the difference between the two totalling around 1 standard deviation (31 percentage points).

There are two reasons why more concentrated ownership might reduce the risk of cost overruns. First, it may reduce coordination costs, allowing more effective monitoring of a project's progress. And second, it may strengthen incentives to monitor costs, as those involved in monitoring get to claim a larger percentage of any cost savings.

Case study: Pestera Wind

The Pestera Wind project serves as an interesting case study with regard to project structure. This project was agreed in 2010 in order to finance the construction of two wind farms in Romania, with a total generating capacity of more than 230 MW. Ownership of the SPV was split between a firm from Portugal (85 per cent) and a firm from Cyprus (15 per cent). Thus, it was highly concentrated, with no government involvement. Construction finished slightly ahead of schedule and cost less than expected. The project achieved a high score for transition impact as measured by the EBRD, reflecting its contribution in terms of demonstrating a successful SPV arrangement and strengthening competition in the market.

CHART 3.4.1. Characteristics of projects with delays and cost overruns



Source: EBRD and authors' calculations.

This analysis suggests that special measures encouraging closer monitoring may be helpful where ownership of SPVs is less concentrated. More dispersed ownership need not necessarily undermine a project's success. Indeed, in some cases less concentrated ownership may help to manage risk and raise the necessary funds. Closer monitoring could be encouraged, for instance, by rewarding the parties responsible for monitoring when cost overruns are successfully avoided.

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Annex 3.1.
Legal frameworks governing public-private partnerships: insights and recommendations

Introduction

Efficient and transparent policies are vital for the effective functioning of the infrastructure sector (which includes, for example, energy, transport and water supply, as well as social infrastructure for education and health care), as are legal and institutional frameworks that encourage private-sector participation. Over the past 12 years, the EBRD has conducted a number of assessments looking at the effectiveness of legislative frameworks governing public-private partnerships (PPPs) in the EBRD region.

The term "public-private partnership" covers a range of long-term arrangements between public authorities and private entities, including concessions, build-operate-transfer (BOT) models and related arrangements, private finance initiatives (PFIs) and institutional PPPs.[1] However, it excludes the sale of public assets as part of privatisation programmes, as well as public works, services and supply contracts which are subject to conventional public procurement rules. In the case of a concession, a contracting public authority entrusts a private entity with total or partial provision of public services or infrastructure for which that authority would normally be responsible, with the private entity assuming some or all of the risk and being remunerated predominantly by end-users. In the case of a PFI-type PPP, by contrast, the private entity is paid primarily by the public authority, rather than by end-users.

The EBRD's assessments compare the legal frameworks in the various countries with internationally accepted standards and best practices, identifying strengths and weaknesses in terms of both extensiveness (law on the books) and effectiveness (law in practice). With international standards and trends in the PPP sector constantly evolving, the EBRD performed its latest assessment in 2017,[2] with the previous assessment having been carried out in 2011.[3]

The findings of these assessments are used to develop practical recommendations for policy-makers, helping them to address, through technical assistance, any weaknesses identified in the national PPP framework. See "What can policy-makers do?" on page 69 for a summary of recommendations based on the findings of the 2017 assessment.

Methodology

The two-part assessments are based on a set of criteria developed by the EBRD. Part I looks at the comprehensiveness of legal rules, while Part II deals with issues of policy, institutional framework and lessons learned from the implementation of PPP projects.

In the 2017 assessment, which was carried out on the basis of laws and regulations as at 30 June 2017,[4] the countries in the EBRD region were divided into two groups. The first group was assessed using a range of public resources (legislation, national reports, legal articles, research findings and press coverage). The second group, which consisted of 12 countries,[5] was subjected to a more extensive assessment, which included interviews with national authorities and private-sector stakeholders. The assessment's findings were then verified by qualified local lawyers, with each country being given a score.

TABLE A.3.1.1. Assessment criteria

Part I – Legislative Framework Assessment (LFA)
1. Legal framework governing PPPs
2. Preparation of projects
3. Selection of private partners
4. Project agreements
5. Security and support issues
Part II – Legal Indicators Survey (LIS) looking at effectiveness
6. Policy framework
7. Institutional framework
8. Award statistics
9. Business environment for PPPs

Source: EBRD (2017).

In 2017, Part I of the assessment was expanded to cover the following: threshold amounts, the involvement of state-owned companies on the private side, changes to shareholdings in project companies, the use of a public-sector comparator or a value-for-money test, competitive dialogue, monitoring procedures and direct agreements. There was also a greater focus on preparatory work and project selection in the form of compulsory feasibility studies, as well as additional questions on unsolicited proposals.

Part II, meanwhile, was expanded to cover two new core areas: award statistics and the business environment for PPPs. These included statistical and other questions aimed at providing a better understanding of how PPPs work in general and the level of development of the PPP industry in each country (which will itself help to determine how quickly any new PPP law is successful).

In addition to the above assessment criteria, a few other new criteria were also included in the 2017 assessment. These included a "bankability test" and "red flags". The bankability test seeks to establish whether a country's legal framework incorporates the fundamental requirements for making PPPs feasible for financing as seen from a lender's perspective,

[1] For further details and definitions of the various types of arrangement, see: www.ebrd.com/what-we-do/sectors/legal-reform/ppp-concessions/sector-assessment.html
[2] See EBRD (2017).
[3] See EBRD (2012).
[4] In exceptional cases, significant legislative developments occurring in July 2017 were also taken into consideration, in order to ensure the completeness and accuracy of the assessment.
[5] Albania, Armenia, Croatia, Egypt, Jordan, Kazakhstan, Lithuania, Mongolia, Poland, Romania, Russia and Turkey.

while red flags indicate a lack of basic minimum compliance requirements, which is a deal-breaker for most investors.

The countries were placed in five groups on the basis of the EBRD's assessment of their compliance with international standards and the effectiveness of their legal frameworks.

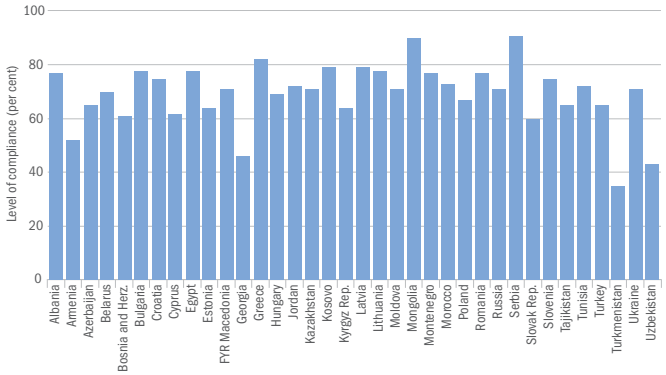
TABLE A.3.1.2. Classification of countries

≥ 90%	Very high level of compliance/effectiveness
70-89%	High level of compliance/effectiveness
50-69%	Moderate level of compliance/effectiveness
30-49%	Low level of compliance/effectiveness
< 30%	Very low level of compliance/effectiveness

Source: EBRD (2017).

Findings on compliance

CHART A.3.1.1. Compliance with internationally accepted standards and best practices



Source: EBRD (2017).
Note: Although it had not yet been adopted at the time of the assessment, so was not taken into consideration, Georgia's new PPP Law, which is due to be finalised and adopted shortly, should significantly improve its PPP framework and make it more compliant with internationally accepted standards and best practices.

Very highly compliant countries

Mongolia, which displayed a very high level of compliance in the 2011 assessment, has maintained that ranking. Its Concessions Act, which was adopted in 2010, represents a comprehensive legal framework governing both concessions and PFI-type PPPs. The Concessions Act provides for a broad range of models, as well as a number of different security instruments. It also allows for the option of government support and guarantees. Meanwhile, bankability is supported by the option of direct agreements and step-in rights.[6]

Serbia, meanwhile, has significantly improved its ranking since the 2011 assessment. Its PPP and Concession Law was amended in December 2016, with the result that Serbia now boasts a comprehensive and very highly compliant legal framework governing PPP projects.

Highly compliant countries

A large number of countries have been placed in the second-highest category on account of their sophisticated legal frameworks, their transparent procurement practices, their easy access to justice (including arbitration), and the fact that a range of security instruments are available, all of which facilitate financing.

Croatia has improved its legislation further since the assessment in 2011, particularly in the area of concessions, which was previously considered underdeveloped relative to PFI-type PPPs. In July 2017, Croatia replaced its 2012 Concession Act with a new Concession Act, which implements Directive 2014/23/EU on the award of concession contracts. While it remains to be seen how this will operate in practice, the new Concession Act clearly sets out the rules governing concessions and heavily regulates the award process. The new Concession Act explicitly provides for a range of different award procedures on the basis of the value of the contract and leaves no uncertainty as to the procedure that needs to be applied. It also expands on the concept of "strategic interest concessions" (which featured in the 2012 Concession Act), identifying sectors in which such concessions can be awarded.[7] Moreover, the country's PPP Act of 2014 is now well established and has been tested in practice. The selection of private partners is governed by public procurement legislation, which implements Directive 2014/24/EU on public procurement.

Lithuania has also improved its legal framework for PPPs. Thanks to recent amendments to its Concessions Act and the amendments made to its Investment Act and its Public-Private Partnership Resolution in 2015, Lithuania is now one of the few countries with a high level of bankability.

Russia has established a solid basis for the development of all forms of PPP. Russia's PPP Law, which came into force in 2016,has since undergone further amendments.[8] Concessions are governed by a separate federal law on concession agreements, which was adopted in 2005 and has since been amended. The PPP Law explicitly allows a private entity to create security interests over a project's assets, whereas the Concession Act restricts this.

FYR Macedonia's legislation has undergone substantial changes, as a result of which its rating has improved from moderately compliant to highly compliant. The country's Act on Concessions and Public Private Partnerships, as amended in 2015 and supported by secondary legislation,[9] provides for (i) variety/flexibility in terms of BOT models and non-concession PFI-type PPPs, (ii) economic evaluations/feasibility studies and (iii) competitive selection processes for private entities. Unlike the 2012 version of the Act, the amended legislation clearly guarantees concessionaires' rights, as well as providing for compensation in the event of termination (in the form of contractual penalties).

[6] This refers to a lender's right to assume the contractual responsibilities of a project partner (without a new tender procedure) in the event that the partner in question fails to meet its obligations under a contract.
[7] Namely, the construction and management of motorways, railway lines, oil pipelines and gas transport systems, the transmission and distribution of electricity, and other concessions specified by the Croatian parliament.
[8] Federal Law No. 224-FZ on Public-Private Partnerships and Municipal-Private Partnerships in the Russian Federation and Amendments to Some Regulatory Acts of the Russian Federation, which entered into force on 1 January 2016.
[9] Bylaw on the contents of agreements establishing PPPs and concessions for goods of public interest of 23 March 2012, adopted pursuant to Article 40(6) of the Act on Concessions and Public-Private Partnerships as published here: http://archive.economy.gov.mk/EN/pppe.html

Moderately compliant countries

Moderately compliant countries are characterised by a business-friendly environment and fairly well developed legal frameworks, which provide for opportunities to establish PPP projects. Core aspects, such as (i) the legal framework and (ii) guidelines or flexibility as regards the contents of a project agreement, the selection of a private partner and the availability of reliable security instruments, are covered by laws and regulations, although not always in a comprehensive and clear manner. This can cause scepticism and increase the risks perceived by investors.

Azerbaijan and Tajikistan have made significant progress in terms of compliance thanks to the adoption of new legislation. Tajikistan's PPP Act, for example, covers the implementation of projects in the area of merchant services (such as the provision of water, electricity and transport) and social services. However, it does not seem to cover mixed companies, the involvement of former state-owned companies following privatisation, or any public participation in joint ventures. It is also unclear whether this legislation prohibits PPP agreements that do not involve the transfer of assets to the public sector, as in the case of a build-own-operate (BOO) arrangement.

Azerbaijan adopted a new PPP Act at the end of 2016. However, there are still a number of uncertainties in relation to bankability. It is unclear, for example, whether security interests can be established over a private entity's rights or assets and whether there is the option of direct agreements or step-in rights.

Turkey's complex legal framework for PPPs is difficult to navigate. What Turkey really needs is a dedicated piece of legislation that specifically regulates PPPs and addresses all fundamental issues. There is a draft law on PPPs, but that legislation has been in the preparatory phase for some years now. The legislature has also adopted a significant number of inter-related sectoral laws covering both concessions and PFI-type PPPs.

Low-compliance countries

Low-compliance countries continue to face challenges in the core assessment areas. These countries typically recognise PPPs, but have so far failed to establish an appropriate legal framework.

Problems often relate to an absence of clarity regarding the scope of a country's framework, non-transparent tender procedures, a lack of flexibility as regards the contents of project agreements and the absence of reliable security instruments (such as step-in rights or the possibility of government support or guarantees). Immature securities markets also have a tendency to hinder investment.

Georgia, Turkmenistan and Uzbekistan all fall into this category, as they did in 2011. At the same time, it should be noted that Georgia is in the process of establishing a modern PPP framework. In 2016, the Georgian government approved its PPP Policy, and in 2017, a draft PPP Law, both of which were developed with technical assistance from the EBRD. As of late October 2017, the draft PPP Law had been sent to the Georgian parliament and was awaiting adoption and enactment.

Turkmenistan does not have a dedicated piece of legislation governing non-concession PFI-type PPPs. The applicable legislation only partially regulates PPPs and does not sufficiently address most of the assessment criteria. There are, for example, very few provisions governing the selection of private partners, and those that do exist lack transparency.

Findings on effectiveness

The effective implementation of laws is a challenge in many countries. Where countries do not have dedicated legislative frameworks specific to concessions or PFI-type PPPs, or they have low-compliance frameworks, the reasons for such a lack of effectiveness are fairly clear. Investors expect legal certainty regarding the scope of a law's application and may be discouraged if a PPP project is only governed by general laws, such as the country's civil code or an investment law. General laws do not typically provide for mechanisms which ensure bankability, such as feasibility studies, fair compensation in the event of termination, step-in rights, or the option of direct agreements between lenders and the contracting authority to give lenders the opportunity to rectify debtors' failings under project agreements.

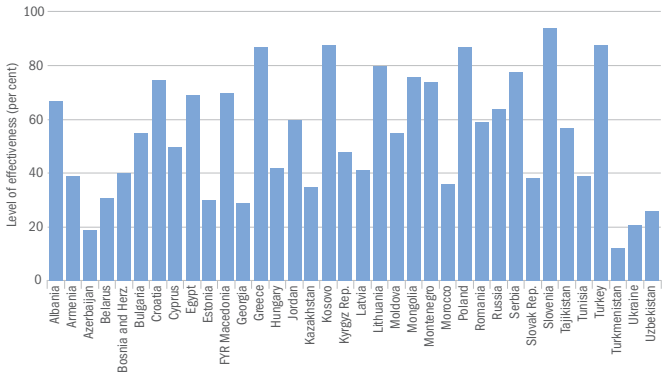
Slovenia is the only country in the EBRD region that has a very high level of effectiveness, with most countries demonstrating moderate, low or very low levels of effectiveness.

The reasons for modest levels of effectiveness even in high-compliance countries seem to be twofold. It may be that some countries have adopted the relevant laws for the purposes of being compliant on paper, but in practice public authorities and local investors do not regard concessions or PFI-type schemes as an effective means of improving their countries' infrastructure. On the other hand, there may be countries where the process of adjusting legislation has been undertaken with a genuine intention to lay the foundations for the effective contracting and performance of concession projects and other PPPs, but no significant transactions have taken place to date.

Countries with compliant laws and mature markets but only a small number of transactions share a number of features: (i) the absence of a strategy or policy document; (ii) a lack of political will; (iii) limited institutional capacity; (iv) insufficient public support; (v) a lack of awareness; and (vi) an absence of proper preparation for projects and/or insufficient funding for such preparatory work.

High-compliance countries such as Croatia and Lithuania have the potential to establish significant numbers of PPPs in the next 10 years. However, the absence of a PPP strategy or policy document demonstrating a clear political will appears to be a major obstacle to further development in this area. Both the general public and civil servants should be educated about the main features of PPPs, which would help to improve PPPs' reputation and address the concerns associated with these models.

CHART A.3.1.2. Effectiveness of political and institutional frameworks and business environments



Source: EBRD (2017).

What can policy-makers do?

Establish a firm policy that will be adhered to irrespective of political developments

A comprehensive policy document and/or clear strategic guidelines will indicate a country's commitment to using PPPs in order to achieve national development goals. Policy documents are particularly welcome in low-compliance countries, but some high-compliance countries also need to make more effort in this area in order to ensure that their policy documents are successfully implemented.

Azerbaijan, Jordan, Russia and Uzbekistan would all benefit from having a strategy document, which would signal their readiness to develop and implement PPP projects. Positive examples in FYR Macedonia, Kosovo, Mongolia, Montenegro and Turkey prove that adherence to a policy document significantly raises the PPP readiness index. Moreover, frequent changes of government may also impede the implementation of policy.

Extol the benefits of PPPs in public

PPP projects need additional promotion, especially in countries with small numbers of transactions, preferably by means of awareness-raising campaigns run at national level.

The public often have limited knowledge about the benefits and advantages of PPPs, which may lead to resistance. PPPs are often regarded as expensive models that favour private partners and facilitate the privatisation of public wealth and services via the back door. This is especially true if PPPs have previously been associated with corruption or negative experiences in the form of failed projects, bad management or a lack of feasibility studies.

The need for an awareness-raising campaign is particularly high in Croatia, Egypt, Jordan and Lithuania, which have high-compliance frameworks but do not make sufficient use of them, partly owing to limited public support for PPPs.

Develop a set of template documents

Even in the presence of well-established legal frameworks, many countries need assistance in order to expedite PPP projects, given their complexity. Template documents (such as tender forms or standard contracts) drawn up by a government PPP unit can provide useful guidance to public entities when it comes to the development and negotiation of PPPs, especially if those template documents incorporate the standards expected by investors.

Such template documents need to be flexible (that is to say, they should be for guidance only), as binding standard contracts are likely to lead to red flags. All countries except Mongolia need to develop template documents, although some countries (particularly Croatia) have been using EU structural funds to develop templates in particular sectors.

Enhance the institutional framework

Countries with well-developed legal frameworks usually have a dedicated unit or body dealing specifically with PPPs. These bodies are established by law and have predefined competences that guarantee their involvement in the selection, oversight and implementation of projects.

The institutional framework is a weak point for most countries with moderate and low levels of compliance. These countries should focus on establishing dedicated bodies which deal solely with concessions and other PPPs. This is particularly true of Estonia and the Slovak Republic.

Having a specialist PPP unit dedicated to the development and supervision of PPP projects can make a real difference when it comes to promoting PPP solutions, concentrating the required expertise in one place and developing it further through targeted initiatives. Such units play a key role in terms of assisting contracting authorities with their PPP projects.

In many countries, it is not particularly clear which authorities are entitled to award PPP contracts. This is especially relevant in countries with decentralised government. In Morocco, for example, municipal authorities do not seem to be entitled to award PPP contracts, whereas regional and national authorities are. This is more than just a theoretical issue, especially when it comes to unsolicited proposals, as potential investors will have difficulty identifying the appropriate authority. Thus, it is important to establish clear and unambiguous rules in this respect to promote PPPs.

Enhance the legal framework

A dedicated legal instrument governing PPPs

In the past, it was common for non-concession PPPs (and even some concessions) to be awarded under general laws (for example, investment laws, civil codes or public procurement laws), but countries now tend to have a dedicated legal instrument governing such arrangements.

All high-compliance countries have dedicated legal frameworks addressing issues such as project selection, tender procedures and contracting in an effective manner. The scope of such frameworks needs to be clearly defined (with clarity, for

example, regarding the definition of a PPP, the sectors concerned, the competent authorities, the eligibility of private entities and the use of public procurement law for selection procedures in EU countries) in order to ensure legal certainty and limit the risk of challenges to the validity of PPP contracts.

Although most countries now have a dedicated legal framework governing PPPs, some do not. Armenia, for example, still relies on general laws when selecting and implementing PPP projects, but it is expected to adopt dedicated legislation in the near future. Bulgaria, meanwhile, is expected to adopt a new Concession Law in the next few months.

Variety/flexibility in terms of models

Some countries adopt a PPP law in addition to a concession law, while others opt for a single piece of legislation covering both concessions and other PPPs. Many countries recognise the need to provide for a wide range of PPP arrangements (including BOT models). Examples of countries providing for a variety of BOT models/concessions and non-concession PFI-type PPPs include Croatia, FYR Macedonia (where only the BOO model is not permitted), Kosovo, Lithuania and Mongolia.

Countries with a limited range of PPP arrangements can be expected to engage in further legislative activity with a view to providing for greater flexibility in terms of models. Azerbaijan, for example, currently only provides for the BOT model, while in Tajikistan it is not clear whether the law covers PPP arrangements where there is no transfer of assets back to the public (as in the case of the BOO model, for instance).

For small projects involving social infrastructure, countries may use the PFI model, but without actually delegating the provision of the public service in question. Such projects are remunerated by means of rent or service fees paid by the contracting authority.

Feasibility studies

An economic feasibility study ascertaining the viability and financial sustainability of a project over the lifetime of the contract (as well as the project's socio-economic benefits and environmental impact) is an essential element of the preparatory process. Many countries (including Albania, Bosnia and Herzegovina, Bulgaria, FYR Macedonia, Jordan, Kosovo, Montenegro, Serbia and Turkey) have recognised the importance of feasibility studies. Albania, for example, has detailed PPP legislation in this regard and requires contracting authorities to thoroughly evaluate PPP projects in the preparatory phase. However, the effectiveness of such legislation in practice remains to be seen and may depend on further guidance, capacity-enhancement measures and other factors.

In many countries, however, such studies are still not mandatory, or the requirements governing them are not clearly specified. In most cases, no such studies are performed, which highlights the need to make feasibility studies mandatory. At the same time, the required evaluation should not be excessively complex or costly.

Feasibility studies can also help to demonstrate that PPP arrangements are the best procurement method for the public sector. In some countries, the relevant legislation refers explicitly to the use of a public-sector comparator, a value-for-money test or another specific and clear evaluation method in order to determine whether a PPP offers significant advantages relative to other forms of procurement. Such tests can play a key role in reducing political resistance to PPPs.

Selection of private partners

Private partners must be chosen by means of a fair and transparent selection process. Exemptions allowing for direct negotiations should be limited, and legislation should contain clear rules on the choice of tender procedure.

Tenderers have a lot at stake when pitching for PPP projects, and the cost of participating in a tender procedure can be very high. Quick and effective legal remedies in the event of appeals against the decisions of the contracting authority will provide valuable protection for investors, while minimising delays to the award process. Past decisions on open legal issues relating to award processes may provide valuable guidance to public officials in future tender procedures. Kazakhstan, the Kyrgyz Republic, Morocco, Turkmenistan and Ukraine are not currently doing enough to provide such legal protection, and Egypt, Tunisia and Uzbekistan could also do more in this regard.

All highly and moderately compliant countries fulfil this requirement, although very few countries have adequately addressed the issue of unsolicited proposals (that is to say, project proposals initiated by the private sector). It is often unclear whether unsolicited proposals are allowed, and if so, how they should be handled. This puts transparency at risk. In Russia, for instance, unsolicited proposals are allowed and enable a contract to be awarded without a tender procedure, provided that there are no other applicants interested in the project.

Some countries still need to work on improving transparency. In Azerbaijan, for example, the relevant legislation does not contain clear rules on the choice of tender procedure, and tender procedures are often not open to all applicants. In Uzbekistan, meanwhile, only foreign investors are allowed to conclude project agreements, placing domestic investors at a disadvantage. Furthermore, some countries do not require their selection committees to document or justify their decisions. In other countries, such as Morocco, public authorities do not have to inform tenderers that they have been excluded from the procedure or rejected at the pre-selection stage, and they are not required to publish the reasons for their decisions.

Establish a "one-stop shop" for permits

Policy-makers often focus solely on the award procedure itself. However, private entities face many other legal issues when it comes to PPPs, particularly as regards the permits required for construction and operations.

Such problems can be addressed by means of a "one-stop shop" incorporating other permits that need to be obtained in connection with the PPP contract. From the perspective of a

private partner (especially a foreign investor), the fact that permits are granted by different authorities (potentially at different administrative levels) or authorities have conflicting competences can represent a major obstacle. Having a single authority to deal with as many permits as possible by means of a single procedure will allow national and international investors to save both time and money. Despite the great practical significance of such issues, only a few countries have applied this concept thus far. Indeed, even very highly compliant countries such as Serbia have not yet implemented this concept.

Provide for reliable security instruments

The bankability of a project is dependent on the availability of reliable security instruments relating to the rights and assets of the private partner in the project and other instruments that can be used to contractually secure the private partner's cash flow in favour of lenders. In order to stabilise a private partner or a project company in turbulent economic times, direct agreements and step-in rights are required. The option of government support and guarantees regarding the contracting authority's proper fulfilment of its obligations will also significantly reduce risks relating to the financing of projects.

Unfortunately, many countries do not give lenders sufficient reassurance in this regard. In a number of countries, statutory rules relating to security instruments do exist (or their creation is, at least, not actively prohibited), but those rules are not sufficiently clear or detailed. This is true, for example, of Armenia, Belarus, Bulgaria, Hungary, Poland, the Slovak Republic and Turkmenistan. In Armenia, Azerbaijan, FYR Macedonia, Tajikistan, Turkey and Turkmenistan, lenders do not have any step in rights. Moreover, although step-in rights do exist in Cyprus, Georgia, Morocco and the Slovak Republic, the rules governing those rights need to be improved.

Meanwhile, in Estonia, FYR Macedonia and Morocco, the relevant legislation neither permits nor prohibits direct agreements between contracting authorities and lenders, and legal conclusions on this matter can only be drawn from the interpretation of general laws. In Romania, the law governing PPPs is similarly silent on this matter. Lastly, the framework governing state support for specific projects needs to be improved (without creating state aid issues) in Bosnia and Herzegovina, Cyprus, Estonia, Georgia, Latvia, Moldova, Morocco, the Slovak Republic and Tajikistan.

Provide for international arbitration and enforcement of arbitral awards

Privately financed infrastructure projects require reliable dispute resolution mechanisms that are trusted by investors. International arbitration is a key dispute resolution instrument, and the absence of a provision enabling international arbitration is sometimes regarded by investors as a deal-breaker or an indication of significant political risk.

While most countries have ratified the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (the "ICSID Convention"), some (such as Russia, Poland and Tajikistan) have not. In Bulgaria, disputes must be settled before national courts, although ICSID protection is available. In Latvia, contracts with state authorities preclude arbitration at national level, but allow international arbitration.

Even in high-compliance countries with legal frameworks that do allow for arbitration, there may, in practice, be resistance to international arbitration. For instance, Jordan's Ministry of Finance appears to be reluctant to accept contracts providing for arbitration if the place of arbitration is not in Jordan, while the private investor involved in Croatia's biggest BOT project had to negotiate long and hard in order to insert an arbitration clause in its contract.

Conclusion

A significant number of countries have amended their legislation since the 2011 assessment, either building on laws adopted prior to 2011 or introducing laws governing non-concession PPPs in addition to existing legislation on concessions.

Highly and very highly compliant countries have the potential to establish significant numbers of PPPs in the next 10 years. However, their current transaction record seems to point to the under-utilisation of such legislation, partly reflecting a perceived lack of political desire to promote the use of PPPs, as well as the need to train public officials.

Moderately compliant countries have supportive business environments and fairly well-developed legal frameworks, providing opportunities for the establishment of PPP projects. However, core areas relating to project selection, tender procedures and the bankability of projects need to be improved further in order to increase transparency and legal certainty.

Lastly, countries with low and very low levels of compliance need to adopt dedicated legislation governing PPPs or improve their legal frameworks in other ways.

All countries should continue to enhance their institutional capacities, preferably by establishing a specialist unit tasked with developing, actively promoting and supervising state-of-the-art PPP solutions.

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EBRD (2017)
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GREEN GROWTH

Sustainable development – and with it, green growth – is now at the centre of the global policy agenda. The EBRD region has witnessed a substantial reduction in aggregate greenhouse gas emissions since the 1990s, but the region's emissions remain substantially higher than those observed in emerging markets with similar characteristics. Stronger policies are needed in order to meet the commitments made under the Paris Agreement, starting with the elimination of energy subsidies. Environmental protection and economic growth can go hand in hand and reinforce each other, but firms in the EBRD region are lagging behind in terms of both environmentally friendly production and trade in environmentally friendly goods and services, with cheap electricity and fuel fostering relatively energy-intensive production structures. Despite this, several countries are well positioned to realise their innovative potential in the area of green growth.

GHG EMISSIONS IN COMPARATOR COUNTRIES ARE

AROUND 20%

LOWER PER US DOLLAR OF GDP THAN THOSE OBSERVED IN THE EBRD REGION

94%

PERCENTAGE OF THE SEMED REGION'S PRIMARY ENERGY SUPPLY THAT WAS ACCOUNTED FOR BY FOSSIL FUELS IN 2015, COMPARED WITH 70% IN THE CEB REGION

7.3%

PERCENTAGE OF TOTAL PATENTS THAT WERE ACCOUNTED FOR BY LOW-CARBON PATENTS IN THE EBRD REGION IN THE PERIOD 2005-15

Introduction

Today, sustainable development – development that meets the needs of the present without compromising the ability of future generations to meet their own needs[1] – is at the centre of the global policy agenda, with the UN's Sustainable Development Goals and the Paris Agreement establishing a common platform for international cooperation in the area of development and climate change. The three main pillars of sustainable development are economic growth, environmental protection and social equality.

This chapter looks at the extent to which environmental protection and economic growth go hand in hand and reinforce each other. The confluence of economic growth and environmental sustainability has become known as "green growth". Green growth supports the creation of wealth, jobs and economic opportunities and contributes to rising living standards, while at the same time preserving natural resources and environmental public goods (such as clean air and water) for future generations. Many international organisations, including the EBRD, are now focused on achieving sustainable, green growth.

Environmental protection can make markets more efficient by correcting market externalities (such as those relating to air quality), while clean innovation can unleash a period of Schumpeterian "creative destruction", triggering a virtuous cycle of reinvention, renewal, investment, market entry and growth.[2] Indeed, there is growing evidence that economic prosperity can be reconciled with environmental concerns. For example, the declining cost of renewables means that they are, in some instances, just as cost-competitive as fossil fuels, particularly when the environmental cost of energy production is factored in.[3] In 2017, Tesla (which makes electric cars, lithium-ion batteries and solar panels) surpassed all traditional car-makers except Daimler, Toyota and Volkswagen in terms of market capitalisation – thanks to its growth potential, rather than its current profitability.

All of the countries in the EBRD region have, to differing extents, made commitments to greener growth,[4] moving away from the cheap energy and chronic environmental neglect of the central planning era. Green growth is seen as an opportunity in environments where traditional sources of growth have largely been exhausted. However, the extent to which environmental commitments will be implemented and achieve the desired outcomes remains to be seen.

This chapter starts by assessing the progress that has been made in the area of greenhouse gas (GHG) emissions.[5] It looks at trends in terms of GHG emissions, the carbon intensity of energy production and the energy intensity of output, contrasting the EBRD region's performance with that of comparator countries with similar economic characteristics. It then examines the role played by policy, looking specifically at energy subsidies, which affect firms' choices when it comes to energy usage.

It then looks at whether producing goods in an environmentally friendly manner or selling green products is also beneficial for firms' financial performance, in addition to the social benefits of greener production. This analysis contrasts the performance of firms in the EBRD region with that of firms elsewhere.

In light of the global policy focus on green growth, this chapter then uses sector-level data to assess the green growth potential of various industries in the EBRD region.

It is worth noting that there are many different aspects of green growth, including low-carbon growth, climate resilience and environmental sustainability. In the EBRD context, countries and projects are assessed in terms of their expected impact on the mitigation of climate change, adaptation to climate change and other environmental areas (see Box 4.1). For reasons of data availability, this chapter often focuses on the low-carbon dimension, but climate resilience and environmental sustainability are just as important.

Progress on reducing GHG emissions

The EBRD region from a comparative perspective

The Paris Agreement on climate change calls for very aggressive reductions in GHG emissions – particularly CO_2 emissions, which account for more than three-quarters of all GHG emissions worldwide. CO_2 is released into the atmosphere through the burning of fossil fuels, solid waste, trees and wood products, and also as a result of certain chemical reactions (those occurring, for example, in the manufacturing of cement).

Since the start of the transition process, the EBRD region has witnessed substantial reductions in GHG emissions, whether emissions are measured in aggregate terms, on a per capita basis or per US dollar of GDP (see Chart 4.1). While this is encouraging, much more remains to be done. Although the region's emissions per capita declined in the 1990s, reaching their lowest point in 2000, they have since increased again.

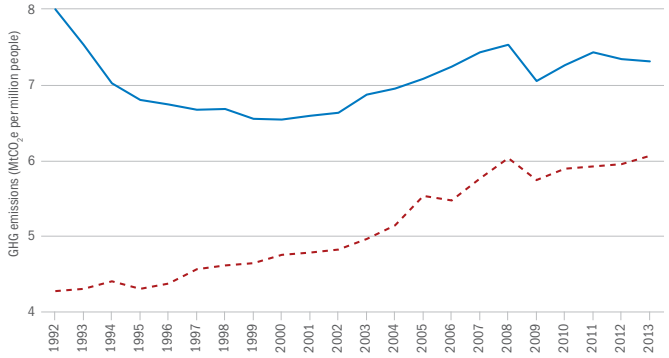
Today, many of the countries in the EBRD region are still among the most carbon-intensive in the world. The region's GHG emissions per capita and per US dollar of GDP remain around 20 per cent higher than in comparator countries – emerging markets that are similar in terms of their populations and per capita incomes (see Chapter 1 for methodological details). This is despite the fact that GHG emissions per capita in comparator countries have been steadily rising since the early 1990s, in contrast with trends in the EBRD region.

Almost 80 per cent of all GHG emissions worldwide originate in the energy sector. There is, of course, significant variation across countries: rich countries' emissions are largely dominated by power and transport, middle-income countries' emissions are shaped by power and industry, and poor countries' emissions stem largely from agriculture. In the EBRD region, the percentage of GHG emissions originating in the energy sector has been relatively stable at more than 70 per cent since the early 1990s.

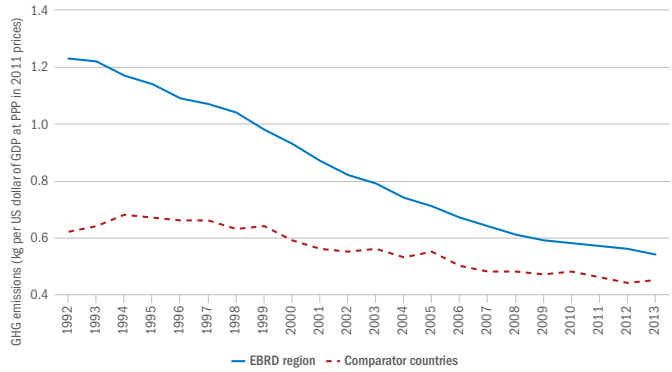
[1] See World Commission on Environment and Development (1987).
[2] See, for example, Bowen and Fankhauser (2011).
[3] See OECD (2017) and The New Climate Economy (2014).
[4] For an overview of climate change legislation, see Nachmany et al. (2017).
[5] The main gases associated with climate change are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and fluorinated gases.

CHART 4.1. GHG emissions per capita and per US dollar of GDP

PANEL A

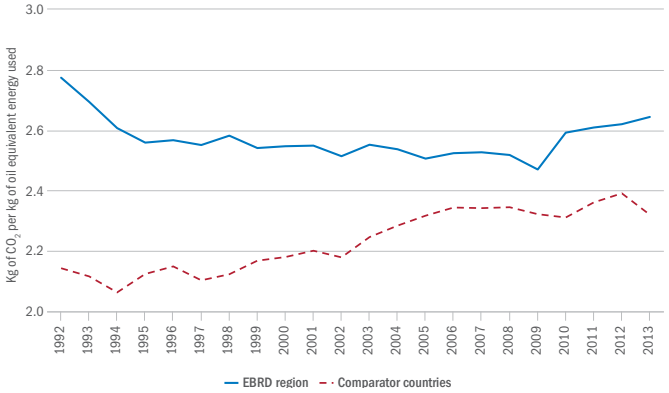


PANEL B



Source: World Resources Institute (2017) and authors' calculations.
Note: Data represent unweighted averages across countries. Comparator countries are emerging markets that are similar in terms of population size and income per capita (see Chapter 1 for details). "$MtCO_2e$" stands for "million metric tonnes of carbon dioxide equivalent".

CHART 4.2. Carbon intensity of the energy sector



Source: WDI and authors' calculations.
Note: Data represent unweighted averages across countries. Comparator countries are emerging markets that are similar in terms of population size and income per capita (see Chapter 1 for details).

In comparator countries, by contrast, the energy sector's contribution to emissions has gradually increased over that period, but it remained below the 70 per cent mark in 2013.

CO_2 accounts for 94 per cent of all energy-related GHG emissions. In order to understand the trends in energy-related CO_2 ($CO_{2,energy}$), it is useful to break total emissions down into their three contributing factors: carbon intensity (carbon emissions per unit of energy E), energy intensity (energy use per unit of GDP) and GDP:

$$CO_{2,energy} = \frac{CO_{2,energy}}{E} * \frac{E}{GDP} * GDP$$

As GDP rises, the carbon intensity of energy production and/or the energy intensity of output have to fall in order for overall carbon emissions to decline. The next two subsections analyse recent trends in carbon intensity and energy intensity.

Carbon intensity in the energy sector

The carbon intensity of the EBRD region's energy sector has declined substantially since 1992 (see Chart 4.2). It remains below the level observed in 1992, despite an upward trend since 2009. In most countries, carbon intensity has either decreased since the early 1990s or remained more or less constant. In Mongolia, however, carbon intensity has more than doubled since 2008 as a result of a mining boom.

That being said, many countries' energy sectors are still among the most carbon-intensive on the planet. Indeed, coal-rich Mongolia's energy sector was the most carbon-intensive in the world in 2013, with its carbon intensity more than 70 per cent higher than that of North Korea (which was ranked second). Meanwhile, Bosnia and Herzegovina, Estonia, Kazakhstan, Jordan, Lebanon, Morocco, Poland, Cyprus and FYR Macedonia were (in declining order of carbon intensity) also in the top 20 economies worldwide in terms of the carbon intensity of their energy sectors.

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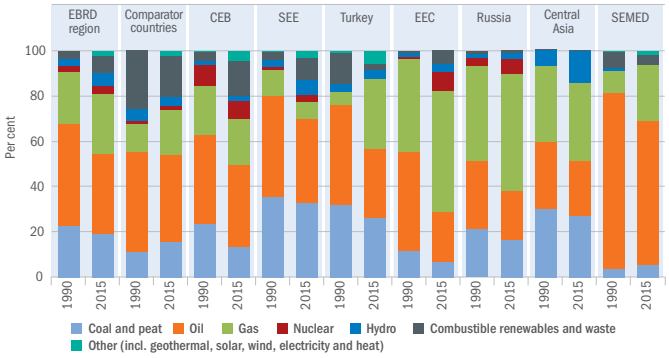
NUMBER OF EBRD COUNTRIES IN THE LIST OF THE 20 MOST CARBON-INTENSIVE ENERGY SECTORS IN THE WORLD IN 2013

In the comparator countries, meanwhile, the carbon intensity of the energy sector has increased over the same period, but remains below the average for the EBRD region. The greater carbon intensity in the EBRD region stems from a combination of two factors. First of all, at the start of the transition process, industry accounted, on average, for 38.4 per cent of GDP in the EBRD region, compared with 36.0 per cent in the comparator countries. And second, despite a shift away from coal and oil towards natural gas,[6] nuclear power and renewables, the EBRD region remains somewhat more reliant on "dirty" fossil fuels than the comparator countries (see Chart 4.3).

Fossil fuels (which include coal, oil and gas) remain the region's primary energy source, being used to generate 81 per cent of its electricity in 2015 (compared with 74 per cent in comparator countries and 66 per cent in the rest of the world). The countries of the southern and eastern Mediterranean (SEMED) have the highest percentage (94 per cent on average – mostly on account of oil), followed by Russia, Turkey and Central Asia. In the SEMED region and Turkey, the use of fossil fuels increased between 1990 and 2015, primarily on account of a substantial rise in the use of natural gas. In central Europe and the Baltic states (CEB), by contrast, that share fell by almost 15 percentage points over the same period, primarily owing to a decline in the use of coal and peat.

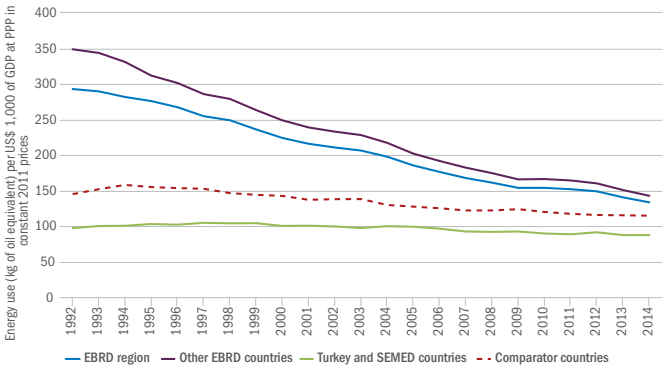
Currently, renewable energy accounts for a small percentage of the total energy supply of the EBRD region, in part because of the weak institutional and regulatory framework for renewables. But Egypt, Mongolia, Turkey and a number of other countries in the region have significant potential to expand the use of wind power, while the SEMED region can tap its exceptional solar-energy resources.

CHART 4.3. Breakdown of primary energy supply by fuel type



Source: IEA data from World Energy Balances.[7]
Note: Data represent unweighted averages across countries. Comparator countries are emerging markets that are similar in terms of population size and income per capita (see Chapter 1 for details).

CHART 4.4. Energy intensity of GDP



Source: WDI and authors' calculations.
Note: Data represent unweighted averages across countries. Comparator countries are emerging markets that are similar in terms of population size and income per capita (see Chapter 1 for details).

Energy intensity of GDP

The energy intensity of GDP is determined largely by the sectoral structure of each economy and the amount of energy that is used to produce a unit of value added in each industry (which reflects the energy efficiency of the various industries), alongside other factors such as weather conditions and the standard of living.

Central planning led to both distortions in the sectoral structure of economies and intrinsic inefficiencies in the use of energy. Consequently, reductions in energy intensity can be traced back to structural changes (shifts towards less energy-intensive economic activities, such as services) and improvements in energy efficiency following the start of the transition process.

The average energy intensity of GDP in the EBRD region has more than halved since 1992. And yet, like carbon intensity, it remains above the level observed in comparator countries (see Chart 4.4). A more nuanced picture emerges when looking at energy intensity by country. Seven EBRD countries of operations were among the 20 most energy-intensive countries in the world in 2014: Turkmenistan, Ukraine, Uzbekistan, the Kyrgyz Republic, Kazakhstan, Russia and Moldova (in declining order of energy intensity). On the plus side, each of those countries had reduced its energy intensity relative to the early 1990s, primarily due to industry accounting for a smaller percentage of GDP. Similarly, services on average accounted for more than half of total value added in those countries in 2014, up from less than 35 per cent in 1990.

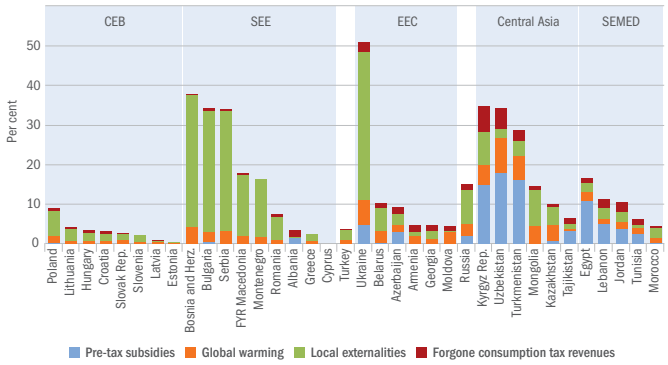
At the level of the EBRD region as a whole, the reduction in the energy intensity of GDP has been driven primarily by improvements in energy efficiency within individual sectors.[8] In Turkey and the SEMED countries, energy intensity has exhibited only a slight downward trend, reflecting the fact that their energy intensity levels were already low at the start of the period when compared with post-communist economies. In that region, only Jordan saw its energy intensity fall by more than 25 per cent in the period 1992-2014, with that decline coming as a result of

[6] Natural gas is also a fossil fuel, but it is cleaner than coal and petroleum products.

[7] Based on IEA data from World Energy Balances 2017, © OECD/IEA 2016, www.iea.org/statistics, licence www.iea.org/t&c; as modified by the EBRD.

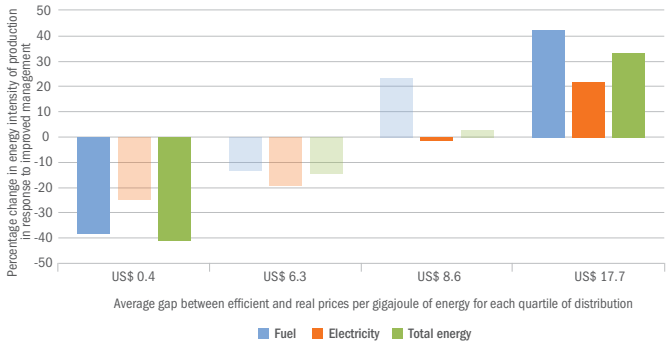
[8] See EBRD (2011).

CHART 4.5. Fossil fuel subsidies as a percentage of GDP



Source: IMF Energy Subsidies Template and authors' calculations.
Note: These estimates relate to 2013 and include both consumption and production-related subsidies (inclusive of tax treatment). No data are available for Kosovo.

CHART 4.6. Relationship between management practices, energy intensity and energy subsidies



Source: IMF, BEEPS V, MENA ES and authors' calculations.
Note: This chart reports the impact associated with improving the quality of management from the 25th to the 75th percentile of the distribution of management scores. Energy intensity is calculated as the energy cost per US dollar of sales, based on energy-intensive manufacturing industries only (see Box 4.2 for details). Solid bars denote estimates that are statistically significant at the 10 per cent level or higher.

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NUMBER OF EBRD COUNTRIES IN THE LIST OF THE 20 MOST ENERGY-INTENSIVE ECONOMIES IN THE WORLD IN 2014

a shift towards non-electricity-intensive industries, as well as improvements in industries' energy efficiency.[9]

The lower levels of energy intensity in SEMED countries do not necessarily reflect more labour intensive production processes. In fact, manufacturers in the SEMED region with at least five employees have lower labour intensity and higher capital intensity than manufacturers in other countries with similar levels of development.[10] In the absence of investment in energy efficiency measures, this could lead to increases in energy usage and GHG emissions in the future.

Management and energy intensity: the role of energy subsidies

When it comes to energy-efficient production structures, firms' choices are influenced by their countries' energy policies. Several countries in the EBRD region that are heavily reliant on fossil fuels for their energy supply subsidise fossil fuels and electricity generated from fossil fuels. With the exception of Cyprus, no countries in the region take account of costs associated with global warming, local externalities or forgone consumption tax revenues when setting energy prices (see Chart 4.5). This is a key policy distortion that makes fossil fuels (and electricity generated from them) cheaper for both households and firms, in turn affecting behaviour in terms of energy usage. According to the IMF, the EBRD region's fossil fuel subsidies had a total value (excluding tax treatment) of US$ 112 billion in 2013 (equivalent to 1.7 per cent of the region's GDP), while subsidies including tax treatment totalled US$ 699 billion (11.7 per cent of GDP).[11]

In order to investigate the relationship between energy subsidies and energy efficiency, the analysis in this chapter uses data on the energy costs and management practices of individual firms derived from the fifth round of the Business Environment and Enterprise Performance Survey conducted by the EBRD and the World Bank (BEEPS V) and the Middle East and North Africa Enterprise Survey conducted by the EBRD, the EIB and the World Bank (MENA ES), combined with other sources.[12] Energy subsidies are calculated as the difference – referred to as the "price gap" – between the efficient energy price (which takes account of the direct and environmental costs of energy) and the actual price level for each country. In order to account for the fact that firms with high levels of energy intensity are more likely to benefit from subsidies, this analysis looks only at highly energy intensive sectors.

Overall, there is no statistically significant relationship between the quality of management practices and energy intensity, but the picture changes dramatically once the price gap is taken into account (see Box 4.2 for details). Improving the quality of management practices from the 25th to the 75th percentile of the distribution of management quality is associated with an increase of almost one-third in the energy intensity of production in countries with high energy subsidies – namely, those in the top 25 per cent of the relevant distribution (where the price gap averages US$ 17.7 per gigajoule of energy). In sharp contrast, the same improvement in management quality in countries where subsidies are negligible is associated with a *reduction* of more than 40 per cent in the energy intensity of production (see Chart 4.6).

[9] See Al-Ghandoor (2012).
[10] See EBRD et al. (2016).
[11] See Coady et al. (2017).
[12] See Schweiger and Stepanov (2017) for details.

These results indicate that although higher-quality management practices are associated with improvements in firms' productivity, they may be linked to declines in environmental performance in the absence of incentives to economise on energy usage. Well-managed firms use energy inputs more efficiently, increasing productivity and reducing GHG emissions at the same time – but only when energy prices are not distorted by subsidies. Thus, governments that wish to reduce GHG emissions and their country's carbon footprint should not only consider adopting climate change-related legislation, but also bear in mind the profound impact that energy prices can have on firms' behaviour.

The characteristics of green firms and their performance

Firms can reduce production-related emissions by manufacturing goods in a more environmentally friendly manner or by shifting production in favour of products and services that are better for the environment. For the economy to grow sustainably, resources need to be reallocated from less productive "dirty" firms to more productive green firms, as discussed in Chapter 2. While there are few studies looking at the impact that environmentally friendly goods have on firms' performance levels, the impact of environmentally friendly production methods has been studied extensively.[13] However, evidence for the EBRD region is scarce in both areas. This section aims to at least partially fill that gap.

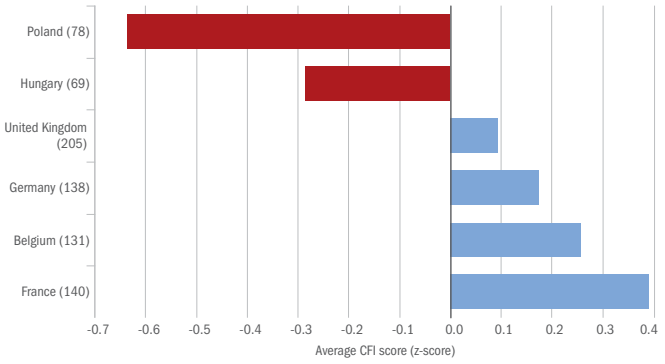
Green production

This subsection investigates the link between environmentally friendly production methods and firms' performance levels using data from the survey carried out by Anderson et al. (2011). That survey, which consisted of almost 800 telephone interviews with managers of manufacturing plants and addressed a variety of climate change-related topics, covered Hungary and Poland, as well as Belgium, France, Germany and the United Kingdom.

Firms' green credentials are quantified using a Climate-Friendliness Index (CFI) – a summary measure combining a variety of different aspects, ranging from firm-level targets for GHG emissions and energy usage to climate-related product and process innovation (see Box 4.3 for details). On the basis of that measure, firms in Hungary and Poland are, on average, less environmentally friendly than their western European counterparts (see Chart 4.7).

Efforts to tackle climate change are sometimes regarded as coming at the expense of economic success, at least in the short run. However, several studies point to win-win opportunities when it comes to environmentally friendly behaviour and growth. The analysis in this chapter supports this view. The estimates in Table 4.1 suggest that improving the average firm's green credentials by 1 standard deviation is associated with an 8.2 per cent increase in labour productivity, all else being equal. This effect is even larger in Hungary and Poland, where the relevant increase in labour productivity is close to 40 per cent.

CHART 4.7. Climate-Friendliness Index



Source: Martin et al. (2017).
Note: Figures in parentheses denote the number of respondent firms per country. Average z-scores are obtained by regressing CFI scores on a set of country dummy variables, controlling for three-digit industry fixed effects, as well as various interview characteristics, and measuring the deviation of a country's coefficient from the average across all country coefficients. The differences for France and Poland are statistically significant at the 1 per cent level.

TABLE 4.1. Labour productivity and the CFI

	(1)	(2)
Dependent variable	**Labour productivity (log)**	
CFI	0.079***	0.050*
	(0.027)	(0.028)
Poland/Hungary * CFI		0.331**
		(0.160)
Observations	715	715
R^2	0.6	0.61

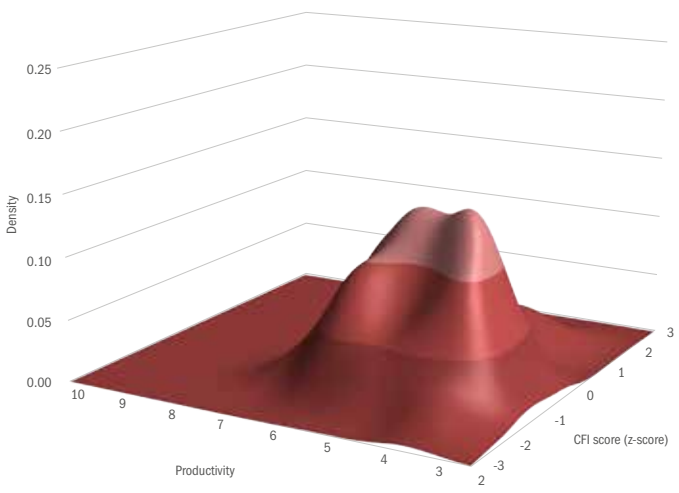
Source: Martin et al. (2017).
Note: Estimated using ordinary least squares. Labour productivity is defined as the ratio of average turnover to average employment in the period 2006-10. All regressions include country and industry fixed effects (see Box 4.3 for details). Standard errors are shown in parentheses. *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively.

33%
INCREASE IN ENERGY INTENSITY OF PRODUCTION ASSOCIATED WITH IMPROVED MANAGEMENT IN COUNTRIES WITH HIGH ENERGY SUBSIDIES

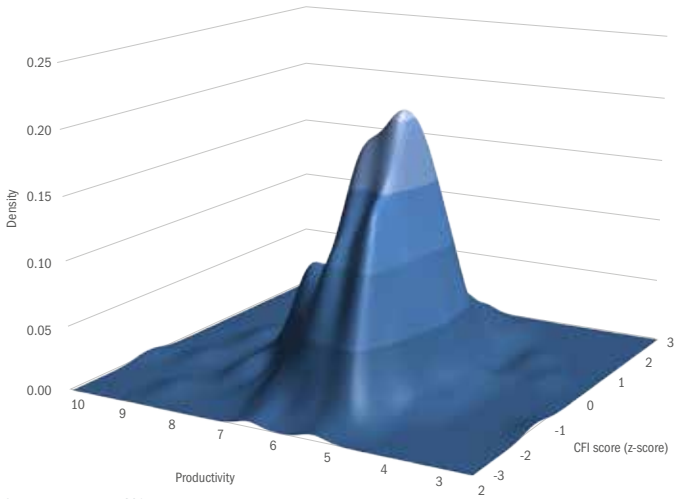
[13] See Ambec and Barla (2006) for an overview. More recently, Endrikat et al. (2014) and Friede et al. (2015) point to a positive (or at least a non-negative) relationship between environmentally friendly production and firms' performance levels, while Trumpp and Guenther (2017) find a U-shaped relationship between carbon emissions and financial performance.

CHART 4.8. Labour productivity and CFI scores: density plots

Panel A: Central Europe (Hungary and Poland)

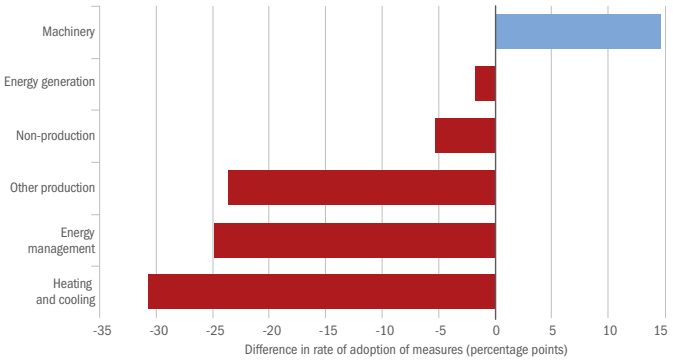


Panel B: Western Europe (Belgium, France, Germany and the United Kingdom)



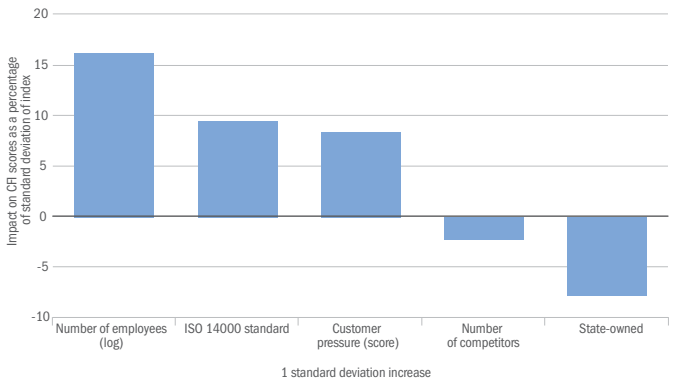
Source: Martin et al. (2017).
Note: Labour productivity is defined as the ratio of average turnover to average employment in the period 2006-10.

CHART 4.9. Adoption of energy-saving measures by central and western European firms



Source: Martin et al. (2017).
Note: See Box 4.3 for methodological details. All differences are statistically significant at the 10 per cent level or higher.

CHART 4.10. Main determinants of CFI scores



Source: Martin et al. (2017).
Note: Data represent standardised coefficients and are based on a regression estimated using ordinary least squares. All regressions include country and industry fixed effects (see Box 4.3 for details).

A closer look at the data suggests that the stronger relationship in central Europe might be due to a higher percentage of firms with low productivity,[14] as less productive firms also tend to be less environmentally friendly. The density plot in Panel A of Chart 4.8 reveals a significant proportion of firms with low productivity and low CFI scores in central Europe, while no such bulge can be seen in the distribution for western Europe.

The stronger relationship between low productivity and low CFI scores in central Europe is largely driven by the measures subcomponent of the CFI. Indeed, firms in central Europe are significantly less likely to adopt energy-saving measures (beyond those relating to machinery) than their western European counterparts (see Chart 4.9).

It is also driven by the innovation and targets subcomponents. Having R&D facilities on site[15] is positively and significantly correlated with productivity for central European firms, but not for their western European counterparts. While most western European firms in the sample do some form of R&D, many of the firms in central Europe that do no R&D are also underperforming.[16] Analysis of the targets subcomponent suggests that low productivity firms in central Europe are not doing enough to measure their energy consumption properly.

Given the strong link between productivity and climate friendliness, it is interesting to see which factors contribute most to such scores. The most important determinant of the degree of climate friendliness is the size of the firm (see Chart 4.10), followed by the adoption of an environmental management

[14] As indicated in Chapter 2 and EBRD (2014).

[15] This R&D indicator is not part of the CFI innovation score and has been included as a separate variable.
[16] According to BEEPS V, firms in Hungary and Poland tend to buy technology, with the percentage of firms engaging in in-house R&D remaining modest (see Veugelers and Schweiger, 2016).

system such as the ISO 14000 standards developed by the International Organization for Standardization (ISO), which provide a framework for firms looking to manage their environmental responsibilities. Indeed, firms that go through this voluntary certification process often do so in order to signal their commitment to protecting the environment.

Customer pressure also plays a role. If customers voice concerns about a firm's emissions or request related data, that will encourage the firm to act in an environmentally friendly manner. At the other end of the scale, state-owned firms tend to be less environmentally friendly, perhaps because they enjoy greater monopoly power.[17] For firms in central Europe, the single most important determinant of climate friendliness is the presence of R&D facilities on site.

Policy-makers can foster environmentally friendly behaviour by helping to create an environment in which successful SMEs can scale up production. As discussed in Chapter 2, SMEs in the EBRD region have fewer opportunities to grow. At the same time, larger firms are more likely to act in an environmentally friendly manner. Policy-makers can encourage firms to become more environmentally responsible by adopting stringent regulations on the measurement of energy usage or by making it easier for firms to access environmentally friendly technology. In addition, the power of customer pressure can be harnessed by requiring firms to publish a few key indicators of their impact on the environment. Some of these measures are likely to have a positive effect on environmental performance in return for a comparatively small outlay. In addition, governments can support green corporate R&D and strengthen links between industry and science in the area of green growth.

Green revenue and trade

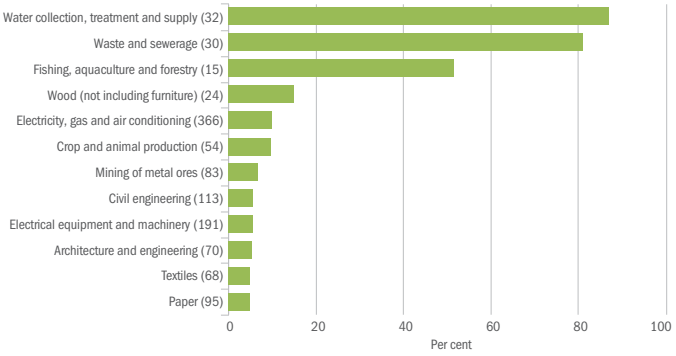
Having looked at *how* firms produce goods, this section now turns its attention to *what* they produce, looking specifically at products that help to mitigate, remediate or adapt to the negative consequences of climate change, resource depletion and environmental erosion. This subsection assesses the link between sales of green products and firms' performance levels using FTSE Russell's Low-Carbon Economy (LCE) database and Bureau van Dijk's Orbis database. The LCE data define green products far more broadly than the title of that database might suggest (see Box 4.4 for details), with products ranging from flood barriers and electric cars to sustainably sourced crops.

On the basis of conservative estimates, less than 1 per cent of the revenue achieved by firms in the EBRD region in 2015 was generated in green sectors, compared with 4.2 per cent in comparator countries (albeit this needs to be interpreted with caution, as the sample for this calculation only includes 194 firms in seven EBRD countries).

While firms generate green revenue in a whole range of different industries, their activities tend to be concentrated in a small number of sectors (see Chart 4.11). While green revenue is highest (as a percentage of total revenue) in utility sectors such as water and waste collection, sewerage, and energy supply, sizeable amounts of green revenue are also generated in forestry and agriculture, engineering and some manufacturing sectors.

At the level of individual firms, companies with moderate amounts of green revenue (that is to say, green revenue is generated, but it accounts for less than half of total revenue) tend, on average, to be older and larger in terms of turnover and employment than firms with no green revenue at all. These companies may be diversifying their revenue sources as part of a long-term strategy or seeking to satisfy investors who are becoming more environmentally aware. In contrast, firms where green revenue accounts for more than 50 per cent of total revenue tend, on average, to be significantly smaller and younger than firms with no green revenue, pointing to the presence of large numbers of innovators.

CHART 4.11. Green revenue as a percentage of total revenue in 2015



Source: FTSE Russell's LCE database, Bureau van Dijk's Orbis database and authors' calculations.
Note: Figures in parentheses denote the number of firms per industry.

TABLE 4.2. Average characteristics of firms by green revenue share in 2015

	Green revenue		
	None	Up to 50%	More than 50%
Turnover (€ million)	3,414	5,611	1,764
Number of employees	13,016	17,930	6,963
Age of firm (years)	35.1	51	26.9
Number of firms	6,125	484	216

Source: FTSE Russell's LCE database, Bureau van Dijk's Orbis database and authors' calculations.
Note: Data represent simple averages across firms.

[17] There are no Hungarian or Polish state-owned firms in the sample.

CHART 4.12. Firms' average performance levels by green revenue share

Source: FTSE Russell's LCE database, Bureau van Dijk's Orbis database and authors' calculations.
Note: Data represent simple averages across firms.

TABLE 4.3. Green revenue shares and firms' performance

Dependent variable	(1) Turnover per employee (US dollars; log)	(2) Return on equity (%)	(3) Return on assets (%)	(4) Turnover growth (%)
Firms with up to 50% green revenue	-0.082	0.623	-0.492	-9.284***
	(0.157)	(3.422)	(1.548)	(2.397)
Firms with more than 50% green revenue	-0.367*	-6.006	-3.667	9.387**
	(0.219)	(5.338)	(2.404)	(4.595)
Constant	14.516***	-6.105	1.314	27.285***
	(0.180)	(3.913)	(2.045)	(6.388)
R^2	0.39	0.10	0.10	0.16
No. of observations	47,793	47,802	47,802	41,264
No. of firms	8,583	8,585	8,585	8,504

Source: FTSE Russell's LCE database, Bureau van Dijk's Orbis database and authors' calculations.
Note: Estimated using ordinary least squares. All regressions take account of country, year and industry fixed effects, as well as firm age, firm age squared, the log of the number of employees, indicators of state ownership, the number of companies in the group, the number of shareholders and whether the firm is listed or delisted (as opposed to unlisted), as well as interaction terms for selected variables and green revenue categories. Robust standard errors, clustered at firm level, are indicated in parentheses. *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively.

Does it pay to produce green goods? Firms with green revenue tend, on average, to exhibit the same labour productivity as firms with no green revenue. Meanwhile, firms where green revenue accounts for more than 50 per cent of total revenue experience stronger sales growth (see Chart 4.12). However, those firms tend to be less profitable: the average return to equity for firms with large amounts of green revenue is just over one-third of that observed for firms with no green revenue. Similar patterns emerge once various firm-level characteristics and country, industry and year fixed effects are taken into account in regression analysis – although, with a few exceptions, differences in performance levels are not statistically significant (see Table 4.3).

On balance, producers of green products appear to be less profitable than other firms in the same sectors, perhaps partially on account of these firms being more recent entrants into the market. They tend to have higher valuations even if their current return on equity is lower than for their non-green peers. This suggests that investors expect higher future returns in this sector and put a premium on firms' environmental performance. In 2017, for instance, Tesla (which makes electric cars) surpassed leading traditional car-makers such as Ford, General Motors and BMW in terms of market capitalisation – thanks to its growth potential, rather than its profitability.

There is also evidence that firms with green revenue are less leveraged than non-green firms. This suggests that green investments are seen as risky and may be shunned by traditional lenders. As a result, firms with green revenue need to rely more on equity as a source of financing (see also Box 4.5).

Future prospects for the green economy

While green revenue currently accounts for only a small percentage of firms' total revenue, the green economy has substantial growth potential. Global trade in low-carbon goods and services probably already exceeds US$ 1 trillion (see Box 4.6), and it can be expected to increase substantially over the next few decades[18] if the global decarbonisation objectives agreed under the Paris Agreement are pursued.

This raises the question of how well prepared the EBRD region is for the advent of the low-carbon economy. In order to answer that question, this section looks at countries' ability to convert existing production processes to low-carbon equivalents and develop the new goods and services that a low carbon economy will demand.

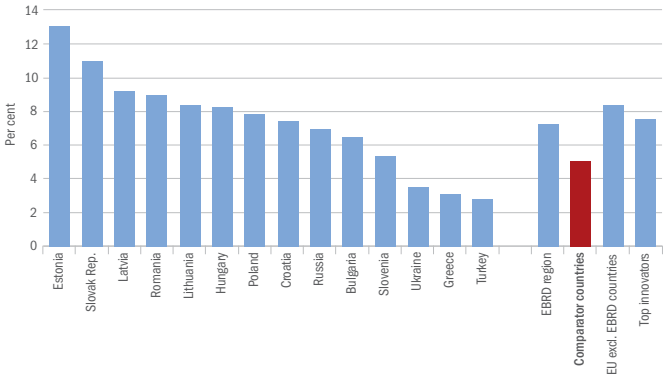
Progress in the area of low-carbon innovation

One useful indicator of the potential for a shift to a low-carbon economy is the degree of low-carbon innovation, which indicates the effort that is currently being put into developing clean products and processes for the future. Low-carbon innovation can be measured using the number of clean patents filed in a country. The European Patent Office (EPO) has a widely used classification system which identifies technological innovations that seek to mitigate climate change, distinguishing between clean patents relating to the energy sector, transport, buildings and carbon capture.[19]

Patents are not a perfect indicator of clean innovation, and clean innovation, in turn, is not a perfect indicator of countries' ability to convert to low-carbon production. Innovations are not always patented, especially in the case of new processes. Moreover, many successful firms are early adopters of clean products, rather than their inventors, and many countries may lack the economies of scale and the skills base that are required to become leading product innovators.[20] Indeed, the total number of patents filed in the EBRD region (both dirty and clean) remains relatively low.

Nevertheless, the link between green patenting and low-carbon innovation is strong, making this an informative – if imperfect – indicator of countries' ability to convert to a low-carbon economy. Estonia and the Slovak Republic have the most clean patents in the EBRD region as a percentage of total patents (see Chart 4.13). Indeed, with low-carbon patents accounting for more than 10 per cent of all patents, these countries are – on this measure, at least – among the world's cleanest innovators, on a par with countries such as France and Germany. In absolute terms, however, the number of green patents issued in these countries is small. Latvia, Romania, Lithuania and Hungary – and, to a lesser extent, Poland and Croatia – also perform relatively strongly, with clean patents accounting for more than 7 per cent of total patents. Turkey has the highest total number of patents, but less than 3 per cent of those are classified as clean.

CHART 4.13. Low-carbon patents as a percentage of total manufacturing patents, 2005-15



Source: EPO and authors' calculations
Note: Only countries with more than 100 patents over this period are included here. "Top innovators" denotes the 20 countries with the highest total numbers of patents worldwide. See Chapter 1 for a definition of comparator countries.

A SWOT analysis of low-carbon competitiveness

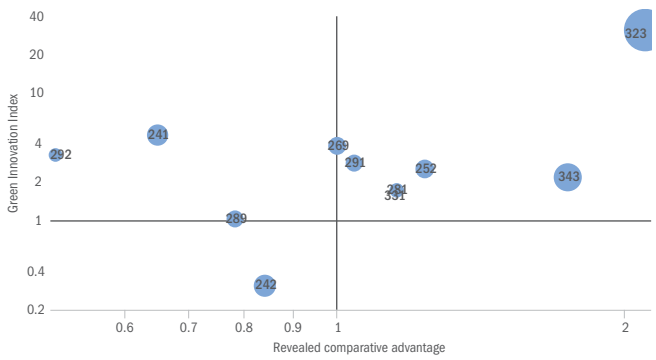
In order to obtain a more comprehensive picture of the economic opportunities and threats arising from a transition to a low-carbon economy, countries' performance in the area of low-carbon innovation can be compared with their current areas of comparative advantage. The interplay between low-carbon innovation and current comparative advantages helps to identify potential strengths, weaknesses, opportunities and threats (SWOTs) in individual countries and specific manufacturing sectors with meaningful levels of overall patenting activity (see Box 4.7 for methodological details and Annex 4.1 for a list of industries). Chart 4.14 presents the results of this SWOT analysis for the six countries in the EBRD region with the highest overall numbers of patents.

This analysis suggests that Hungary, Poland and Slovenia are relatively well placed to embrace the low-carbon economy. Although Hungary's main manufacturing sectors file relatively few patents, a reasonable percentage of these are clean, resulting in a range of low-carbon strengths (see top right quadrant) and opportunities (see top-left quadrant), including energy-efficient communication products (industry code 323). Poland and Slovenia both have good prospects in sectors such as chemicals (241-242) and plastics (252), and Poland is also well placed in terms of mineral products (269), while Slovenia is well positioned as regards accessories for motor vehicles (343). However, there are threats to Poland's crucial meat and food processing industry (151) and Slovenia's machinery sector (292).

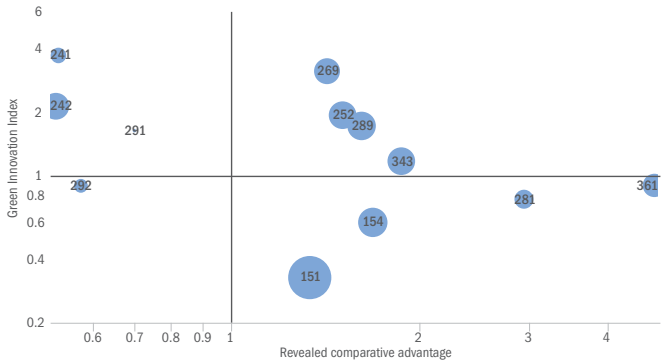
[18] See Haydock et al. (2017).
[19] For details, see www.epo.org/news-issues/issues/classification/classification.html.
[20] See EBRD (2014).

CHART 4.14. Low-carbon competitiveness: strengths, weaknesses, opportunities and threats

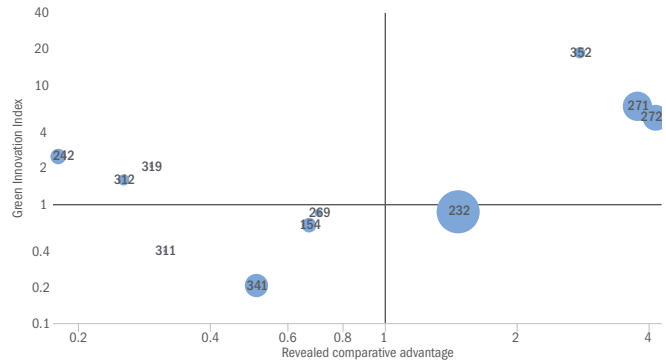
HUNGARY



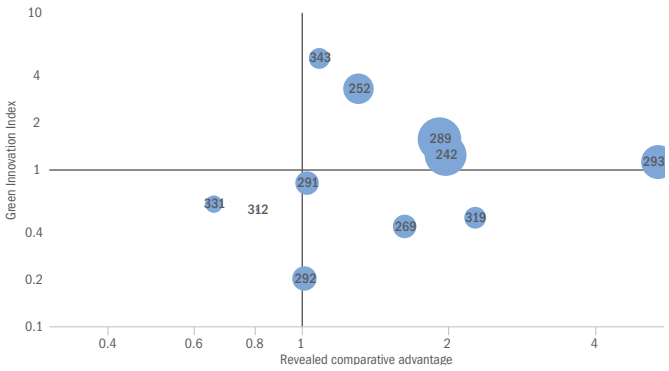
POLAND



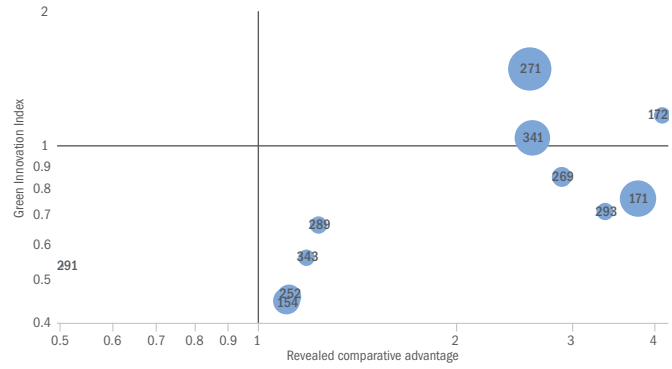
RUSSIA



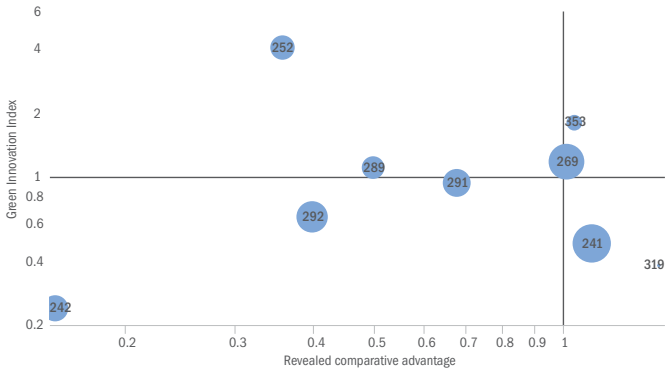
SLOVENIA



TURKEY



UKRAINE



Source: UN Comtrade database, EPO, UNIDO INDSTAT4 2017 ISIC Rev. 3 and authors' calculations.
Note: For both the Green Innovation Index and revealed comparative advantage, a score of more than 1 signifies performance above the global average (see Box 4.7 for details). The size of each dot is proportionate to the relevant sector's contribution to national GDP. This chart covers the 12 largest manufacturing sectors in each country (on the basis of gross value added) which have filed at least 30 patents (11 sectors in the case of Hungary). See Annex 4.1 for a list of sector codes.

For both Turkey and Ukraine, however, the low-carbon economy presents many more threats than opportunities. High-performing sectors include iron and steel (271) and textiles (172) in Turkey and plastics (252) and air/spacecraft (353) in Ukraine, but most other sectors are underperforming in the area of clean innovation. Ukraine's crucial iron and steel sector has a low level of innovation overall – too low to be included in this analysis – with just one low-carbon patent being filed in the past 10 years.

Russia falls between these two groups of countries, faring far better than Turkey and Ukraine, but with fewer strengths and opportunities than the three EU countries. Metals (271-272) are an important area of strength, but the country's crucial petroleum products sector (232) has an innovation score that is slightly below average, so it falls into the threats category.

These patterns are merely indications of potential trends. In many transition countries, the link between science and industry is weak and patents do not necessarily translate into new products. In Poland, for example, more than one-third of all patents issued in the period 2000-10 were held by universities or research institutes.[21] On the other hand, some countries in the EBRD region may be well placed to benefit from low-carbon innovation in the future on account of existing production structures (see Box 4.8).

Conclusion

At the start of the transition process, the EBRD region was an outlier relative to comparator countries with similar levels of development, not only in terms of its industrial structure, but also in terms of the amount of GHG emissions that resulted from it. Encouragingly, aggregate GHG emissions have fallen since the 1990s, but they remain above the levels observed in equivalent comparator economies. Moreover, reductions in emissions have been driven primarily by increases in energy efficiency, rather than reductions in the carbon intensity of energy production. If the EBRD region is to unlock further reductions in emissions and meet its commitments under the Paris Agreement, its carbon intensity will need to fall considerably and its energy efficiency improvements will need to continue.

Putting economies on the path to green growth will require strong policies and strict implementation, starting with the elimination of energy subsidies and the introduction of reasonable carbon pricing. It will also require a strengthening of the institutional and regulatory frameworks for renewable energy. When electricity and fuel are subsidised, well-managed firms choose more energy intensive production structures, resulting in higher emissions. In contrast, when energy is appropriately priced, well-managed firms respond to price signals and reduce their emissions. Energy subsidies tend to be concentrated in countries that are heavily reliant on fossil fuels as a source of export revenue.

The transition to a green economy will be particularly challenging for the fossil fuel-rich countries where it may be necessary to adopt special policies in order to replace lost income (see Box 4.9). Meanwhile, other parts of the EBRD region are relatively well placed to achieve success in the low-carbon economy. There is evidence of green innovation in a number of areas, despite countries continuing to lag behind the technological frontier in terms of emissions, environmentally friendly production processes and the production of green goods.

While sales of green goods and services are still at a relatively low level, volumes are growing rapidly. Among publicly listed firms, green revenue is typically higher among smaller, younger firms. Firms with a large percentage of green revenue tend to be less profitable, partly because the business environment favours non-green products. The fact that such firms are in business is encouraging and suggests that investors expect higher future returns in this sector and put a premium on firms' environmental performance.

Realising the region's green growth potential will not be without challenges. It will require determined, far-sighted management and a willingness by the private sector to embrace the low-carbon economy. It will also require better policies on the part of governments. The private sector will look to governments to provide a business environment that is conducive to low-carbon investment. This should start with the removal of energy subsidies and the introduction of appropriate pricing of carbon emissions, but also include regulatory measures (such as efficiency standards) to encourage energy saving, policies to promote renewable energy, and the use of subsidies to promote low-carbon technology. In addition, more comprehensive social safety nets and retraining opportunities may be required in order to soften the structural impact of transition to a low-carbon economy. With the right policies in place, investment will start to flow to cleaner, more sustainable and more productive firms.

ENERGY SUBSIDIES
TEND TO BE CONCENTRATED IN COUNTRIES THAT ARE HEAVILY RELIANT ON FOSSIL FUELS

[21] See Veugelers and Schweiger (2016).

Box 4.1. Assessing "green transition"

The EBRD's mandate is to foster sustainable market economies that are competitive, well governed, green, inclusive, resilient and integrated. With this in mind, a green index has been developed in order to quantify the performance of countries in the EBRD region in the area of "green transition". In line with the EBRD's operational strategy for green investment, this index comprises three equally weighted categories: mitigation of climate change, adaptation to climate change and other environmental areas.

The green index is based on a combination of physical and structural indicators, each normalised on a scale of 0 to 10, with 10 indicating the best performance. Physical indicators reflect environmental performance (for example, current and projected water stress), while structural indicators reflect regulatory or market responses to problems (such as water pricing). Physical indicators account for 35 per cent of the index, with structural indicators accounting for the remaining 65 per cent.

Each indicator is assessed relative to the performance of a "frontier country" (defined as the top performing OECD country in that area), with the various countries in the EBRD region being assessed in terms of their proximity to that frontier. Sweden, for example, is the frontier country for industrial emissions, with the Czech Republic, Germany and the United States of America acting as comparators for other indicators.

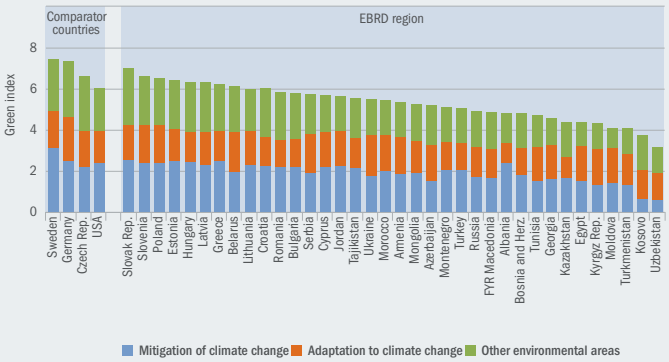
Results

The results of this analysis reveal that even the best-performing countries worldwide are some distance from the overall frontier when scores are averaged across all areas of the green economy (see Chart 4.1.1). Sweden tops the list, achieving a relatively modest score of 7.5 out of 10. Thus, all countries need to make more effort to tackle environmental concerns, notably the high level of CO_2 emissions.

As regards the EBRD region, countries that are part of the EU perform best, with the CEB region leading the way. The Slovak Republic achieves the highest score (7.1), followed by Slovenia (6.7) and Poland (6.6). At the other end of the scale, the fossil fuel-rich countries of Central Asia record the lowest scores on account of poor regulatory/market responses to environmental concerns and very high CO_2 emissions per unit of GDP.

This composite indicator has a number of limitations. First of all, given the time lags involved in the compilation of statistics, it may not capture the most recent developments in the area of green transition (such as the reduction seen in political support for renewables in Poland and various other EU countries). Second, the index focuses largely on commitments and objectives. Measuring the effectiveness of legislation is a more complex task. A final caveat concerns the limited number of indicators used to assess adaptation to climate change, as well as their simplistic and binary nature.

CHART 4.1.1. Breakdown of green index scores



Source: World Bank, IEA (see footnote 7), EIA, World Health Organization, World Resources Institute, International Carbon Action Partnership, IMF, OECD, EBRD, ND-GAIN, CGIAR, Waste Atlas, IUCN Red List of Threatened Species, United Nations Environment Programme, United Nations Statistical Division, National Geographic and authors' calculations.
Note: In the case of Kosovo, data are not available for all underlying indicators.

Box 4.2. Energy intensity, management practices and energy subsidies

The relationship between energy intensity, the quality of management practices and the difference between the efficient energy price and its actual level can be estimated using ordinary least squares and survey-weighted observations on the basis of the following specification:[22]

$$(EE/S)_{ic} * 100 = \beta_0 + \beta_1 M_{ic} P_c + \beta_2 M_{ic} + \beta_3 P_c + \boldsymbol{\gamma}' \mathbf{Z_{ic}} + \sum_{c=1}^{C} \delta_c D_c + \sum_{s=1}^{S} \delta_s D_s + \varepsilon_{ic}$$

where EE and S denote energy expenditure and total sales respectively for firm i in country c. EE is measured as fuel expenditure, electricity expenditure or the total of the two. P is the difference between the efficient price of fuel, electricity or total energy and its actual level.

Efficient energy prices take account of the cost of supplying energy, as well as the estimated costs of any externalities arising from energy usage (such as global warming, local air pollution, road congestion, car accidents and damage to roads).[23] The actual price of fuel is the average of gasoline, diesel, kerosene, coal and natural gas prices and is calculated per gigajoule of energy. If the efficient price exceeds the actual price, the difference is attributed to energy subsidies.

The variable of interest is the management practices score M. Control variables include country (D_c) and sector (D_s) fixed effects, firm-level characteristics (sales, capital, labour, age of firm, ownership structure, access to credit, whether the firm is a shareholding company with shares traded on the stock market, percentage of employees with a university degree, capacities utilised and self-generated electricity) and characteristics of the firm's vicinity that could affect energy use (intensity of night lights and average January and July temperatures). The regression uses Taylor-linearised standard errors that account for survey stratification.

This analysis focuses on highly energy-intensive manufacturing industries (which are more likely to benefit from energy subsidies), looking at textiles, paper and paper products, coke and refined petroleum products, chemical products, non-metallic mineral products and basic metals.[24]

The focus is on coefficient β_1, which indicates the relationship between management practices and firms' energy intensity with subsidies at different price-gap levels. Chart 4.6 indicates the economic impact of this coefficient for a hypothetical firm with energy intensity equal to the sample mean, reporting the estimated change in the firm's energy intensity in the event of its management score improving from the 25th to the 75th percentile of the distribution of management quality.

Box 4.3. Assessing firms' green credentials

As part of the survey carried out by Anderson et al. (2011), almost 800 telephone interviews were conducted with managers of manufacturing plants in Belgium, France, Germany, Hungary, Poland and the United Kingdom between late August and early November 2009. That survey covered a variety of topics, including competition and other external drivers of climate change-related management practices, as well as specific measures adopted by firms in order to reduce energy consumption and GHG emissions. On the basis of the managers' responses, a Climate-Friendliness Index (CFI) can be constructed in order to measure each firm's green credentials.

Measuring firms' green credentials

That CFI covers four areas: targets and monitoring, innovation, barriers to energy investment, and the adoption of energy-saving measures. The targets and monitoring questions focus on the scope and frequency of the firm's monitoring of energy usage and GHG emissions, the types of energy and emissions targets that are in place at management level and the extent to which they are realistic, and the enforcement of those targets (including financial consequences in the event of their achievement or non-achievement).

The innovation questions ask whether firms commit staff time and financial resources (including for the purposes of R&D) in order to reduce GHG emissions and whether firms try to develop climate change-related products.

The question on barriers to energy investment asks whether the required payback time for energy-efficient investments is longer or shorter than that applied to non-energy-related cost-cutting measures.

Lastly, the last block of questions looks at the number of energy-saving measures adopted by the firm. These measures could be related to heating and cooling, energy generation, machinery, energy management, any other aspect of production, or non-production-related matters.

The scores for each aspect are converted into z-scores by normalising responses to each question to a mean of zero and a standard deviation of 1. First of all, four unweighted averages are calculated across the z-scores for each of the four areas. Those four averages are, in turn, converted into z-scores, averaged across the four areas and expressed as z-scores. This means that the average CFI score across all firms in all countries is equal to zero. Firms with a score in excess of zero are more environmentally friendly than the average firm.

[22] This specification is adapted from Bloom et al. (2010).
[23] See Coady et al. (2017).
[24] See Upadhyaya (2010) for classification details.

Box 4.4. FTSE Russell's LCE database: a description and analysis

Data

FTSE Russell's LCE database consists of 11,789 publicly listed firms in 63 countries (including 213 publicly listed firms in seven EBRD countries)[25] and covers the period from 2009 to 2015. For each firm, FTSE Russell provides information on the percentage of revenue that is "green".

Revenue is deemed to be green where it is generated by goods or services that help to mitigate, remediate or adapt to the effects of climate change, resource depletion or environmental erosion. For example, flood barriers are a green product that helps to prevent flooding caused by increased rainfall. Such products are categorised on the basis of the LCE Industrial Classification System, which consists of eight LCE sectors (such as energy generation) and 60 subsectors (such as biofuels). For a number of firms (more than 15 per cent of all companies in the database), it is not possible to put a precise figure on the percentage of revenue that is deemed to be green. Instead, a range is indicated, with minimum and maximum values being provided. The analysis in this chapter employs a conservative approach and focuses on minimum green revenue shares.

Analysis

For the purposes of the analysis in this chapter, the LCE database is combined with firm-level information from Bureau van Dijk's Orbis database, whereby only observations including information on green revenue, turnover, numbers of employees, profit measures and industry classification are included. This results in a sample comprising 7,221 firms from 59 countries (including 100 firms in seven EBRD countries).

The relationship between firms' performance levels and green revenue shares is estimated using ordinary least squares on the basis of the following main specification:

$$Y_{isct} = \beta_0 + \beta_1 D_{it}^{GR_{moderate}} + \beta_2 D_{it}^{GR_{high}} + \mathbf{y_1'X}_{it} + \mathbf{y_2'X}_{it} D_{it}^{GR_{moderate}} + \mathbf{y_3'X}_{it} D_{it}^{GR_{high}} + \mathbf{y_4'Z}_{it} + \sum_{s=1}^{S} \delta_s D_s + \sum_{c=1}^{C} \delta_c D_c + \sum_{t=1}^{T} \delta_t D_t + \varepsilon_{isct}$$

where Y is the outcome variable of interest for firm i in sector s and country c in year t, $D_{it}^{GR_{moderate}}$ denotes green revenue shares that are greater than zero and less than 50 per cent, and $D_{it}^{GR_{high}}$ denotes green revenue shares that are greater than 50 per cent. Firm-level control variables for age, age squared and the log of the number of employees and indicators of national, state or local government ownership ($\mathbf{X}$) are interacted with green revenue shares. $\mathbf{Z}$ is a matrix of other control variables, including the number of companies in the group, the number of shareholders, and whether the firm is listed or delisted (as opposed to unlisted). D_s, D_c and D_t are sector, country and year fixed effects, and ε is the error term. Standard errors are robust and clustered by firm.

There are a number of caveats that need to be borne in mind here. First of all, the sample is not nationally representative, as the FTSE Russell LCE database focuses on gathering information on the world's largest firms in term of market capitalisation. Thus, only very large firms are included, and the majority of those firms are from China, Japan, the United Kingdom and the United States of America, which together account for more than 70 per cent of the sample. Second, the sample includes only 100 firms from the EBRD region, limiting the conclusions that can be drawn from this analysis. Lastly, because the analysis focuses on minimum green revenue shares, the results can be interpreted as lower-bound estimates. The results are qualitatively similar if mean or maximum green revenue shares are used instead.

[25] See the disclaimer in the Acknowledgements section.

Box 4.5. Financial development and industrial pollution

Growing financial systems tend to have a positive, causal impact on long-term economic growth[26] and may, therefore, also influence pollution levels. As discussed in Chapter 1, pollution increases at early stages of development, but declines once a country reaches a certain income level.[27] As countries get richer, voters may, for instance, start to demand stricter anti-pollution legislation. How do the growth and structure of the financial system shape this relationship between economic growth and carbon emissions?

Recent research based on data for 18 industries in 73 countries over a period of 39 years provides some initial insight into the way in which financial development and financial structures impact industrial pollution (as measured by the level of CO_2 emissions).[28] This analysis shows that higher levels of financial development are associated with higher levels of CO_2 emissions. What is more, aggregate CO_2 emissions per capita are strongly positively correlated with the development of credit markets, but strongly negatively correlated with the size of stock markets (see Chart 4.5.1). Results at industry level confirm these patterns. When the level of financial development is taken into account, a more equity-based financial system is associated with lower levels of CO_2 emissions in industries that depend on external finance for technological reasons.

There are two channels through which credit translates into higher levels of industrial pollution and equity translates into lower levels. The first channel is intra-industry technological innovation, whereby industries adopt cleaner technology over time. As the financing of innovation often tends to involve equity rather than loans, access to equity markets facilitates the process of intra-industry technological innovation, while access to credit slows it down by facilitating the adoption of less innovative and less efficient dirty technology.

The second channel involves the reallocation of resources across industries, whereby – keeping the technology constant – stock markets reallocate investment to relatively clean sectors. Conversely, credit markets reallocate investment away from clean sectors.

It would seem from the data that the first channel is underpinning the negative relationship between stock market development and industrial pollution: stock markets appear to be well suited to facilitating the adoption of cleaner technology in polluting industries, whereas there is no evidence of credit markets playing such a role.

CHART 4.5.1. Impact of financial development and financial structures on industrial pollution

Source: De Haas and Popov (2017).
Note: Financial indicators are averaged over the period 1974-2013. "Bank credit" refers to credit to the private sector and excludes credit issued by central banks and cross-claims by one group of intermediaries against another.

[26] See Popov (2017) for a recent overview of this literature.
[27] For a review of empirical research on the environmental Kuznets curve, see Dasgupta et al. (2002).
[28] See De Haas and Popov (2017).

Box 4.6. Trade in environmental goods

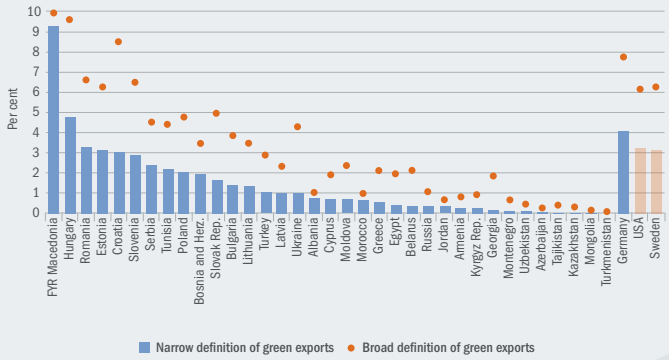
The diffusion of advanced and clean technology and services – also called "environmental goods and services" – will be key to achieving greener growth around the world. Trade barriers hinder access to such green goods and services and increase their cost for importing countries, thereby hampering the adoption of advanced green technology. Trade barriers can take many forms, including tariffs imposed on imports, as well as non-tariff barriers such as quotas, certification rules and local content requirements. While tariff barriers on many environmental products are moderate, non-tariff barriers are much higher.[29] In some countries, total barriers are as high as 40 per cent (when expressed in tariff-equivalent units), thereby limiting opportunities for a structural shift towards greener growth.

The World Trade Organization (WTO) has been promoting free trade in environmental goods since the Doha Ministerial Declaration of 2001. However, although the EU and a number of other WTO members[30] began negotiating an Environmental Goods Agreement (EGA) in 2014, progress has been slow. One of the major challenges in this regard is the definition of environmental goods. While some products (such as inputs for the generation of renewable energy or resource-saving equipment) undoubtedly have environmental benefits, such benefits are less obvious where goods have multiple uses spanning both conventional and green technology. With this in mind, the analysis in this box uses both a narrow definition of green goods and a broad one.

Global trade in environmental goods and services probably exceeds US$ 1 trillion, with markets and trade volumes growing rapidly. In the EBRD region, imports of environmental goods accounted, on average, for around 2 to 5 per cent of total imports in 2014, with such goods making up a particularly large percentage of imports in Central Asian economies. Export volumes are more limited, however. Even with a broader definition of green goods, there are only 10 countries in the EBRD region where environmental goods account for more than 4 per cent of total exports (see Chart 4.6.1).

The liberalisation of trade would make clean technology cheaper to import, thereby making the transition to a green economy more cost-effective. For the many transition countries that are already producing intermediate inputs and technology with environmental benefits, liberalised trade would also provide an opportunity to strengthen export competitiveness through spillovers of technology and knowledge.

CHART 4.6.1. Exports of green goods as a percentage of total exports



Source: UN Comtrade and authors' calculations.

[29] See Sauvage (2014).
[30] The parties to the EGA negotiations are Australia, Canada, China, Costa Rica, the European Union, Hong Kong SAR, Iceland, Israel, Japan, Liechtenstein, New Zealand, Norway, Singapore, South Korea, Switzerland, Taipei China, Turkey and the United States of America.

Box 4.7. Measuring drivers of the low-carbon economy

There are three leading indicators that may predict drivers of the low-carbon economy.[31]

The first is the Green Innovation Index (GII), which is defined as green (clean) patents as a percentage of total patents in a given country and sector, relative to the percentage of green patents in that sector at global level. Formally, this is expressed as,

$GII_{is} = \frac{p_{is}^{G}}{p_{is}} / \sum_i \frac{p_{is}^{G}}{p_{is}}$ where p_{is}^{G} is the number of clean patents and p_{is} is the total number of patents in sector s and country i (based on EPO data). Higher GII scores indicate a larger percentage of clean innovation in a given sector relative to other countries, and thus a more rapid conversion from conventional to clean production.

The second indicator is a sector's revealed comparative advantage (RCA), which is defined as that sector's share in the total exports of the country, divided by that sector's share in global exports. This is expressed as $RCA_{is} = \frac{e_{is}}{\sum_s e_{is}} / \frac{\sum_i e_{is}}{\sum_s \sum_i e_{is}}$ where e_{is} is the volume of exports from sector s in country i (based on UN Comtrade data). A larger relative share in exports means that a sector has a greater RCA and is more competitive.

The third and final indicator is green production at the outset, which is correlated with – and therefore measured using – total production in the relevant sector today, based on UNIDO data (INDSTAT4 2017, ISIC Rev. 3).

The analysis in this chapter covers industries at the three-digit level of disaggregation across 64 countries. In order to be included, a sector has to account for more than 1.5 per cent of national GDP and have filed more than 50 patents in total (both clean and dirty). This threshold is lowered to 30 patents if the sector is one of the three largest in the country or one of its top three patenting sectors.

These three indicators can be shown in a bubble chart, with the x-axis measuring RCA, the y-axis measuring GII scores and the size of the bubble indicating total production in the sector today (see Chart 4.14). Sectors in the top-right quadrant represent *strengths* – areas of comparative advantage (x-axis) with substantial green innovation (y-axis), which should ease the conversion to low-carbon products and processes. These sectors are well placed to remain areas of competitive strength in the low-carbon economy.

Sectors in the top-left quadrant represent opportunities. These are not currently areas of comparative advantage, but they are characterised by significant low-carbon innovation, which could facilitate the conversion to low-carbon products and processes. These sectors could therefore become areas of strength in the future, displacing less innovative incumbents.

Sectors in the bottom-right quadrant represent *threats* – areas where there is currently a comparative advantage, but insufficient low-carbon innovation. In these sectors, there is a risk that conversion to clean products and processes could stall and market share could be lost as the low-carbon economy grows.

Lastly, sectors in the bottom-left quadrant represent weaknesses. These are not currently areas of comparative advantage, and there is insufficient low-carbon innovation to establish a comparative advantage in the future.

Box 4.8. Green complexity and green competitiveness

Countries tend to develop new products and industries in areas where they already have a comparative advantage. In other words, future production capabilities are strongly dependent on existing industrial structures. The Economic Complexity Index (ECI)[32] measures the diversity and complexity of economies' productive capabilities on the basis of what countries export. In a similar vein, the Green Complexity Index (GCI)[33] assesses the diversity and complexity of countries' green exports, indicating the countries that are currently best placed to become leaders in the green economy.

Countries with high GCI scores tend to have high ECI scores, as many green products and technologies involve complex production knowledge. However, some countries demonstrate particular potential in the area of green products. Estonia, Hungary, Poland and Slovenia are the top-ranked countries in the EBRD region in terms of GCI scores. Estonia, for example, has significant potential linked to its existing capabilities in the area of complex measuring devices (such as spectrometers and optical instruments).

However, many countries will have to reorientate their existing industrial structures and cultivate new green industries in order to transition successfully to greener growth. This process will be easier for countries where existing capabilities are closer to the capabilities required to export new green products. This proximity is measured by the Green Complexity Potential (GCP) index.

A number of countries (including Egypt, Greece, Lithuania, Morocco, Poland and Turkey) have high GCP scores relative to their GCI scores (see Chart 4.8.1). These countries may be particularly well placed to develop future green capabilities, unleashing their potential in terms of income generation, employment growth, trade in green goods and the scaling-up of related services. Whether that ultimately happens will depend on whether or not they invest in the right skills and infrastructure. In many cases, new green technology requires specialist services facilitating its installation, operation and maintenance – services that are typically offered by local SMEs. If the benefits of green growth are to be maximised, there will also need to be international cooperation promoting trade in green goods with a view to benefiting all countries.

CHART 4.8.1. GCI and GCP scores in 2014

Source: Mealy and Teytelboym (2017).

[31] See Fankhauser et al. (2013).

[32] See Hausmann et al. (2014).

[33] See Mealy and Teytelboym (2017).

Box 4.9. Fiscal consequences of green transition for countries that export fossil fuels

The exact shape and pace of a country's transition to a green economy is uncertain and will depend on the country's development trajectory, the government's policy responses and the availability of technology. (Services tend to be less energy-intensive than industry, for instance.) What *is* certain, however, is that transition to a green economy – combined with an increase in the use of renewable energy and higher levels of energy efficiency – will influence the price of fossil fuels and the value of related assets. If global prices cease to allow for the recovery of costs, many fossil fuel assets could become "stranded" – a situation that could lead to the unanticipated closure of production and the devaluation of assets, with assets potentially becoming net liabilities.[34]

As the owners of 70 per cent of all fossil fuel reserves and related assets worldwide, national governments have the potential to be heavily affected by this. Fossil fuels are often a major source of government revenue and an important area of expenditure.[35] In the EBRD region, Azerbaijan, Egypt, Kazakhstan, Mongolia, Russia, Turkmenistan and Uzbekistan are particularly exposed. Kazakhstan's recent experience offers a cautionary tale in this regard. Relatively high global oil prices between 2012 and 2014 allowed the Kazakh government to generate a regular budget surplus, as revenue from oil makes up around 50 per cent of total government revenue. However, falling fossil fuel prices in 2014 and 2015 resulted in a major shock to GDP and government revenue.

In order to make the best of the transition to a green economy, fossil fuel exporters will need to manage the risks resulting from green growth and exploit the opportunities. Fiscal policy and the management of public finances will be crucial when it comes to managing this process, with potential risks and opportunities arising on both the revenue and the expenditure side. If prices and production fall, governments will experience declines in fossil fuel revenue and a concomitant contraction in their fiscal base. This negative impact can be at least partially offset by the emergence of new sectors and revenue sources linked to the green economy, such as increases in the output of green firms or revenue from environmental taxes such as carbon pricing.[36]

In addition, falling asset values could lead to decommissioning costs, impairments and losses on asset sales. However, fossil fuel prices also affect the level of fossil fuel subsidies, which are prevalent across the EBRD region. For example, Turkmenistan's fuel subsidies totalled around 16 per cent of GDP in 2014, according to IEA data. Lower fossil fuel prices mean a reduction in the need for subsidies, so reduced revenue from fossil fuels will be partially mitigated by falling subsidies.[37]

There are a number of policy responses available. First of all, general economic reforms can promote growth in other sectors. The nature of these reforms will necessarily be country-specific. In Kazakhstan, for example, improving the efficiency of state-owned enterprises while facilitating cross-border trade integration will foster growth in the non-extractives sector.[38] Second, as long as fossil fuel extraction continues, governments should look to maximise revenues while also reducing risks to their balance sheets. This could, for example, involve improving the efficiency of production, fine-tuning tax policies and tailoring the country's strategy for the extraction of fossil fuels to prevailing market conditions. And third, priorities on the fiscal policy side include the removal of fossil fuel subsidies encouraging consumption and production, the promotion of investment in the green economy and adherence to an effective budget process in order to manage fiscal risks.

[34] See Ansar et al. (2013).
[35] See EBRD (2015) and Nelson et al. (2014).
[36] See Bowen (2015).
[37] See Kojima (2016).
[38] See EBRD (2017).

Annex 4.1.
ISIC Rev. 3 three-digit industry classification

TABLE A.4.1.1. Selected ISIC Rev. 3 three-digit industry codes

Code	Description	Code	Description
151	Processing/preserving of meat, fish, fruit, vegetables, oils and fats	**292**	Special-purpose machinery
154	Other food products	**293**	Domestic appliances
171	Spinning, weaving and finishing of textiles	**311**	Electric motors, generators and transformers
172	Other textiles	**312**	Electricity distribution and control apparatus
181	Wearing apparel, except fur apparel	**319**	Other electrical equipment
232	Refined petroleum products	**321**	Electronic valves and tubes and other electronic components
241	Basic chemicals	**323**	TV and radio receivers and associated goods
242	Other chemical products	**331**	Medical appliances/instruments, measuring/testing/navigating appliances
252	Plastics products	**341**	Motor vehicles
269	Non-metallic mineral products	**343**	Parts/accessories for automobiles
271	Basic iron and steel	**351**	Building and repairing of ships and boats
272	Basic precious and non-ferrous metals	**352**	Railway/tramway locomotives and rolling stock
281	Structural metal products, tanks, reservoirs and steam generators	**353**	Aircraft and spacecraft
289	Other fabricated metal products; metalworking service activities	**361**	Furniture
291	General-purpose machinery	**369**	Manufacturing

Source: UN Statistics Division (https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=2).

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MACROECONOMIC OVERVIEW

After five consecutive years of economic slow-down, the average annual growth rate in the EBRD region rose to 1.9 per cent in 2016. Nevertheless, that rate remains below the average for a group of comparator economies with similar characteristics. The stronger growth recorded in 2016, which continued in the first few months of 2017, reflects recoveries in the prices of oil and other commodities, which have supported growth in Russia, Central Asia, and eastern Europe and the Caucasus. In contrast, lower revenue from tourism, partly due to security concerns and geopolitical risks, continues to weigh on the economic outlook for the southern and eastern Mediterranean region. Growth in EBRD countries of operations is expected to strengthen further in 2017 and 2018.

1.9%
AVERAGE ANNUAL GROWTH RATE IN THE EBRD REGION IN 2016, UP FROM 1.3% IN 2015

8
NUMBER OF ECONOMIES IN THE EBRD REGION THAT OUTPERFORMED THEIR EMERGING MARKET PEERS BY AT LEAST 1 PERCENTAGE POINT IN TERMS OF GROWTH IN 2016

3%
AVERAGE DEPRECIATION IN THE EBRD REGION'S CURRENCIES AGAINST THE US DOLLAR IN NOVEMBER/ DECEMBER 2016

Growth from a comparative perspective

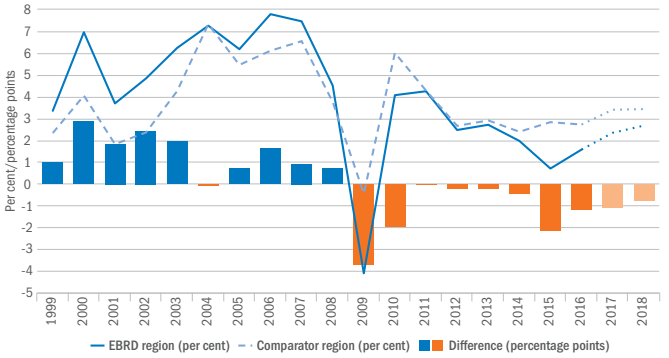
The average annual growth rate in the EBRD region rose to 1.9 per cent in 2016, up from 1.3 per cent – the lowest rate since 2009 – in 2015. This was the first increase in average annual growth since 2010. This upward trend is forecast to continue, as discussed in the latest issue of *Regional Economic Prospects in EBRD Countries of Operations*.[1] However, economic growth is expected to remain modest in 2017 and 2018 – both by historical standards and relative to a group of comparator countries with similar levels of economic development.

Since 2009, average annual growth in the EBRD region has consistently been below the global average as well as the average for a group of countries of similar size with comparable income per capita (see Chart M.1). As in Chapter 1, the calculation here is based on a modified synthetic control method. For each country, a synthetic comparator is calculated as a weighted average of the growth rates of other economies in that year. Those weights are, in turn, based on countries' similarity in terms of their economic characteristics.[2]

Relative to its synthetic comparator, the EBRD region was worse affected by the 2008-09 financial crisis and has subsequently recorded weaker average annual growth every year.[3] In 2016, however, the gap between the EBRD region's average annual growth rate and that of the comparator region narrowed somewhat relative to 2015 – the combined result of stronger economic growth in the EBRD region and moderate growth in a number of other emerging markets, notably in Latin America.

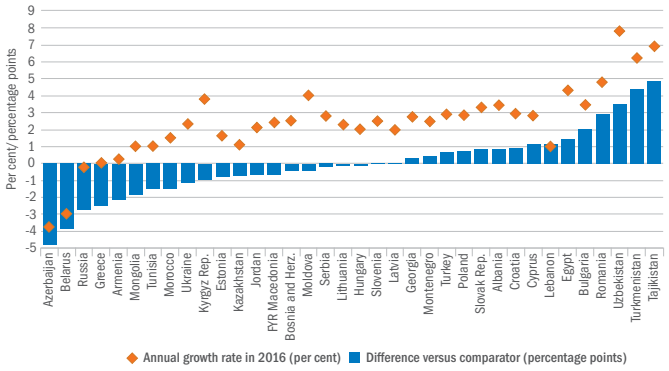
Looking at individual countries where the EBRD invests, eight economies outperformed their reference groups by at least 1 percentage point (see Chart M.2). Indeed, five countries outperformed their comparators by more than 2 percentage points: three Central Asian economies (namely, Tajikistan, Turkmenistan and Uzbekistan), plus Bulgaria and Romania. At the other end of the spectrum, several economies had negative gaps of more than 2 percentage points relative to their comparators: three countries in eastern Europe and the Caucasus (EEC; namely, Armenia, Azerbaijan and Belarus), plus Greece and Russia. On the basis of projections as at 1 October 2017, the gap between the EBRD region and the comparator economies is expected to narrow further in 2017 and 2018, but not to disappear completely.

CHART M.1. Average annual growth rates in the EBRD region and a comparator region



Source: IMF and authors' calculations.
Note: Weighted on the basis of GDP at PPP; figures for 2017 and 2018 are based on IMF and EBRD forecasts as at 1 October 2017.

CHART M.2. Economic growth relative to comparators



Source: IMF and authors' calculations.

[1] This publication presents the latest economic forecasts for all EBRD countries of operations.
[2] See Abadie et al. (2010).
[3] The calculation is conducted as follows. For each economy, the reference group comprises countries that are broadly similar in terms of GDP per capita and population, weighted on the basis of differences in income per capita and population size (see Chapter 1 for a more detailed discussion). For example, the economies with the largest weights in Egypt's reference group include Indonesia, Peru and Sri Lanka. Weights for the EBRD region's economies based on GDP at purchasing power parity (PPP) are then applied to the growth rates of the comparators for each country in order to construct a comparator for the EBRD region as a whole.

Global economic environment

Since mid-2016, the global economic environment has been characterised by increased political uncertainty, combined with robust investor confidence. Economic policy uncertainty has increased as a result of the new administration taking office in the United States of America following the November 2016 presidential election and the United Kingdom officially serving notice of its intention to exit the European Union (with its two-year countdown starting on 29 March 2017).[4]

At the same time, financial markets have remained broadly sanguine. Equities have performed strongly in advanced and emerging market economies alike, with markets pricing in the anticipated benefits of future tax reform in the USA and the positive impact that a stronger US economy is expected to have on the rest of the world. Equities have also performed well in emerging Europe. In advanced economies, financial stocks initially rallied strongly following the US election, but those gains have since been partially reversed, with the prospects for comprehensive financial deregulation being reassessed in light of the impasse over health care reform in the USA. Stock market volatility has been low for a considerable period of time (the longest since 2013, in fact), both in advanced markets and in the EBRD region.

In advanced economies, marked improvements have been seen in indicators of business and consumer confidence and purchasing managers indices. These improvements have been much larger than the changes observed in "hard" data on GDP, sales volumes and industrial production. The strongest contrast between confidence-based and production-based indicators can be seen in the USA, where businesses and consumers appear to be positive about the new administration's expected future policies (including tax cuts, additional infrastructure spending, and deregulation in the financial sector and other industries).

This surge in confidence has not, however, translated into improvements in indicators of output. Indeed, the annual growth rate of global GDP remains modest by historical standards, falling from 3.4 per cent in 2015 to 3.2 per cent in 2016. The annual growth rate in the euro area has also remained broadly stable, fluctuating between 1.8 per cent and 2 per cent between 2015 and the first quarter of 2017. On the other hand, the ongoing weakness of investment spending and international trade has continued to weigh on the outlook for global growth, and credit growth in the USA has weakened markedly.

In advanced markets, the result of the US presidential election on 9 November 2016 also led to a rise in bond yields, which returned to the levels observed prior to the United Kingdom voting to leave the EU in June 2016. Markets swiftly priced in the expected impact of a looser fiscal stance and tighter monetary policy in the USA. In line with market expectations, the US Federal Reserve System raised its policy rate by 0.25 percentage points in December 2016, March 2017 and June 2017, with the target range for that rate now standing at 1-1.25 per cent. Markets expect further gradual tightening – one rate rise in 2018 and another in 2019 – as the US economy benefits from the anticipated fiscal stimulus.

At the same time, spreads between yields on bonds issued by higher-risk emerging market borrowers and yields on US Treasury bonds have declined as investors' search for yield has intensified. Capital flows to emerging markets have strengthened on average, notwithstanding some fluctuation. This suggests that monetary tightening in advanced economies has been implemented more slowly than investors were anticipating. As a result, the currencies of emerging markets have reversed some or all of their post-election losses against the US dollar, with the notable exception of the Turkish lira. Several countries in the EBRD region, including Egypt, have taken advantage of the relatively benign conditions in global financial markets by issuing sovereign bonds at favourable rates.

The European Central Bank (ECB) has maintained its accommodative stance for the time being. Its quantitative easing (QE) programme has been extended by nine months and is now scheduled to run until end-2017, although its monthly asset purchases have been scaled back from €80 billion to €60 billion. Discussions regarding possible future tapering of the ECB's QE programme resulted in the euro strengthening against the US dollar in mid-2017 and reaching its highest level since early 2015.

Oil prices have remained broadly stable, with the price of Brent crude oil fluctuating between US$ 45 and US$ 55 per barrel between mid-2016 and mid-2017. This price level appears to be sufficient to sustain the profitability of some shale oil producers in the USA. The agreement in principle to cut production that was reached by the Organization of the Petroleum Exporting Countries (OPEC) and a number of other oil producers in late 2016 has reduced downward pressure on oil prices. That agreement has since been extended.

The economic outlook for the EBRD region remains materially affected by terrorism, geopolitical tensions and the refugee crisis. Over the past year, Egypt, Jordan, Russia and Turkey have experienced several terrorist attacks, while Syria remains in the grip of a major humanitarian crisis.

Growth performance in the region

The difference between the east and west of the EBRD region in terms of the economic outlook has narrowed since 2016. Increases have been seen in the price of oil following the lows of the first half of 2016 (with Brent crude oil averaging US$ 52 per barrel in the first half of 2017, compared with US$ 40 per barrel in the first half of 2016), benefiting Russia, other commodity exporters, and countries in Central Asia and the EEC region that rely on Russia as a major source of remittances and/or export demand. In contrast, average growth in central Europe and the Baltic states (CEB) and the southern and eastern Mediterranean (SEMED) region declined in 2016, falling by around 0.6 percentage points relative to 2015.

Whereas growth in CEB picked up slightly in the second half of 2016, it averaged only 2.6 per cent for the year as a whole,

[4] See https://fred.stlouisfed.org/ based on the methodology developed by Baker et al. (2015).

down from 3.4 per cent in 2015. That slow-down was due mainly to weak private and public investment, partly reflecting reduced utilisation of EU investment funds during that period. Consumption, on the other hand, has been growing at a steady pace. Growth increased to around 4 per cent year on year in the first half of 2017 on the back of a strong performance by the CEB region's largest economy, Poland, where output growth was boosted by stronger investment activity and an increase in social welfare payments. The Baltic states, Hungary and Slovenia also saw stronger economic growth in the first half of 2017.

More generally, investment activity has remained relatively weak across the EBRD region, with little sign of investment-to-GDP ratios moving back towards the levels that prevailed prior to the 2008-09 financial crisis (see Chart M.3). This reflects the weakness of the economic outlook, the slow utilisation of EU structural and cohesion funds in several countries in the CEB region and south-eastern Europe (SEE), and financing constraints caused by the relatively low levels of domestic savings in many economies. Domestic savings are, in turn, being negatively affected by rapid population ageing in emerging Europe (see Chart M.4), which is putting pressure on government spending. Thus, concerns remain about the potential for a vicious circle whereby a weaker long-term economic outlook depresses investment, and low investment, in turn, further weakens the long-term outlook.

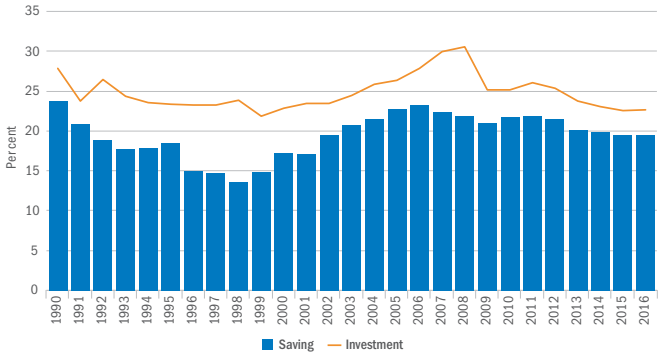
Some of the decline seen in investment-to-GDP ratios may be due to structural shifts in the global economy. Investment goods have become cheaper, so replacing capital stock now requires lower levels of spending. In addition, production has been shifting towards less investment-intensive *services* and away from more investment-intensive *activities* such as manufacturing and mining.[5]

Growth in the SEE region has remained steady, averaging 2.9 per cent in 2016 and 3.3 per cent year on year in the first half of 2017. In Romania, however, the annual growth rate rose to more than 5 per cent in 2016 and the first half of 2017, driven by private consumption and an accommodative fiscal stance. Growth has also picked up in the Western Balkans, supported by a gradual resumption of credit growth and a number of major infrastructure projects. Meanwhile, the Cypriot economy has exceeded expectations, achieving an annual growth rate of 2.8 per cent in 2016. In Greece, however, output stagnated in 2016 as a whole, with only modest year-on-year growth being recorded in the first half of 2017.

The gradual economic recoveries under way in Moldova and Ukraine have continued. However, recessions in Azerbaijan and Belarus resulted in output for the EEC region as a whole stagnating in 2016. Growth in the EEC region rose to close to 1.5 per cent year on year in the first half of 2017, with growth turning positive in Belarus and the recovery in Ukraine gaining further momentum.

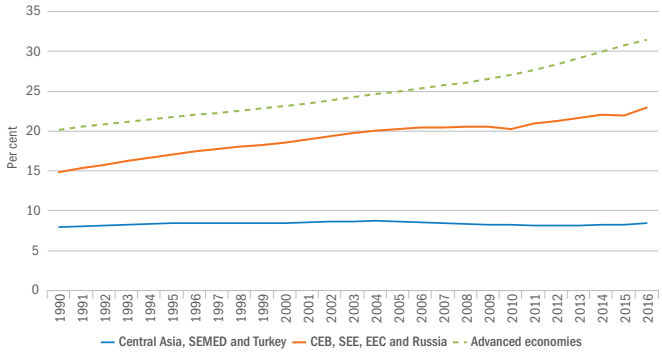
Turkey's annual growth rate fell to 3.2 per cent in 2016, down from 6.1 per cent in 2015. While a 30 per cent increase in the minimum wage in January 2016 boosted private consumption throughout the year, growth in 2016 was hit by a combination of

CHART M.3. Investment and saving in the EBRD region as a percentage of GDP



Source: IMF and authors' calculations.
Note: Data represent unweighted averages for the EBRD region as a whole.

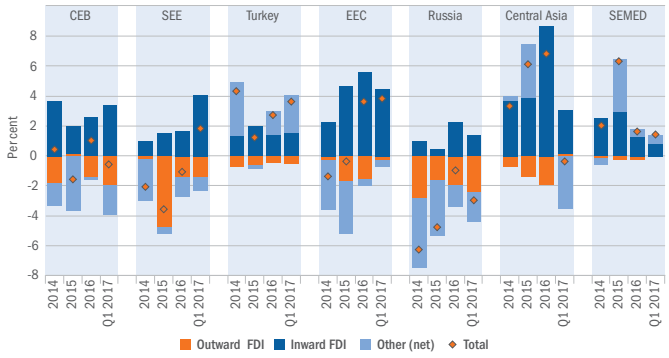
CHART M.4. Old-age dependency ratios



Source: IMF and authors' calculations.
Note: Data represent unweighted averages across countries. The old-age dependency ratio is the population aged 65 and over as a percentage of the population aged 15 to 64.

[5] See also World Bank (2017) for a discussion of this issue.

CHART M.5. Capital flows as a percentage of GDP



Source: National authorities via CEIC Data and authors' calculations.
Note: Averages are weighted by GDP. Capital flows are calculated as changes in foreign assets and liabilities. Data for Turkmenistan and Uzbekistan are not available.

sharp declines in tourism revenue, Russian sanctions and geopolitical tensions in the Middle East. Weak consumption and investment following the attempted military coup in July 2016 compounded these problems and contributed to a weakening of the lira. The introduction of various stimulus measures towards the end of 2016, including a TRY 250 billion (US$ 71 billion equivalent) Credit Guarantee Fund for small and medium-sized enterprises and various tax incentives, helped growth to recover to around 5 per cent year on year in the first half of 2017.

Russia's economy has now returned to growth, following a cumulative contraction of around 3 per cent in 2015-16, with output expanding at a rate of 1.5 per cent year on year in the first half of 2017. At the same time, investment activity remains constrained by economic uncertainty, perceived weaknesses in terms of the country's investment climate and relatively high financing costs, in addition to the global and region-wide factors discussed earlier.

The annual growth rate in Central Asia remained broadly unchanged at around 3.5 per cent in 2016. It has since showed signs of picking up again, with growth averaging around 5 per cent year on year in the first half of 2017 on the back of higher commodity prices (relative to the first half of 2016) and the improved economic outlook in Russia.

The annual growth rate in the SEMED region fell to 3.4 per cent in 2016 as high levels of inflation adversely affected consumption in Egypt, tourism revenue declined in Jordan, Morocco experienced a weak harvest, and the implementation of reforms was delayed in Tunisia. In the first half of 2017, growth averaged around 4 per cent year on year for the region as a whole, with Morocco and Tunisia regaining momentum.

Capital flows

Capital flows to emerging markets strengthened in the first few months of 2017, despite the gradual tightening of monetary policy in the USA. This probably reflects the fact that rate rises to date have been fully priced in by the markets and the pace of monetary tightening has, if anything, been slower than expected.

Bond and equity inflows in the EBRD region also strengthened in the first few months of 2017, in line with global trends, before moderating over the summer. Russia has been one of the main beneficiaries of these flows. Meanwhile, non-foreign direct investment outflows have moderated markedly relative to the levels observed in 2014-15 (see Chart M.5). Foreign direct investment (FDI) inflows in the EBRD region have remained broadly stable. Turkey remains heavily reliant on both FDI and non-FDI capital inflows – in roughly equal measure – to finance its persistent current account deficit.

Currency movements

In the aftermath of the US election, the region's currencies initially weakened against the US dollar, losing an average of around 3 per cent of their value in November and December 2016. The direction of currency movements changed in early 2017, and by April 2017 those post-election declines had been fully reversed in most countries. Those fluctuations also mirrored broader trends relating to the euro and the currencies of other advanced economies and emerging markets.

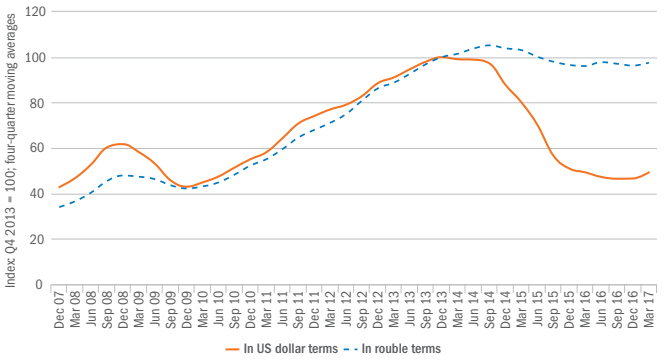
The currencies of commodity exporters – the Azerbaijani manat, the Kazakh tenge and the Russian rouble – strengthened overall as oil prices stabilised at around US$ 45-55 per barrel of Brent crude. While the tenge moved broadly in line with the price of Brent crude, the appreciation of the rouble in the second half of 2016 and the first four months of 2017 was stronger than oil price rises and the replenishment of Russia's international reserves would suggest. This, in part, reflected capital inflows in Russia's bond and equity markets.

In contrast, the Turkish lira weakened significantly against the US dollar in the fourth quarter of 2016. It has since recovered some of those losses, but in early August 2017 its value remained around 17 per cent lower than that recorded in August 2016. While Egypt and Uzbekistan liberalised their exchange rate regimes in November 2016 and September 2017, respectively, the gap between official and unofficial exchange rates has widened in Tajikistan and Turkmenistan.

Remittances

Remittances from Russia to Central Asia and the EEC region stabilised in US dollar terms towards the end of 2016 as the Russian economy returned to growth and the rouble appreciated in line with oil prices (see Chart M.6, which plots four-quarter moving averages of the levels of remittances). Remittances started to increase again in the first quarter of 2017, rising 37 per cent year on year, compared with a 19 per cent contraction a year earlier. Following three years of declines, the total value of remittances in the first quarter of 2017 was, in US dollar terms, less than 60 per cent of the value recorded four years earlier.

CHART M.6. Remittances from Russia to Central Asia and the EEC region



Source: Central Bank of Russia and authors' calculations.

Credit conditions

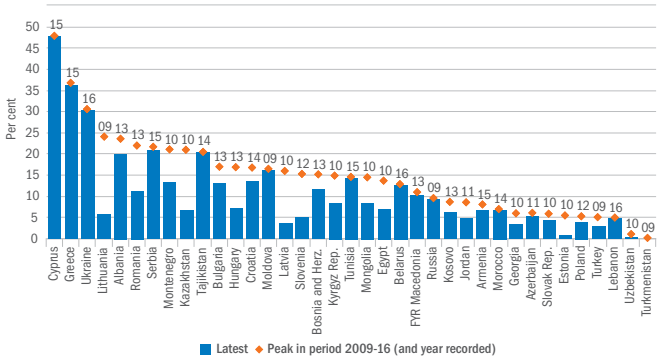
Credit conditions in the EBRD region in mid-2017 were broadly unchanged compared with a year earlier. In most countries, real credit growth (that is to say, credit growth adjusted for inflation and exchange rate movements) remained modest or negative, with the notable exceptions of Georgia, Kosovo and the Slovak Republic. In Turkey, the expansion of the Credit Guarantee Fund resulted in annualised credit growth rates of around 20 per cent in the first few months of 2017. Credit continued to contract in real terms in countries such as Azerbaijan, Belarus, Cyprus, Greece, Moldova, Tajikistan and Ukraine, reflecting weak bank balance sheets in those economies.

In around two-thirds of all countries in the EBRD region, non-performing loan (NPL) ratios – that is to say, NPLs as a percentage of total loans – peaked in double digits following the 2008-09 financial crisis (see Chart M.7). In half of those economies, NPL ratios peaked at levels close to or above 20 per cent.

In most countries, NPL ratios continued rising for a few years after the crisis, before peaking and starting to decline. There are, however, a number of exceptions in this regard. In the Baltic states, for example, NPL ratios peaked early and have now declined to around 5 per cent or less. In contrast, in several economies in the EEC region and Central Asia, NPL ratios have risen further recently, reflecting slow-downs in those economies on the back of the recent recession in Russia and declines in commodity prices.

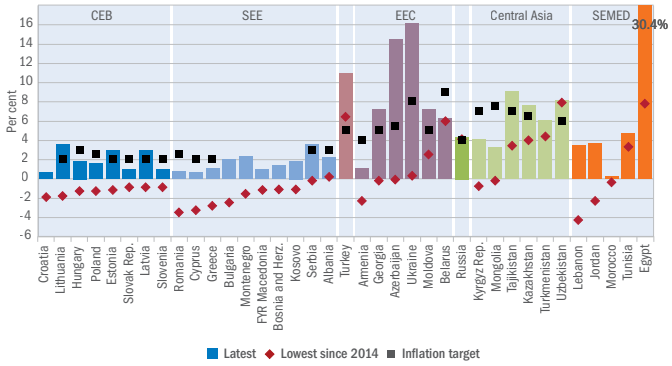
Post-peak declines in NPL ratios have tended to be modest, with NPL levels remaining elevated across much of the EBRD region. Among countries with high NPL ratios, the median post-peak decline is 3 percentage points, while the median peak ratio is around 16.5 per cent (the corresponding mean values are around 3.5 percentage points and 15 per cent, respectively). Countries that have reduced their NPL ratios by a third or more relative to their respective peak values include the Baltic states, Egypt, Hungary, Kazakhstan, the Kyrgyz Republic and Romania. Those reductions were facilitated by a combination of specific policies, the establishment of special-purpose vehicles for managing NPLs, and improvements to the economic outlook. In contrast, NPL ratios are still in excess of 30 per cent in Cyprus, Greece and Ukraine.

CHART M.7. NPL ratios now and at their peak



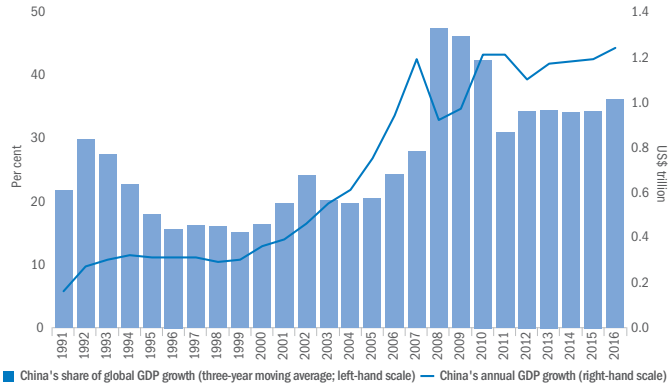
Source: National authorities via CEIC Data and authors' calculations.
Note: Peaks relate to the period 2009-16.

CHART M.8. Consumer price inflation in the EBRD region



Source: National authorities via CEIC Data and authors' calculations.

CHART M.9. China's annual GDP growth in US dollars at PPP



Source: IMF and authors' calculations.
Note: Annual increases in China's GDP are calculated by multiplying its growth rate and its GDP for the previous year. GDP is measured at PPP in 2011 prices.

Inflation

Since mid-2016, inflation has turned positive in a number of countries in central and south-eastern Europe that were previously experiencing deflation (see Chart M.8), with inflation rates rising towards average levels for emerging markets. This has been driven by increases in oil and energy prices relative to a year ago, as well as tighter labour market conditions in CEB economies. In Russia, inflation has fallen towards the central bank's target of 4 per cent, with the rouble strengthening and economic activity remaining weak. In contrast, inflation rates in Azerbaijan, Egypt, Turkey and Ukraine remained close to or above 10 per cent in July 2017, largely reflecting the weakening of their respective currencies.

3.5
percentage points
AVERAGE POST-PEAK DECLINE IN NPL RATIOS IN THE EBRD REGION

Risks to the economic outlook

The global economic environment remains challenging, with significant downside risks for economies in the EBRD region. (For a summary of the latest economic forecasts, see the most recent issue of *Regional Economic Prospects in EBRD Countries of Operations*.)

Geopolitical tensions and security threats are weighing on tourist numbers and investor confidence in a number of countries. In addition, significant uncertainty continues to surround the trade policies of the world's largest economies.

China, which is by far the most important contributor to global GDP growth, faces multiple policy challenges as its economy continues its rebalancing process, with its service sector and domestic consumption now playing a greater role in the economy. These include moderating the pace of credit expansion and reducing excess capacity in certain mining and manufacturing sectors and narrowly specialised towns. When expressed in trillions of US dollars at PPP in 2011 prices, China's annual GDP growth has been broadly constant since 2007, as its slow down in growth has been offset by the increasing size of its economy (see Chart M.9). This has provided a source of stability in terms of global demand. Were China to experience a credit crunch or a decline in the US dollar value of its annual GDP growth, that could create considerable headwinds for the global economy (see Box M.1).

Oil prices represent a major source of risk for Russia, as well as countries in the EEC region and Central Asia that have close economic ties to Russia. Were oil prices to fall back towards the levels observed in January 2016, that would have a significant impact on those economies. A faster-than-expected tapering of asset purchases by the ECB may have a profound impact on leveraged households and corporations across Europe.

Box M.1. The potential impact of a Chinese credit crunch on growth in the EBRD region

Since 2009, China has seen very strong growth in household and corporate credit. Total credit to China's non-financial private sector is now in excess of 220 per cent of GDP and significantly higher than the level that would be expected on the basis of economic fundamentals, according to recent analysis by the Bank for International Settlements (BIS).[6] This raises concerns as to whether China's current growth performance is excessively reliant on exponential increases in domestic credit.

At the same time, analysis by the Institute of International Finance shows that credit growth and quarterly GDP growth are negatively correlated in China, which is unusual in emerging markets.[7] This partly reflects the fact that the rapid credit growth observed in China since 2008 has coincided with a gradual slow-down in GDP growth. In fact, the easing of credit conditions could be seen as part of the policy package adopted in response to a weaker outlook for growth.

It is therefore interesting to look at the impact that a sharp weakening of Chinese credit growth could potentially have on the economies of the EBRD region, supplementing the analysis of the potential impact of a slow-down in China that was carried out in last year's *Transition Report*.[8] As before, spillover effects are estimated on the basis of a global vector autoregressive (GVAR) model. This model encompasses countries accounting for more than 90 per cent of global GDP and captures various channels for economic stress, modelling its transmission through international trade, financial markets and global commodity prices, both directly and through third-party economies. For each country, the external variables in the estimation represent weighted averages of estimates of domestic variables for other countries, whereby weights are based on bilateral links in terms of trade, investment and remittances.[9]

These estimates suggest that a credit crunch in China – modelled as a one-off 10 percentage point decline in quarter-on-quarter credit growth, which represents a large shock corresponding to four standard deviations of historical credit growth – would have a major impact on GDP growth in the EBRD region (see Chart M.1.1).

A credit shock of that size results in GDP growth rates declining by approximately 3-5 percentage points in Central Asia, the EEC and SEE regions, Turkey and Russia relative to a scenario with no shock to Chinese credit growth. This impact materialises within three quarters and is statistically significant. Moreover, that lost output is only partially recovered in subsequent years, with the level of output remaining around 1-1.5 percentage points lower compared with the baseline four years after the initial shock (with that impact remaining statistically significant in some cases). The impact on the CEB and SEMED regions is substantially weaker, reflecting China's less significant role as an investor, lender and trading partner in those regions.

These large spillover effects come about via multiple transmission channels, notably the important role that domestic credit plays in the funding of overseas direct investment by Chinese companies. To the extent that the model assumes that China's GDP growth is, if anything, negatively correlated with credit growth, those estimates are in fact conservative. On the other hand, the GVAR model makes no assumptions about policy responses to the credit crunch, and in that sense, it may overstate the impact on other economies. Regardless of the precise estimates, a potential credit crunch in China appears to be a significant source of risk for the economies of the EBRD region.

CHART M.1.1. Impact of a 10 percentage point decline in Chinese credit growth on GDP in the EBRD region

Source: Authors' calculations.
Note: Based on a GVAR model.

TOTAL CREDIT TO CHINA'S NON-FINANCIAL PRIVATE SECTOR IS NOW IN EXCESS OF
220%
OF GDP

[6] See BIS (2017).
[7] See IIF (2017).
[8] See EBRD (2016).
[9] See Dées et al. (2007) for a discussion of the GVAR approach. Domestic variables include GDP, inflation, exchange rates, equity market indices and both short and long-term interest rates, while global variables include commodity prices and Chinese credit growth. Data cover the period from 2001 to 2017.

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STRUCTURAL REFORM

In light of the challenges that countries currently face in trying to achieve sustainable growth, the EBRD has reviewed its transition concept. Under the updated interpretation of transition, a sustainable market economy should be competitive, well governed, green, inclusive, resilient and integrated. Looking at reform efforts across the region over the past year, it is noticeable that many relate to competitiveness and resilience. Improving the competitiveness of businesses and sectors and strengthening financial systems seems to be a concern for many countries in the region. In addition, some have implemented reforms in order to improve aspects of governance – an area where the EBRD's new transition scores suggest that numerous countries have room for improvement.

A SUSTAINABLE MARKET ECONOMY IS CHARACTERISED BY

6

QUALITIES

COMPETITIVENESS AND GOOD GOVERNANCE ARE THE

2

AREAS IN WHICH THE LARGEST GAPS EXIST BETWEEN THE EBRD REGION AND ADVANCED ECONOMIES

INCREASING NUMBERS OF COUNTRIES IN THE EBRD REGION ARE SETTING THEMSELVES THE TARGET OF GENERATING

20%

OF ELECTRICITY FROM RENEWABLE SOURCES

Introduction

Last year the EBRD conducted a review of its transition concept. That review built on the findings of the *Transition Report 2013 ("Stuck in Transition?")*, which analysed structural reforms in the EBRD's countries of operations and was a catalyst for reflections on the modern-day relevance of the transition framework adopted in the 1990s. That review took account of all the economic developments that had been observed over the previous 25 years, as well as the EBRD's wealth of experience in supporting countries' transition from planned to market economies.

This has resulted in an updated interpretation of transition, under which a sustainable market economy is characterised by six key qualities; the economy should be competitive, well governed, green, inclusive, resilient and integrated. With the agreement of its shareholders, the EBRD now looks at transition countries' development and the impact of its operations through the prism of those six qualities.

This section takes a closer look at what those qualities mean and how they can be translated into new measures of progress that also contribute to shaping the global narrative on development. An outline of the EBRD's new assessment methodology is followed by a summary of key results.

This section also provides an overview of structural reforms in the region over the past year. This year, those developments are described using a new set of scores that cannot be directly compared with earlier sectoral scores. As of next year, progress in the area of structural reform will be assessed on the basis of upward or downward changes to these new scores.

The six qualities of a sustainable market economy

In the early 1990s, transition countries faced a common set of challenges, ranging from reforming economic systems and introducing market-based prices to creating appropriate institutional frameworks for growth and economic stability. Policy-makers encountered many major economic and social problems: industrial output, real wages and salaries fell, while inflation and unemployment both rose rapidly; and trade declined with the collapse of the main reference market (COMECON), while penetrating new markets on the basis of existing technology proved difficult. Since then, transition economies have experienced significant changes in terms of their institutions and markets, and those changes have varied considerably in terms of their pace and magnitude. Initially, with the market economy a distant goal, the direction of change was broadly uniform. However, as countries have progressed along the transition path, they have faced different conditions and drivers of development. As a result, the economies of the EBRD region are now far more diverse in terms of their institutional development and market orientation.

Views on the roles of the state and the private sector have also evolved since the start of the transition process. Following the fall of the Berlin Wall, the prevailing economic thinking was that the economic role of the state should be limited to dealing with certain issues (such as natural monopolies, public goods, some elements of income redistribution and the conduct of macroeconomic policy), with most other things being left to the private sector. In line with this approach, transition countries emerging from the command economy focused largely on the privatisation of state assets. More recently, however, it has increasingly been recognised – particularly after the 2008-09 financial crisis – that unfettered markets and poor regulation can lead to suboptimal outcomes such as rising inequality, variable productivity (owing to the effects of market failures – especially on innovation and growth) and poor environmental sustainability. The slow growth that has been observed in the aftermath of the financial crisis – especially the high unemployment rates and the weak growth in real incomes – has contributed, in some countries, to public disillusionment with markets and a decline in public support for market reforms.

It is now understood that the roles of the state and the private sector are closely intertwined. For a healthy private sector to exist, the state has to provide sound legal and regulatory frameworks that uphold the rule of law, correct market failures, prevent abuses by vested interests, ensure a level playing field and allow all sections of society to have equal access to economic opportunities.

This conceptual shift is reflected in the updated transition concept. While the previous methodology emphasised the promotion of structural aspects of markets, such as private ownership and competition, the revised approach focuses on outcomes, looking at the qualities of a sustainable market economy. In particular, as described below, successful economies are competitive and well governed, resilient enough to withstand shocks and economically integrated (both internally and with neighbouring markets and the global economy). Moreover, in order to be fully sustainable, they are also inclusive and green. These six qualities can be regarded as a natural extension of the original transition concept and represent a useful instrument facilitating the EBRD's continued focus on markets and the private sector as a tool for development and growth.

Transition indicators

Since the mid-1990s, the EBRD has sought to quantify countries' progress towards market economies with the aid of a set of transition indicators. This year, that assessment methodology has been updated in order to reflect the revised transition concept. The new methodology is based on the six qualities of a sustainable market economy, rather than structural or sectoral indicators (see Box S.1 for an overview of past approaches to the measurement of transition).

In the interests of consistency and continuity, the new assessment follows the principles used for sectoral transition

TABLE S.1. Components used to measure the six qualities of a sustainable market economy

Quality	Components
Competitive	Market structures for competition and business standards
	Capacity to add value and innovate
Well-governed	National-level governance
	Corporate-level governance
Green	Mitigation of climate change
	Adaptation to climate change
	Other environmental areas
Inclusive	Gender equality
	Regional disparities
	Opportunities for young people
Resilient	Financial stability
	Resilient energy sector
Integrated	Openness to foreign trade, investment and finance
	Domestic and cross-border infrastructure

Source: EBRD.

scores in previous years. This remains a data-driven comparative exercise, with a number of indicators being used to produce scores quantifying progress. At the same time, however, the updated approach further reduces the scope for discretion in the calculation of scores. Instead, country and sector-specific knowledge derived from the EBRD's activities on the ground plays a greater role in the strategies devised by the Bank in response to the challenges identified allowing for a more nuanced discussion regarding scores and what they mean for a specific country or sector.

The new assessment methodology also makes more extensive use of output indicators, thereby capturing not only processes and institutional set-ups, but also actual performance. This results in certain changes in terms of the overall picture of structural reforms. Lastly, structuring the assessment on the basis of the six qualities of a sustainable market economy allows country specificity to be taken into account when assessing the development of an economic system. Indeed, we can see from looking at advanced economies that there is no such thing as a "standard" market economy and no single way of getting there.

The results are also presented differently. Progress is now measured on a continuous scale from 1 to 10 for each quality, whereby 10 is the best possible score and denotes the frontier in terms of a sustainable market economy. (Earlier assessments used a scale of 1 to 4+, with discrete notches.) The primary purpose of the new scores is to provide a consistent high-level snapshot across countries for each quality. The composite indicators at quality level aggregate a wide range of sub-indicators.

New transition indicators: coverage and methodology

The first stage of this assessment process involves the identification of relevant key components for each quality (see Table S.1).

The assessment of competitiveness looks at market structures that support competition and incentives for sound decision-making (including measures of openness, business skills and the business environment). It also takes account of firms' capacity to add value and innovate (including measures of access to appropriate infrastructure and resources).

The assessment of the extent to which an economy is well governed builds on the EBRD's existing analysis of corporate governance for private enterprises, which is complemented by a measure of integrity. In addition, that analysis also incorporates measures of the quality of public governance, the control of corruption and the rule of law, which are based on available external sources.

The analysis of challenges in the green economy looks at the mitigation of and adaptation to climate change, as well as environmental outcomes such as air pollution, the generation of waste, and biodiversity. This builds on some of the indicators that were used in the assessment of sustainable resources in the *Transition Report 2015-16*, such as carbon intensity or the role played by renewables in the energy mix.

The assessment of economic inclusion is closely aligned with the previous methodology for quantifying transition gaps in the areas of inclusion and equality of opportunity, with a particular focus on gender gaps, regional disparities and opportunities for young people (see the *Transition Report 2013* for details). While that methodology has been refined somewhat in recent years, the key principles have remained unchanged.

The analysis of challenges in building stability and economic resilience looks at two different components of stability. In the area of financial stability, it draws on existing assessments of transition challenges in financial sectors. Given the importance of the banking sector relative to other sources of finance, most indicators relate to the health and adequate regulation of the banking sector. However, other aspects, such as the existence and performance of stock markets, are also taken into account. The second component relates to the resilience of the energy sector and looks mainly at domestic and cross-border connectivity (but also takes account of legal and regulatory considerations in electricity and gas markets). Even though fiscal stability is also an important aspect of resilience, it is not currently included in the EBRD measurements.

The assessment of economic integration looks at both cross-border and domestic connectivity, using measures of openness to trade and investment, as well as balance of payment considerations. It also maps the quality of cross-border and domestic infrastructure, incorporating cost considerations and the provision of services. Measures of the quality of energy and ICT infrastructure are also included as important aspects of integration in a modern market economy.

The next step is to identify relevant indicators and data sources (see Chart S.1). The majority of the indicators are quantitative, with some qualitative indicators being used where necessary. Indicators have been constructed using a wide range of sources, including national and industry statistics, data from other international organisations (such as the World Bank, the IMF and the UN) and surveys such as the Business Environment and Enterprise Performance Survey (BEEPS) and the Life in Transition Survey (LiTS), as well as expert qualitative assessments (see also the methodological notes in the online version of this report, at tr-ebrd.com).

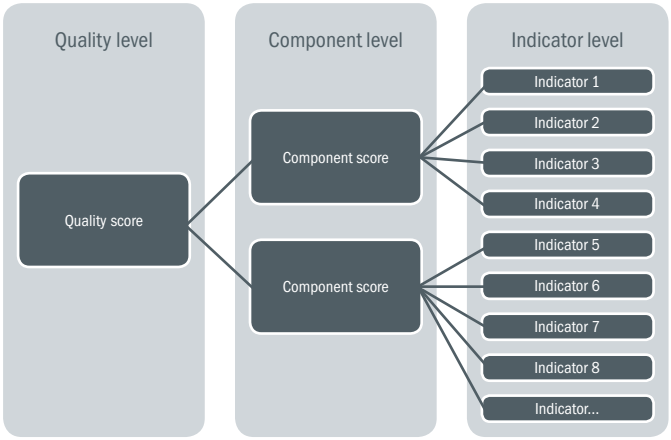
To some extent, the selection of indicators is limited by the fact that the data need to cover all of the countries in the EBRD region, as well as advanced comparator economies outside the region. Data limitations also mean that proxies and imputation have to be used for some observations. Furthermore, data on outcomes are, by definition, a reflection of past decisions. This means that more recent reforms which will take time to show in the data may not be reflected in current transition scores.

Lastly, a scoring mechanism needs to be developed for each quality (see Box S.2). That score measures the situation in each economy relative to a frontier representing the best possible features of a sustainable market economy, which acts as a common benchmark. At indicator level, this frontier represents the situation in the best-performing country in the sample (which comprises the countries of the EBRD region and selected OECD countries as comparators).[1] At component or quality level, the frontier can be regarded as a synthetic country made up of the best performers for each indicator, meaning that no single country in the world is at the overall frontier.

That frontier establishes a useful common benchmark, allowing all countries to be assessed in a consistent manner. However, the frontier is not intended to serve as a finish line. Even though all of the comparator economies included in the analysis can be characterised as well-functioning and sustainable market economies, they score differently across the six qualities. They stand out as being consistently high performers, but their degree of success varies. Thus, the inclusion of comparator countries in the analysis provides a more realistic indication of where countries could be expected to end up with respect to a given frontier.

THE EBRD HAS BEEN MEASURING COUNTRIES' PROGRESS WITH TRANSITION SINCE
1994

CHART S.1. Schematic representation of the assessment methodology



Source: EBRD.

New transition indicators: results

The scores and rankings of individual countries vary across qualities. For example, Slovenia is ranked fifth to seventh in terms of being well governed, resilient and integrated, but second or third in terms of being competitive, green and inclusive. These results may reflect variation in countries' priorities.

Regional aggregates (see Chart S.2) show that countries in the EBRD region tend, on average, to be furthest away from the frontier in the areas of competitiveness and good governance. At the same time, the EBRD region appears to be relatively well integrated, with much of that being driven by external integration.

Taking account of both the distance to the frontier and countries' rankings at quality level, regional results indicate that the best-performing countries are in central Europe and the Baltic states (CEB). Indeed, Estonia, Latvia and Slovenia are consistently among the top scorers in the EBRD region. Other CEB countries are usually in the top third, but perform worse than countries in other regions in at least one quality.

In south-eastern Europe (SEE), the picture is more mixed. In terms of the distance to the frontier, the largest gaps can be seen in the areas of competitiveness, good governance, the green economy and inclusion. A closer look at countries' performance relative to other EBRD countries shows that the four EU member states in this region (Bulgaria, Cyprus, Greece and Romania) perform well overall, but are weak when it comes to good governance and inclusion, as are the countries of the

[1] In some instances, benchmarks represent a theoretical ideal, rather than the performance of an actual country. For example, the frontier for the loan-to-deposit ratio indicator in the assessment of the stability of the financial sector represents a balanced middle ground, as going to the extreme in either direction is undesirable (with very high ratios implying insufficient buffers to deal with potential shocks and very low ratios implying that banks are failing to lend to capacity).

TABLE S.2. Transition scores for six qualities of a sustainable market economy

	Competitive	Well-governed	Green	Inclusive	Resilient	Integrated
Central Europe and the Baltic states						
Croatia	5.75	5.14	6.03	6.03	6.61	6.85
Estonia	7.58	7.58	6.44	7.30	8.19	7.77
Hungary	6.42	5.31	6.37	6.27	6.65	7.89
Latvia	6.53	6.09	6.37	6.82	7.66	7.73
Lithuania	6.06	6.10	6.06	7.05	7.23	7.78
Poland	6.38	6.15	6.56	6.29	7.64	6.79
Slovak Rep.	6.82	4.98	7.05	5.73	7.64	7.85
Slovenia	6.93	5.74	6.67	7.02	7.44	7.61
South-eastern Europe						
Albania	4.41	4.31	4.85	5.11	4.86	5.76
Bosnia and Herz.	4.74	3.66	4.85	4.83	5.35	5.47
Bulgaria	5.96	4.69	5.82	5.33	6.54	6.86
Cyprus	7.21	6.15	5.76	6.20	5.19	6.52
FYR Macedonia	5.39	5.20	4.91	4.72	5.31	6.04
Greece	6.31	4.34	6.27	5.63	6.67	6.38
Kosovo	3.37	3.73	3.80	4.70	5.09	4.89
Montenegro	4.89	5.12	5.15	5.62	5.93	5.59
Romania	6.28	4.97	5.86	5.08	6.98	6.88
Serbia	4.94	4.39	5.77	5.16	5.55	6.39
Turkey	4.89	5.30	5.12	4.21	7.08	5.90
Eastern Europe and the Caucasus						
Armenia	4.47	4.79	5.41	5.72	5.04	5.94
Azerbaijan	3.64	4.61	5.23	4.71	4.46	5.84
Belarus	4.99	4.32	6.16	5.72	4.17	5.38
Georgia	4.54	5.98	4.58	5.14	5.71	6.54
Moldova	4.87	3.94	4.14	5.19	5.27	5.64
Ukraine	4.68	3.58	5.54	5.88	4.60	5.04
Russia	5.20	4.55	4.92	5.94	5.95	5.17
Central Asia						
Kazakhstan	4.30	5.05	4.42	5.37	5.66	5.00
Kyrgyz Rep.	3.45	3.33	4.36	4.46	4.98	4.94
Mongolia	4.25	4.50	5.28	5.64	4.57	5.68
Tajikistan	2.66	3.69	5.58	4.58	3.76	4.23
Turkmenistan	1.46	3.83	4.13	4.86	3.12	4.64
Uzbekistan	2.72	4.32	3.20	5.34	3.98	4.20
Southern and eastern Mediterranean						
Egypt	2.87	3.90	4.41	4.24	5.41	4.27
Jordan	3.92	5.26	5.65	4.88	5.66	6.12
Lebanon	4.92	TBD	TBD	TBD	TBD	5.82
Morocco	3.98	4.35	5.47	4.16	6.06	5.45
Tunisia	3.94	4.33	4.78	4.72	4.75	4.70

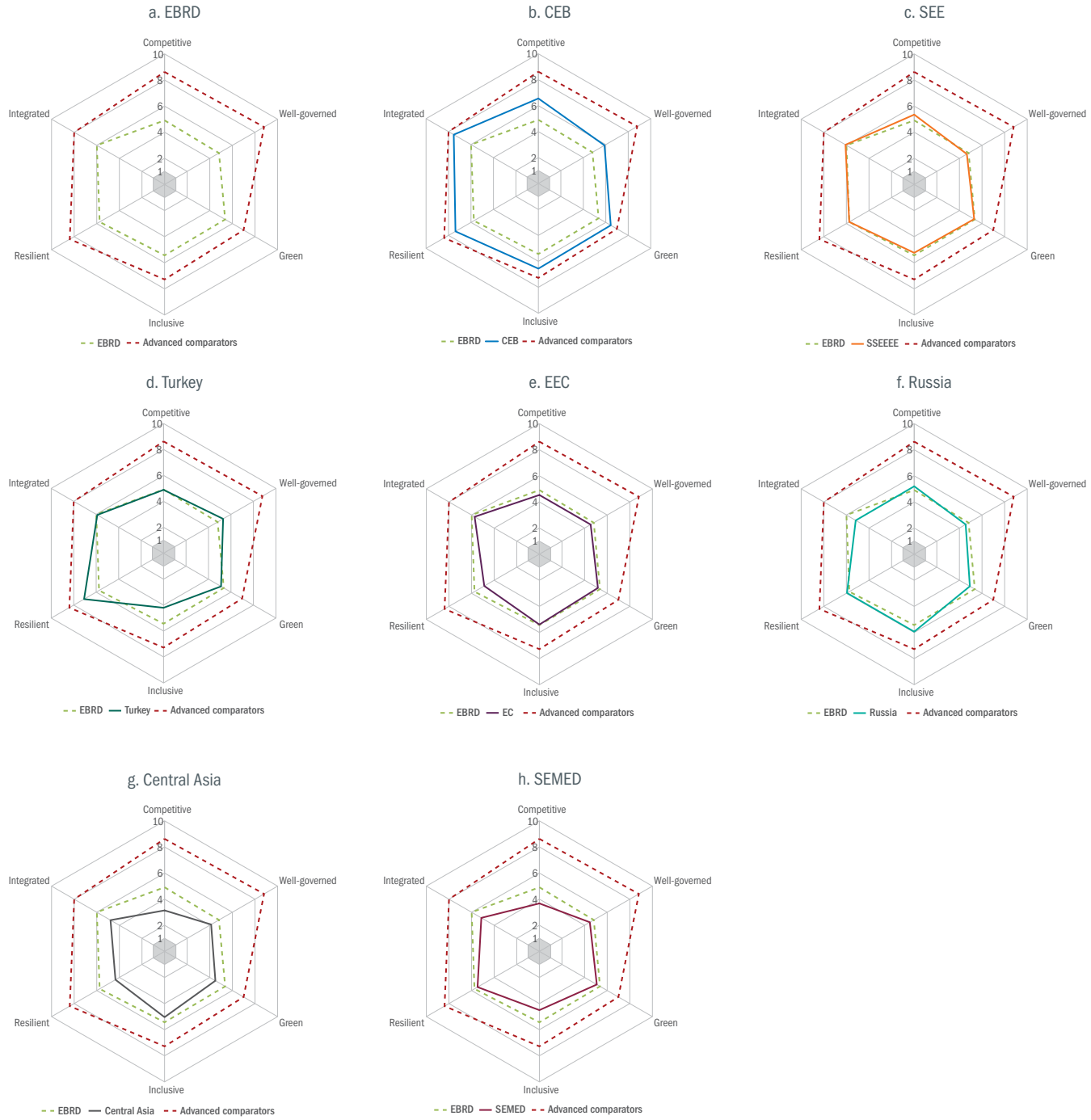
Source: EBRD.
Note: Scores range from 1 to 10, where 10 denotes the synthetic frontier for each quality. The inclusion score for Uzbekistan covers gender equality and regional disparities only. The inclusion score for Turkmenistan covers gender equality only. "TBD" indicates scores that are not yet available.

Western Balkans. In addition, Albania, Bosnia and Herzegovina, FYR Macedonia and Kosovo are all ranked in the bottom third in terms of how green their economies are. Lastly, Cyprus and Greece both appear to be less resilient than a number of their EU peers.

In eastern Europe and the Caucasus (EEC), countries' performance is similarly mixed. This region is weak when it comes to resilience, but two or three countries stand out on account of their performance in other areas. For instance, Georgia performs well in terms of good governance and integration relative to other countries. Meanwhile, Armenia, Belarus and Ukraine all stand out in the area of inclusion, but Ukraine faces considerable challenges in the area of good governance.

However, the biggest challenges in terms of transition to a sustainable market economy can be found in Central Asia and the southern and eastern Mediterranean (SEMED) region. All of the countries in these two regions need to improve in the areas of competitiveness, inclusion and, to varying degrees, internal and external integration.

CHART S.2. Average transition scores by region or country



Source: EBRD and authors' calculations.
Note: "Advanced comparators" denotes the average score for Germany, Sweden and the United States of America. The average for SEMED does not include Lebanon.

Overview of reforms over the past year

The new transition methodology outlined above provides a useful framework for thinking about reforms and evaluating reform efforts against the needs and gaps identified in the new scoring system. The past year has seen a range of reforms being implemented across the region, as well as a number of reversals, and these developments can be viewed through the prism of the new transition concept – despite the fact that, with the new system having only just been introduced, countries' transition scores are not directly comparable with data for previous years. The country pages of the online version of this report contain detailed evaluations of all the main structural reforms in each country over the last year, but the key developments are reported below.

Competitive

This quality covers a broad range of reforms aimed at making it easier for firms to do business and grow, improving the attractiveness of the economy for investors, and enhancing skills and innovation. Not surprisingly, a number of countries have made changes with the aim of improving the competitiveness of individual companies or entire sectors over the last year. Many such reforms have been seen in the CEB region, for instance, as well as Central Asia.

In some cases, governments have introduced comprehensive and far-reaching reform packages following long periods of inactivity. Uzbekistan is the most dramatic example in this regard. Uzbekistan has long been a laggard when it comes to market-oriented reforms, and it languishes near the bottom of the list in terms of overall transition scores (as it did under the previous methodology). However, in 2017 the Uzbek authorities initiated a number of reforms that could, if implemented, have far-reaching effects in terms of the country's competitiveness. Most notably, the country's exchange rate regime has been liberalised following a presidential decree on 5 September 2017 announcing the free convertibility of the Uzbek currency, the sum. This represents a major step forward, as convertibility has long been seen as a litmus test for reform efforts. Egypt has also liberalised its exchange rate regime and removed restrictions on cross-border currency transfers, thereby easing the concerns of foreign investors, who were previously unable to repatriate profits.

In recent years, the EBRD region has led the way in terms of reforms aimed at making it easier to do business, as measured by the World Bank's annual Doing Business rankings, and many countries have kept up this momentum in the past year. In Croatia, for example, the government has reduced the administrative fees that are charged for establishing a company, as well as implementing a number of other measures aimed at reducing the administrative burden on firms. These are long overdue, as Croatia has tended to perform poorly relative to its peers in the CEB region when it comes to measures of competitiveness and ease of doing business. In Turkey, meanwhile, the government adopted a reform package in June 2017 with a view to reducing operational and investment costs for manufacturing companies by easing access to and lowering the cost of land in organised industrial zones, as well as cutting fees and taxes on production and investments. Similarly, the Egyptian government has approved new laws on investment and industrial licensing, both of which should simplify the process of establishing companies and obtaining licences.

In FYR Macedonia, a two-year political crisis, which had led to stagnation and weakening growth, was resolved in mid-2017. The new government has introduced a comprehensive reform plan with an emphasis on support for local businesses and enhanced regional integration. Meanwhile, elsewhere in the Western Balkans, the EU approximation process remains the key anchor for market-oriented reforms. Montenegro continues to lead the way in this regard, with 28 of the 33 chapters of the country's accession negotiations now open, and three provisionally closed. Serbia has also made progress with its negotiations over the past year, while Bosnia and Herzegovina is in the process of completing the European Commission's pre-accession questionnaire, having applied for EU membership in 2016.

In addition, several countries have made important advances in the area of privatisation. In Greece, three important privatisation projects have been completed this year: concessions for Piraeus port and 14 regional airports, and the sale of the railway company TrainOSE. Slovenia has made progress with its plan to sell 20 companies in 2017, although the flagship sale of the country's biggest bank, NLB, is on hold. Progress has also been made with Kazakhstan's ambitious privatisation plan, with 53 small companies owned by state holding company Samruk Kazyna being sold between mid-2016 and mid-2017. However, Ukraine's privatisation programme has largely stalled. Indeed, the government was forced to nationalise Ukraine's largest commercial bank, Privatbank, at the end of 2016 in order to preserve financial stability. In Poland, where state control over the economy remains significant (particularly in the banking and energy sectors), the government has called a halt to the country's privatisation programme.

Well-governed

Improving governance is a difficult task and typically requires a sustained commitment to reforms over a period of time. Several SEMED countries have recently embarked on major reforms of their public administrations and civil services. In Tunisia, for example, the government adopted a new strategy earlier this year with the aim of reforming its civil service. That strategy aims to streamline the civil service by 2020 and substantially reduce its wage bill. Morocco has also made progress with reforms to its civil service, while the Jordanian government has carried out a comprehensive public investment management assessment with a view to enhancing the efficiency of public investment spending.

Reforms of public-sector governance have also featured prominently in the CEB region. In Poland, for example, a number of spending reviews have been carried out. In the Slovak Republic, meanwhile, a successful programme introduced

in 2016 with the aim of ensuring value for money has been expanded to cover several new sectors. The Slovak government is also strengthening measures to ensure that the drawing of public funds (including EU funds) is carried out in accordance with best practices and that opportunities for corruption are minimised. Bulgaria and Romania both remain under the EU's Cooperation and Verification Mechanism, which was introduced when the two countries joined the EU in January 2007. Both countries have made further progress in this regard over the past year. Bulgaria has made progress with judicial reforms and drawn up new laws aimed at tackling high-level corruption and money-laundering. Romania has also taken important steps in these areas over the past year, including the adoption of a new anti-corruption strategy for 2016-20.

In view of the importance of the natural resources sector for many countries in the region, the EBRD continues to support the Extractive Industries Transparency Initiative (EITI). There are a number of EITI countries in the EBRD region, and developments in those countries have been mixed over the last year. Mongolia, for instance, has been certified as having made meaningful progress against the EITI's 2016 standards, while the Kyrgyz Republic and Tajikistan have both been suspended on account of inadequate progress. Most notably, Azerbaijan's membership of the EITI was suspended in March 2017 over concerns about the enabling environment for civil society. Following that suspension, Azerbaijan formally withdrew from the initiative, although the government has stated that it remains committed to the principles of good governance, revenue transparency and accountability. A presidential decree dated 5 April 2017 established a commission on additional measures to increase transparency and accountability in the extractive industries.

Governance is not just important at national level. Companies should also adhere to good standards of corporate governance. This can help to attract investment and provide a framework for identifying and managing risk, as well as helping to ensure better and more effective management that takes account of stakeholders' concerns. This is particularly important for state-owned companies, which can be subject to political demands. With the help of the EBRD, a number of countries are now implementing reforms aimed at improving the corporate governance of state-owned enterprises across a variety of different sectors (including transport, energy, finance and industry). In Belarus, for instance, a programme is being implemented in order to improve the governance of two state-owned banks in preparation for subsequent privatisation, while Albania's main utilities company, KESH, is in the process of improving its governance and operating practices.

Green

Major progress has been seen right across the region in the area of green transition, especially as regards the development of renewable energy.

The Egyptian government's Sustainable Energy Strategy, which was approved in 2016 and covers the period up to 2035, has formalised its commitment to renewable energy. That strategy seeks to establish a sustainable and diverse energy mix and reconfirms the ambitious target (previously set in 2008) of obtaining 20 per cent of electricity from renewable sources (particularly solar and wind) by 2022. Achieving this target will require massive investment, most of which is expected to come from the private sector.

In Mongolia, meanwhile, all of the financing for the Sainshand and Tsetsii wind farms has now been secured, and construction has begun. That progress followed more than six years of policy dialogue and project structuring in relation to the earlier Salkhit wind farm in order to help set up an appropriate framework. Those projects should help Mongolia to achieve its goal of renewable energy accounting for 20 per cent of all power by 2020 and 30 per cent by 2030.

In Serbia, where the use of renewable energy remains limited, the Kovačica and Dolovo wind farms have successfully raised all of the required financing following significant policy dialogue involving the EBRD and other international financial institutions with a view to ensuring the bankability of the associated power purchase agreements. Together, those projects will achieve carbon savings totalling more than 600 tonnes of CO_2 emissions per year, as well as helping to demonstrate the viability of the country's newly established renewable energy support scheme.

In Poland, however, new legislation on renewable energy which entered into force in August 2017 may discourage new investment and jeopardise the existence of current producers of renewable energy. That new law follows earlier legislation sharply restricting the deployment of inland wind farms. These developments make it less likely that the country will achieve its target of generating 15 per cent of its energy from renewable sources by 2020. On a more positive note, however, the government has also issued an important air quality directive restricting the production and use of polluting heating installations.

Substantial efforts have also been made across the region with a view to expanding the market for green financing, increasing fuel switching, reducing gas flaring and rolling out energy-efficiency measures. In the Baltic states, Lithuania's national energy company is issuing some of the EBRD region's first ever green bonds, while in the SEE region, Montenegro has embarked on the third phase of its modernisation and smart meter installation programme, which is expected to result in it becoming the first country in the EBRD region to meet the EU's target of having at least 80 per cent of the population covered by smart meters by 2020. In Turkey, meanwhile, gas companies have continued to expand their gas distribution network to new cities, resulting in significant switching away from higher-carbon alternatives.

Inclusive

The issue of inclusion poses major challenges across large parts of the EBRD region. The large skills gaps and high levels of youth inactivity in the SEMED region and the Western Balkans are hindering young people's access to skills and employment. Meanwhile, legal and regulatory barriers are continuing to prevent women from participating in labour markets to the same extent as men, particularly in the SEMED region, Turkey and Central Asia. In addition, variation in the quality of local institutions and access to services within individual countries is exacerbating regional inequality and limiting convergence in the SEE region and Central Asia. Moreover, for many countries, the ongoing refugee crisis and increased migration flows are posing substantial challenges. Nevertheless, efforts to promote inclusive growth are under way across the region.

Gender equality has been at the top of the policy agenda in the SEMED region and Central Asia in the last year, with Jordan becoming the third SEMED country (after Morocco and Lebanon) to preclude the use of marriage to avoid rape prosecutions. Tunisia, meanwhile, has adopted its first law preventing gender-based violence and providing support to survivors, as well as abolishing a law prohibiting Tunisian women from marrying non-Muslim men. In Kazakhstan, the Secretary of State has adopted a new Gender and Family Strategy 2030 to address legal barriers preventing women from working freely in all sectors. In this context, a commitment has been made to "optimise" the list of 299 jobs that women are currently prohibited from undertaking. Similar efforts are under way in the Kyrgyz Republic.

In many parts of the Western Balkans, reforms are under way with the aim of improving technical and vocational education and skills, albeit progress is often slow. In 2016, Kosovo and Montenegro launched strategic plans seeking to align their vocational education and training policies with labour market requirements. Albania has adopted new regulations aimed at improving its dual learning system, while the Montenegrin parliament has adopted a new social strategy with the aim of enhancing the skills and employment opportunities of its Roma and Egyptian minorities. At the same time, however, Bosnia and Herzegovina, FYR Macedonia and Serbia still have not adopted new national qualifications frameworks, despite this issue having been under discussion since early 2016.

In Kazakhstan, the authorities have launched an employment and entrepreneurship programme with a view to mitigating the impact that weak growth has had on the labour market. As part of those efforts, fees for basic vocational and technical training courses have been abolished. In Georgia, meanwhile, reform measures have been introduced with a view to strengthening work-based learning and facilitating the progression from vocational training to tertiary education. In Ukraine, pilot projects are under way in 200 local schools with the aim of testing new approaches to vocational education.

The Turkish government has adopted a new selective migration and refugee policy and is now allowing Syrians to apply to the Labour Ministry for work permits. Meanwhile, the Jordanian government has adopted the Jordan Response Plan 2017-19 (which includes initiatives aimed at strengthening resilience at local and national level), set up a new National Committee for Human Resource Development and developed a new strategy aimed at improving the development of human resources. In Egypt, meanwhile, resolutions seeking to protect the most vulnerable groups in society were announced by the President in June 2017. Those measures are aimed primarily at the poor and pensioners and provide vital cash support at a time of relatively high inflation.

200 SCHOOLS
ARE PARTICIPATING IN A MAJOR PILOT PROJECT IN UKRAINE TRIALLING NEW APPROACHES TO VOCATIONAL EDUCATION

Resilient

A number of countries have taken important steps to strengthen the resilience of their financial sectors in the last year. Indeed, there have been a large number of developments relating to this quality, suggesting that countries are still making major efforts to reform and strengthen their financial systems. In addition, some countries have taken steps towards putting their energy sectors on a more financially sustainable footing.

In many cases, this has involved dealing with the legacy of the pre-crisis credit boom and the high non-performing loan (NPL) ratios that persist across the region. This problem is especially severe in the SEE region – particularly in Cyprus and Greece, where NPLs still account for nearly half of all loans. Important legislative changes have been made in both of those countries in the last year with a view to helping to resolve this problem, and the countries' biggest banks have now started to tackle the issue of NPLs, with some limited success so far. Elsewhere in the SEE region, NPL ratios have fallen significantly in Albania, FYR Macedonia, Romania and Serbia. In order to support these efforts, an NPL project established as part of the Vienna Initiative has organised several workshops over the last year and launched a knowledge hub (npl.vienna-initiative.com) with a view to facilitating knowledge-sharing between stakeholders.

In Moldova, significant progress has been made with the mitigation of major vulnerabilities in the country's banking system. Two years ago, Moldova was shaken by a massive fraud in the country's three main banks, resulting in an outflow of funds totalling US$ 1 billion. At the time of writing, two of those three banks were still subject to special supervisory measures, while the third was under special administration by the central bank. Legal changes have been made to help prevent a similar crisis in the future.

In Azerbaijan, meanwhile, the authorities have made progress with the restructuring of the country's largest bank, IBA, in preparation for its eventual privatisation. And in Tunisia, the authorities have made important progress with the restructuring of public banks by concluding performance contracts – a major step in terms of strengthening the financial sector.

While subsidies remain a prominent feature of energy markets in a number of countries (notably in the SEMED region), the last year has seen some countries take advantage of low oil prices in order to reduce such market distortions. In Egypt, for instance, the government has carried out several rounds of reforms amending fuel and electricity subsidies, leading to higher prices for a range of energy products. The Tunisian government has also made progress with reforms to fuel and electricity subsidies, while the Jordanian authorities have introduced an electricity tariff adjustment mechanism to promote more efficient use of energy.

Integrated

Most of the countries in the EBRD region can be regarded as small, open economies, but barriers to cross-border integration persist. These barriers are gradually being broken down, with important advances being observed in the SEE region and Central Asia over the last year. Regional integration has been an important objective for SEE countries in recent years, but the poor quality of infrastructure has often been an obstacle to cross-border trade and investment. Albania, FYR Macedonia, Kosovo and Montenegro have all made major progress in the area of road building in the past year. However, important road projects in Bosnia and Herzegovina are being delayed by the authorities' failure to amend the law on fuel excise duties and allow an increase in the price of fuel.

Progress has also been made with a number of cross-border energy infrastructure projects supporting regional integration. Further progress has been made, for example, with elements of the Southern Gas Corridor (SGC), with major benefits expected to materialise across Albania, Azerbaijan, Greece and Turkey in the areas of employment, regulatory reform and energy security. In November 2016, Bulgaria and Romania completed the construction of a new gas interconnector, allowing gas to flow between the two countries and helping to ensure the eventual integration of SGC gas sources into central and western European markets.

In Central Asia, Kazakhstan is leading the way in terms of the promotion of international integration – notably in the financial sector, where the Astana International Financial Centre is almost ready to be launched. Meanwhile, the authorities in Uzbekistan are now reaching out to neighbours in order to open up new trade and investment opportunities. New road border crossings and a new rail link with Kazakhstan were opened in 2017, and commercial flights between Uzbekistan and Tajikistan resumed after a 25-year hiatus.

Box S.1. Measuring transition: an overview of past approaches

The EBRD has been assessing the progress made by countries of operations and attempting to quantify it since 1994. Transition scores are constructed on the basis of the EBRD's experience, surveys and available data, reflecting both the magnitude of countries' achievements and the scale of the remaining challenges. The first set of transition indicators was introduced in 1994 and covered various aspects of the transition process, focusing on what were considered to be the core elements of the market economy: enterprises and households, markets and financial institutions. The indicators that were selected on the basis of that conceptual framework ranged from privatisation and enterprise restructuring to price liberalisation and banking reform. That first generation of transition indicators was expanded over the years, being supplemented by measures relating to the development of the financial sector and infrastructure.

In 2010, those country-level indicators were complemented – and eventually replaced – by a broader range of sectoral indicators. While those original transition indicators had served an important purpose by providing an overview of progress over two decades where data on economic transition were relatively scarce, some of the limitations of those indicators were becoming increasingly apparent. One of the main criticisms was that the original indicators reflected a somewhat rudimentary approach to transition, with a focus on reducing the role of the state. Many countries had pursued reforms in these areas and achieved reasonable levels of private-sector participation in the economy. However, they continued to face challenges in terms of their economic development, which were not sufficiently captured by those fairly simplistic indicators. Many of the developments observed in the 1990s showed that having the state set the rules of the game and having an effective institutional environment was essential for the proper functioning of markets.

The new sectoral scores were based on a more nuanced approach, taking account of the market structures and institutions that are required to establish a well-functioning market economy. In addition, although they still incorporated an element of discretion on the basis of information that was not summarised in publicly available data, those sectoral scores relied more heavily on external data, thereby offering a more objective and justifiable account of countries' progress.

Box S.2. Scoring methodology

The raw data for each indicator are normalised to the same scale (0 to 1) using the values for the best and worst performers. If the highest value equates to the best performance, that transformation is carried out as follows:

$$x' = \frac{\mathrm{x} - \mathrm{x}_{worst}}{\mathrm{x}_{best} - \mathrm{x}_{worst}}$$

This ensures the comparability of scores across indicators. The next step is to aggregate those normalised data at component level using simple averaging. Lastly, components are averaged in order to obtain quality-level indicators using specific weights. Those weights are based primarily on the EBRD's judgement as to their relative importance (see the methodological notes in the online version for details). The resulting scores are then rescaled from 1 to 10, where 10 represents the frontier for each quality.

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Chapter 3
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