

# TRANSITION REPORT 2014



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## Innovation in Transition

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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 publication 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 are based on information as of early October 2014.

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## COUNTRY ABBREVIATIONS

Albania	<b>ALB</b>	Morocco	<b>MOR</b>	Argentina	<b>ARG</b>
Armenia	<b>ARM</b>	Poland	<b>POL</b>	Australia	<b>AUS</b>
Azerbaijan	<b>AZE</b>	Romania	<b>ROM</b>	Brazil	<b>BRA</b>
Belarus	<b>BEL</b>	Russia	<b>RUS</b>	Canada	<b>CAN</b>
Bosnia and Herz.	<b>BOS</b>	Serbia	<b>SER</b>	China	<b>CHN</b>
Bulgaria	<b>BUL</b>	Slovak Republic	<b>SVK</b>	Czech Republic	<b>CZE</b>
Croatia	<b>CRO</b>	Slovenia	<b>SLO</b>	Finland	<b>FIN</b>
Cyprus	<b>CYP</b>	Tajikistan	<b>TJK</b>	France	<b>FRA</b>
Egypt	<b>EGY</b>	Tunisia	<b>TUN</b>	Germany	<b>GER</b>
Estonia	<b>EST</b>	Turkey	<b>TUR</b>	India	<b>IND</b>
FYR Macedonia	<b>FYR</b>	Turkmenistan	<b>TKM</b>	Indonesia	<b>IDN</b>
Georgia	<b>GEO</b>	Ukraine	<b>UKR</b>	Israel	<b>ISR</b>
Hungary	<b>HUN</b>	Uzbekistan	<b>UZB</b>	Italy	<b>ITA</b>
Jordan	<b>JOR</b>			Japan	<b>JPN</b>
Kazakhstan	<b>KAZ</b>			Netherlands	<b>NED</b>
Kosovo	<b>KOS</b>			Saudi Arabia	<b>SAU</b>
Kyrgyz Republic	<b>KGZ</b>			Singapore	<b>SGP</b>
Latvia	<b>LAT</b>			South Africa	<b>ZAF</b>
Lithuania	<b>LIT</b>			South Korea	<b>KOR</b>
Moldova	<b>MDA</b>			Thailand	<b>THA</b>
Mongolia	<b>MON</b>			United Kingdom	<b>UK</b>
Montenegro	<b>MNG</b>			United States	<b>USA</b>

## GLOSSARY

A glossary for this *Transition Report* is available at [tr.ebrd.com](http://tr.ebrd.com).

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# EXECUTIVE SUMMARY

How can firms in transition countries become more productive? And how can a dynamic and innovative business sector help countries grow? This year's *Transition Report* seeks answers to these important questions by analysing firm-level innovation across the transition region.

The *Transition Report 2014* exploits a unique enterprise survey that for the first time unlocks detailed information on how firms innovate by introducing new products, new production processes, new ways of organising themselves and fresh approaches to marketing their products and services. The report also takes stock of firms' investments in research and development (R&D) and provides new insights into how managerial practices influence a firm's productivity.

A key idea put forward in this report is that regardless of a country's level of economic development or its progress along the transition path, individual firms can make a difference. Even in countries that seem "stuck in transition" – a central concept in last year's *Transition Report* – managers can make decisions that have a profound impact on the efficiency and productivity of the businesses they run. Yet, in order to establish which actions are most beneficial – R&D, adopting products that have been developed elsewhere or improving management practices – it is necessary to know more about the business environment in which a firm operates.

Against this background, the first four chapters of the report examine the link between innovation and productivity and look at factors that drive innovation occurring both within the firm and externally. Special attention is paid to firms' access to finance for facilitating innovation. Lastly, Chapter 5 takes stock of how policy-makers can help create the right conditions for firm-level innovation to flourish.

The last two sections of the report examine recent regional macroeconomic developments, provide an economic outlook for the transition region and discuss recent trends in structural reforms during 2013-14. *Assessments of economic developments and structural reform in individual countries across the region are available online at [tr.ebrd.com](http://tr.ebrd.com).*

## THE MANY FACES OF INNOVATION



Improvements in the overall productivity of an economy reflect many changes at the level of individual firms. When new firms with novel ideas enter the market and unproductive firms cease to operate, scarce resources are put to more productive use. Overall productivity also increases when highly productive firms and firms where productivity is growing fast increase their market share. However, most of the economy-wide productivity gains derive from productivity improvements within firms. These are the dynamics at the heart of this *Transition Report*. Such improvements are often driven by firm innovations in the form of the introduction of new products, the implementation of new production processes or the use of new organisational practices or marketing innovations.

Only a small number of these innovations are new to international markets and advance the global technological frontier. Instead, across the transition region most innovative activities involve the adoption of existing technologies by firms. This is a direct reflection of the fact that there is still substantial scope for catching up with the global technological frontier.

Some new products and processes are developed as a result of in-house R&D activities while others require no R&D efforts. This chapter shows that many firms in the transition region "buy" rather than "make" knowledge; they outsource R&D to other firms or purchase or rent patents, licences or technological know-how. The mix of strategies for the acquisition of external knowledge varies by country. Firms in higher-income countries tend to spend more on in-house R&D relative to purchases of external knowledge.

At the country level, Chapter 1 shows how over the last two decades, exports from the transition region have become more innovation-intensive. Innovation through the adoption of existing state-of-the-art technologies has played an increasingly important role. ●

## INNOVATION AND FIRM PRODUCTIVITY



Across the world, economies remain characterised by large differences in labour productivity between firms. The results of the Business Environment and Enterprise Performance (BEEPS) survey show that there are firms with high labour productivity in every transition country. However, in the less-advanced transition countries the share of firms with poor productivity is higher and the differences between the productivity levels of individual firms are larger too.

One way firms in these countries can become more productive is by introducing new products and processes or new approaches to marketing. Returns to all these types of innovation are sizeable even when they are not innovations at the global frontier but products and processes that are simply new to the firm. This chapter illustrates how firms in all sectors can benefit from innovation. In fact, returns to the introduction of new products are particularly high in low-tech manufacturing sectors where firms tend to innovate less.

For some firms, innovation may still be a step too far. Many can still boost their productivity by improving the way in which they are managed. In countries where the quality of management is generally weak, improvements in management practices deliver high returns while returns to process innovation tend to be lower. This suggests that management practices need to be improved before new processes can yield substantial productivity gains. On the other hand, in countries where management practices are on average better – in south-eastern Europe and in central Europe and the Baltic states – the introduction of new processes results in more benefits than further management improvements.

Chapter 2 ends with a cross-country analysis which suggests that exports from industries with a higher innovation component tend to grow faster, provided that the business environment is favourable and firms have sufficient access to finance. In these countries, innovation-intensive industries can thus become the engines of economic growth. ●

## DRIVERS OF INNOVATION



Successful firm innovation relies on a supportive business environment. A poor business environment can substantially increase the costs of developing new products and make returns to innovation much more uncertain, thus undermining firms' incentives to innovate. The results of the BEEPS survey reveal that firms that innovate by introducing one or more new products are more sensitive to the quality of the business environment compared with non-innovating firms. These differences in the perception of the business environment by firms that innovate and those that do not are particularly large when firms are asked to assess the importance of corruption, workforce skills and customs and trade regulations. They are also greater in Central Asia, eastern Europe and the Caucasus and Russia, while in central Europe and the Baltic states they are smaller. The findings suggest that the overall environment in these countries may be more supportive of innovation.

Firm-level and cross-country analyses of the drivers of innovation also show that firms innovate more predominantly in countries that have better core economic institutions, such as an environment of low corruption and a strong rule of law, countries that are more open to trade and investment and countries that benefit from a highly skilled workforce. Better access to finance and higher-quality information and communication technology infrastructure also helps firms to innovate.

Innovative start-ups are relatively scarce in the transition region. Unlike in countries such as Israel, innovations by young, small firms are also less likely to target the global technological frontier than those of large firms. Moreover, many successful R&D start-ups tend to quite rapidly migrate to other countries such as the United States, causing an "innovation drain". ●

## FINANCE FOR INNOVATION



In the transition region, innovation often takes the form of adopting existing products and processes from more developed countries and adapting them to local conditions. The speed at which firms adopt new and existing technologies can explain up to a quarter of the differences in national income levels. However, technology adoption can be costly and firms may therefore need access to external finance.

Against this background, Chapter 4 first studies how differences in local banking conditions across cities and towns in the transition region have an impact on firms' access to credit. In light of the fact that small business banking remains largely a local affair, the chapter finds that local banking systems which enable the formation of long-term lending relationships tend to boost access to credit. At the same time, the presence of foreign-owned banks locally also tends to be beneficial to firms' access to credit.

The chapter then goes on to show that better access to bank loans has a significant positive impact on technology adoption across the region. Moreover, these new products and processes are often also new to the firm's markets; hence they set an example for competitors in terms of technology uptake. In addition, firms use bank loans not only to purchase external licences and know-how to adopt new technologies, but also to cooperate with their suppliers and clients to develop business solutions. Therefore, local banking markets that increase access to finance can encourage firms to learn from each other and lead to the intra-national diffusion of technology. In the medium term, this has the potential to reduce regional growth disparities.

Bank financing remains the dominant source of external capital for firms across the transition region. Can banks alone carry the burden of funding innovative activity? The analysis in this chapter finds that additional sources of risk capital may be necessary to induce firms to carry out original R&D. In particular, a discussion about private equity and venture capital industries in the transition region reveals a large equity-funding gap. This gap arises as a result of underdeveloped stock markets in the region, as well as insufficient human capital, which limit the flow of private equity funding into the region. ●

## POLICIES SUPPORTING INNOVATION



Governments everywhere are keen to foster innovation. However, countries at various stages of development differ in terms of their capacity to use and create knowledge. These capacities are shaped by the quality of institutions, macroeconomic stability and the functioning of product, labour and financial markets. They are also influenced by specific conditions that underpin countries' ability to access existing technologies, effectively absorb them and create new ones.

Transition countries perform reasonably well in terms of access to technology, but lag behind advanced economies and many emerging markets when it comes to absorptive and creative capacity. The analysis of national innovation policies reveals that they appear surprisingly similar, despite the underlying differences in countries' levels of development and strategies pursued by firms to acquire knowledge (through in-house research or by purchasing patents, licences or know-how). In particular, the innovation policies in the region tend to follow trends set by countries at the global technological frontier and focus on the creation of technologies.

However, a one-size-fits-all approach such as this may not suit the circumstances of many of the transition countries. Given that these countries are yet to close the gap with the technological frontier, policies need to prioritise improvements in countries' absorptive capacity. Such improvements can be achieved through better secondary education and professional training, better management practices and policies that alleviate credit constraints. While innovation systems should imitate the governance and general design of advanced countries' innovation policies, policy instruments and priority areas need to be tailored to reflect an individual country's specific conditions.

As countries develop and approach the technological frontier, innovation policies must evolve. They need to place greater emphasis on helping firms improve their capacity to create knowledge – by facilitating the supply of specialised skills and specialised finance, strengthening competition and facilitating the entry and exit of firms.

Vertical innovation policies that offer support for particular sectors require high standards of governance to be effective and may not suit the circumstances of many transition countries. If pursued, such policies should make effective use of private-sector participation, which provides for an independent check on the commercial viability of projects selected to receive preferential treatment. ●



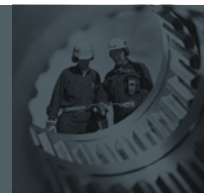
## MACROECONOMIC OVERVIEW



Economic growth has slowed down further in the transition region as a whole. By the time the eurozone's recovery started to take hold in the second half of 2013, two major developments substantially affected the performance of the region's economies. First, regional growth has been affected negatively by the events in Ukraine since late 2013. These developments and the resulting rounds of economic sanctions made the growth outlook significantly more uncertain. Second, similar to numerous emerging markets, many of the transition countries had already been affected by the expectations of a tapering of quantitative easing in the United States and monetary tightening in advanced economies more generally.

Faster economic growth in south-eastern Europe was more than offset by a deceleration of growth in Russia and Turkey, and the recovery in the southern and eastern Mediterranean (SEMED) region has remained slow. Thus average growth in this region is likely to remain below 3 per cent for three consecutive years (2012-14). Regional growth is projected to accelerate only slightly in 2015. ●

## STRUCTURAL REFORM



The current political and economic situation in many countries continues to provide a challenging environment for reform. For the first time, this year's assessment of progress in reform by sector contains more downgrades than upgrades. The downgrades are mainly concentrated in the financial sectors where a number of additional structural challenges have been revealed, even though the assessment of the institutional reforms has remained largely unchanged. Downgrades in non-financial sectors are concentrated in European Union countries. In several cases, disproportionate government interference across different sectors has had a negative effect on the functioning of markets.

Positive developments are evident in the infrastructure sector, where commercially based mechanisms have been successfully introduced, ensuring the efficient delivery of services. In addition, small improvements in access to finance for small and medium-sized enterprises (SMEs) have led to upgrades of related financial-sector indicators. Two countries have been upgraded in one of the traditional country-level indicators – competition policy. But the region's largest economy, Russia, has been downgraded on trade and foreign-exchange liberalisation as a result of the restrictions on trade and the activities of foreign companies in the country. ●

# INNOVATION IN TRANSITION



Last year's *Transition Report*, entitled *Stuck in Transition?*, examined the causes of the slow-down in income convergence between transition countries and more advanced market economies. It focused on country-level characteristics that continue to hamper economic development in large parts of the transition region – weak economic and political institutions, slow structural reforms, limited productivity growth and the

daunting challenge of improving human capital and working towards equal opportunity. The report was a general reality check and, to some extent, a wake-up call.

Innovation in Transition – the title of this year's *Transition Report* – tackles a similar set of issues from a completely different perspective. The report focuses, in considerable detail, on the individual firm in transition. Adopting this micro perspective is crucial to achieving a deeper understanding of why countries can become “stuck” in transition. More importantly, it also reveals the effect that individual firms can have on economy-wide productivity and the specific steps that can be taken to help boost productivity and reinvigorate economic growth. The challenge for policy-makers is discovering how to facilitate and encourage change at the firm level without intervening in decisions that are best left to firm owners and management.

We use the word “innovation”, with some hesitation, to describe what happens in individual firms. Innovation has associations with high tech and R&D, but innovation is something much broader and encompasses the introduction of any new products, services or production processes. This definition of innovation is particularly important in emerging economies because many productivity improvements, and ultimately economic growth, will come from imitation and adapting globally available technologies to local markets. Some of these changes will happen when new firms with novel ideas enter the market and when unproductive firms cease to produce, freeing up resources that can be used to realise better ideas. The economy also gains when efficient and fast-growing firms expand their market share while inefficient ones wither. Yet, most productivity improvements stem from within firms, particularly in emerging and developing economies.

The overriding question that the *Transition Report 2014* aims to answer is why certain firms in the region innovate and grow

while others become stuck in terms of their development. To answer this question, the report draws on a unique enterprise survey conducted across the region by the EBRD and the World Bank over the past three years – the fifth round of the Business Environment and Enterprise Performance Survey (BEEPS) – together with the Middle East and North Africa Enterprise Surveys (MENA ES) carried out by the World Bank, the EBRD and the European Investment Bank. The latest round of BEEPS includes, for the first time, a special module on firms' innovation activities. This collates information about the new products and processes that firms have introduced in the recent past. The survey enables these activities to be related to a firm's management practices, its performance and the business environment in which it operates.



**The overriding question is why certain firms in the region innovate and grow while others become stuck in terms of their development.**

The analysis also benefits from another major survey conducted by the EBRD in 2012, the second round of the Banking Environment and Performance Survey (BEPS II). The survey used face-to-face interviews with the CEOs of over 600 banks in the region to collect detailed information on their operations and business models. BEPS II also collected data on the locations of over 137,000 branches operated by these banks. This has provided a unique opportunity to gain additional insights into how firms and banks interact throughout the transition region and how these interactions may drive innovation in firms.

Through the analysis of these rich data it is possible to establish that firm innovation in the transition region entails much more than “frontier” innovation in the form of research and development (R&D) and the creation (and patenting) of products and services that are new to the global market. In many transition countries, firms innovate mainly by adopting existing products and technologies and adapting them to local circumstances.

Reaping these relatively easy returns remains an important

driver of firm productivity across many transition countries and one that, unfortunately, is often overlooked by local policy-makers. As a result, innovative firms – much more so than non-innovative ones – continue to suffer from business constraints. These limitations take the form of widespread corruption, a lack of skilled labour, excessive customs and trade regulations and scarce funding options.

In countries still far removed from the technological frontier, policy-makers should focus more on improving the country's capacity to absorb and benefit from technologies developed elsewhere. This requires, in particular, better primary and secondary education, better access to bank credit and an environment in which entrepreneurs are encouraged to improve the way they manage their firms.

As firms gradually close the gap between themselves and the global technological frontier and as the structure of the economy changes, economic institutions and policies supporting this change should also evolve. As an economy approaches the global frontier, the contributions made by innovative start-ups play an increasingly important role compared to improvements made within existing firms. The policy focus then needs to shift from facilitating investment and the transfer of technologies to nurturing creativity, providing highly specialised human capital and creating space for the entry of young, innovative firms as well as allowing the exit of firms that do not succeed. This requires that we pay more attention to flexible labour markets, better competition policies, good universities and sufficient access to venture capital and private equity for young start-up firms. It is the failure to successfully achieve such structural transformation that has left so many countries stuck in the "middle-income trap".

While governments cannot directly make firms improve their performance, they can help them do so. They can achieve this by ensuring that economies are sufficiently open to trade and investment, by helping firms to learn about more efficient ways of doing business, by enabling workers to acquire the right skills and raising the general level of education and by safeguarding competition that rewards firms that transform themselves and puts pressure on laggards to improve. Importantly, as firms transform themselves, the structure of the economy and the economic institutions must also evolve. Government policies should adapt too; there is no one-size-fits-all innovation policy.

As experience has shown, blindly copying the institutions of advanced economies is not the solution – the main challenge is establishing how to tailor institutions and policies to the needs of a particular country. Countries must engage in what Dani Rodrik and others have described as "self-discovery". For such a

process to result in the right policies, the private sector must be involved, probably even in a leading role. To prevent manipulation by special-interest groups the process must be transparent and independently governed.

As governments succeed in tackling the institutional challenges and are able to local build capacity they can become involved in more risky activities. These include targeting sector-specific technology or skills gaps and finding interesting ways of enhancing sector-specific skills with cross-cutting enabling technologies. Such so-called "smart specialisation" requires a basic implementation capacity in countries and an adequate quality of human capital, but it has the potential to create added value.

The overall message of this year's *Transition Report* is a hopeful one. Last year's report argued that change at the regional level within a country can eventually help to reform institutions and increase income. Likewise, as explained in this year's edition, changes at the firm level can collectively transform an entire economy. Regardless of a country's level of economic development or its progress along the transition path, individual firms can make a difference.

In all countries, no matter how difficult the business environment is or how weak the economic institutions may be, there are firms that enjoy high levels of productivity, on a par with those of their peers in advanced markets. The main difficulty for countries is the large number of less-productive firms. Managers in these firms can make decisions that have a profound impact on the productivity of their businesses. Governments can make it easier for them to implement these decisions and can increase the pool of talent from which they can draw. As firms move along their transition path, so will the countries in which they are based.



**Erik Berglof**  
Chief Economist  
EBRD

# THE MANY FACES OF INNOVATION



OVER

# 15,000

FIRMS WERE SURVEYED AS PART OF THE BEEPS V SURVEY

# 28%

OF BEEPS RESPONDENTS HAVE ADOPTED NEW ORGANISATIONAL PRACTICES OR MARKETING TECHNIQUES IN THE LAST THREE YEARS

AT A GLANCE



BEEPS FIRMS IN SLOVENIA SPEND ON AVERAGE

# 0.7%

OF THEIR ANNUAL TURNOVER ON R&D - THE HIGHEST PERCENTAGE IN THE TRANSITION REGION



**Innovation is a key driver of firms' productivity and comes in many forms, such as new products and production processes, novel approaches to marketing and improved management techniques. All of these innovations help firms to grow and become more productive, even if only a small percentage of them advance the global technological frontier. Over the last two decades the output of firms across the transition region has become more innovation-intensive, and the adoption of state-of-the-art technology has played an important role in this regard.**

## Introduction

As the EBRD's *Transition Report 2013* showed, convergence between the income levels and living standards of the transition region and those of advanced countries has slowed markedly in recent years. In some cases, it has stopped altogether. Last year's report concluded that much of the slow-down could be attributed to trends in total factor productivity – the efficiency with which capital, labour, land and human capital are combined.

At the start of the transition process, countries in the EBRD region generally had unusually low levels of total factor productivity, reflecting the inefficient allocation of resources under central planning. When production factors began to be redeployed more efficiently, total factor productivity initially grew rapidly.

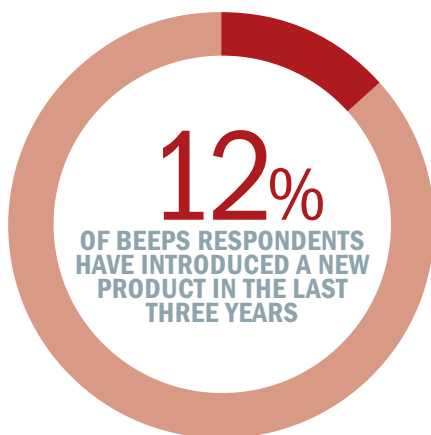
However, by the time of the global financial crisis, productivity in the region had reached the levels seen in other emerging markets with similar income levels. This suggests that most of the easy options have now been exhausted. Further improvements in productivity will need to come from structural changes in these economies – in other words, changes to their economic structure and economic institutions, as well as policies supporting reforms and the development of human capital.

The challenge of boosting productivity in an economy can also be examined at the level of individual firms. On the one hand, an economy's aggregate productivity and growth are shaped by macro-level factors – the availability of capital, labour, skills and natural resources – and the efficiency with which these factors are combined and used. On the other hand, though, aggregate productivity and growth also represent the sum of the productivity and growth rates of all firms operating in the economy in question.

This report focuses on the various challenges faced by firms across the transition region when they seek to improve their productivity. It makes use of a recent survey, the fifth Business Environment and Enterprise Performance Survey (BEEPS V) conducted by the EBRD and the World Bank, as well as the Middle East and North Africa Enterprise Surveys (MENA ES) conducted by the EBRD, the World Bank and the European Investment Bank (EIB). These unique surveys contain detailed information on firms' characteristics, performance and perception of the business environment, and they cover almost 17,000 companies.

This was the first BEEPS survey to include a detailed module looking at firms' innovation activities and management/organisational practices over the last three years. The data cover 30 countries in eastern Europe and Central Asia, as well as Jordan and Israel. Israel is a particularly interesting comparator when studying firm-level innovation, as it is a world-class innovation hub – second only to Silicon Valley in the United States in terms of the concentration of start-up companies.<sup>1</sup>

Importantly, the design of BEEPS V allowed independent verification of firms' responses regarding their innovation activities on the basis of descriptions of their main new products and services. This is important, given that innovation may mean different things to different people (see Box 1.1 for more details). ◉



<sup>1</sup> See, for example, Bloch et al. (2012) and Herrmann et al. (2012).

☞ This chapter starts by examining the link between aggregate productivity in the economy and the productivity of individual firms, highlighting the role of innovation. Using BEEPS data, it then looks at the distinction between innovation at the technological frontier (at the global level) and the adoption of existing technology. It also distinguishes between firms' introduction of new products, the introduction of new production processes and innovation in the areas of marketing and organisation.

With these distinctions in mind, the chapter then examines the different strategies that firms across the transition region use to obtain the knowledge and know-how that underpins innovation. Lastly, the chapter uses cross-country data to assess the overall level of innovation of individual economies. Particular attention is paid to countries' output in terms of patents, as well as the composition of their exports.

## Productivity: a firm-level perspective

Changes in the aggregate productivity of an economy can be described as the sum of five distinct components:<sup>2</sup>

1. The "within effect" comprises changes in the productivity of individual firms.
2. The "between effect" concerns the relative market shares of high and low-productivity firms. For example, if the former expand and the latter shrink, the aggregate productivity of the economy will increase.
3. The "cross effect" concerns productivity gains which are driven by increases in the market shares of firms whose productivity is increasing fast. (Thus, the between effect reflects the growth of firms with high levels of productivity, while the cross effect reflects the growth of firms which are rapidly improving their productivity).
4. The "entry effect" reflects the contribution made by new firms. A new entrant contributes positively to the overall productivity of an economy if it is more productive than the average firm.
5. The "exit effect" captures the impact that exiting firms make to aggregate productivity. That effect is positive if the exiting firm is less productive than the average firm and its exit frees up valuable economic resources.

Studies show that the first effect – productivity growth within firms – accounts for an average of 60 to 80 per cent of overall productivity growth.<sup>3</sup> Until the mid-2000s, however, aggregate productivity growth in transition countries was driven largely by the reallocation of resources from less productive sectors and firms to more productive ones (that is to say, between and cross effects), as well as significant entry and exit effects.<sup>4</sup>

Significant barriers to the entry and exit of firms remain. Dismantling these barriers through liberalisation reforms has the potential to give a much-needed boost to the overall productivity of the region's economies (see Box 1.2 on service-sector liberalisation in Ukraine). The same is true of barriers to the expansion of more productive firms, such as the political

connections that low-productivity firms exploit to defend their positions (see Box 1.3).

At the same time, now that most of the easy options have been exhausted (in the form of the correction of distortions stemming from the legacy of central planning), productivity gains from firms' entry and exit will be reliant on simultaneous changes in countries' economic structures and supporting economic institutions, and change within firms will have to make a larger contribution to productivity growth.

Firms' managers can increase productivity in many ways. They can make better use of excess capacity (if they have any), they can cut costs (shedding labour where necessary), and they can improve the way they manage their businesses. However, the most common and the most important driver of change within firms (particularly in advanced industrialised countries) is the introduction of new products and new ways of conducting business – in other words, innovation.<sup>5</sup> Innovation and its contribution to productivity growth and the transition process will be the focus of this *Transition Report*.

## To create or to adapt?

Many people would perhaps associate innovation with ground-breaking technology – innovations that advance the global technological frontier. However, while firms constantly work to improve their products and introduce new ones, few of those products are truly new at the global level. Most new products stem from the adoption of existing technologies that have been developed elsewhere, possibly with some customisation in order to better serve the needs of the local market. Although these innovations do not advance the global technological frontier, they can still significantly improve firms' productivity, thereby contributing to increases in aggregate productivity.

The adoption of such technology is particularly important for emerging markets and developing economies, where firms have considerable room for improvement relative to the technological frontier. With supportive policies in place, firms in emerging markets will invest, learn in an open economic environment and improve their productivity, gradually moving closer to the technological frontier. The resulting change in the structure of the economy needs to be accompanied by changes in economic institutions and policies supporting the overall structural transformation. For instance, as the economy approaches the technological frontier, the entry and exit of firms will play an increasingly important role in boosting overall productivity and policies will need to evolve to nurture economic creativity.<sup>6</sup> That being said, even in the majority of advanced economies, the adoption of technologies that have been developed elsewhere continues to play a key role as a driver of productivity growth.<sup>7</sup>

So, an innovation is something that is new, original or improved which creates value. In order for a change in a firm's products or processes to be considered an innovation, it must, at the very least, be new to the firm itself (rather than the global economy as a whole).

<sup>2</sup> See Foster et al. (2001).

<sup>3</sup> See, for example, Foster et al. (2001) for the United States, Bartelsman et al. (2009) for a number of Organisation for Economic Co-operation and Development (OECD) countries (including Estonia and Slovenia) and World Bank (2008) for Estonia, Georgia, Hungary, Latvia, Romania, Russia, Slovenia, Sweden and Ukraine.

<sup>4</sup> See, for example, World Bank (2008), Bartelsman et al. (2009) and Isaksson (2010).

<sup>5</sup> See, for example, Geroski (1989) and Geroski et al. (2009).

## Faces of innovation

### Products

This innovation could be a new product – a category that includes significant improvements to technical specifications, components and materials, incorporated software, user-friendliness and other functional characteristics of goods and services.<sup>8</sup>

Around a quarter of all firms interviewed as part of BEEPS reported that they had introduced a new product in the last three years. However, when those responses were then cross-checked against the description of product innovation, that percentage fell to 12 per cent (see Box 1.1 for details of the cleaning process).

As one might expect, the percentage of surveyed firms in the transition region that introduced a product which was new to international markets was relatively low at only 0.4 per cent – compared with around 5 per cent in Israel (see Chart 1.1). While around half of all product innovation reported in Israel can be classified as innovation at the technological frontier, in the transition region that ratio is only 5 per cent. However, while innovation on a global scale is encountered less frequently in the transition region, notable examples of such innovation can be found across emerging Europe, Central Asia and the southern and eastern Mediterranean (SEMED) region. For instance, the software behind products such as Skype and the file-sharing application Kazaa was developed by Estonians. Another example is the Akrapovič exhaust system, which was developed in Slovenia.

When it comes to the introduction of products that are new to the relevant firm, rather than being new to the international market, the picture changes. Indeed, such innovation is actually more common in the transition region than it is in Israel. This reflects the fact that firms in that region have greater scope for adopting – and sometimes improving – existing technologies and products.

### Processes

Productivity-enhancing innovations are not limited to new products. They can also be new or significantly improved production methods – or, for service-sector companies, delivery methods. Examples of such process innovations include the automation of work that used to be done manually, the introduction of new software to manage inventories and the introduction of new quality-control measures.

A process innovation may, for instance, help to introduce a new product. For example, buying new machinery in order to start producing a new product involves both product and process innovation. Of the BEEPS respondents that have introduced new products, around a third have also introduced a new process in the last three years (see Chart 1.2). Indeed, product and process innovation may sometimes be hard to tell apart (see Table 1.1 for some real-life examples).

Alternatively, process innovations may help firms to deliver existing products in a more efficient, cost-effective manner – for instance, with the help of new equipment or new software. Around 9 per cent of all BEEPS respondents introduced a new process without engaging in product innovation. Around a quarter of all

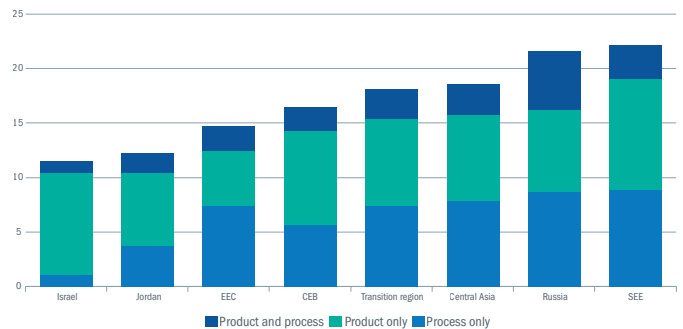
**CHART 1.1. Product innovation at the global technological frontier and the adoption of existing technologies**



Source: BEEPS V, MENA ES and authors' calculations.

Note: Based on cleaned data. Cleaned data on new products are not available for the Slovak Republic, Tajikistan or Turkey at the time of writing. Data represent unweighted cross-country averages and indicate the percentage of surveyed firms that have introduced new products in the last three years. Figures for the transition region include data for the CEB, SEE, and EEC regions, as well as Russia and Central Asia.

**CHART 1.2. Percentage of firms engaging in product and process innovation**



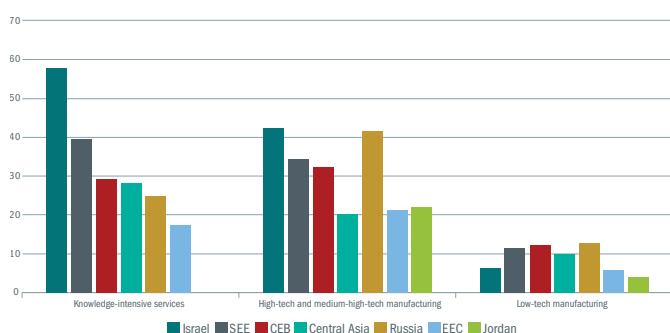
Source: BEEPS V, MENA ES and authors' calculations.

Note: Based on cleaned data. Data represent unweighted cross-country averages and indicate the percentage of surveyed firms that have introduced new products and/or processes in the last three years.

<sup>8</sup> See, for instance, Acemoglu et al. (2006) and Aghion et al. (2013).

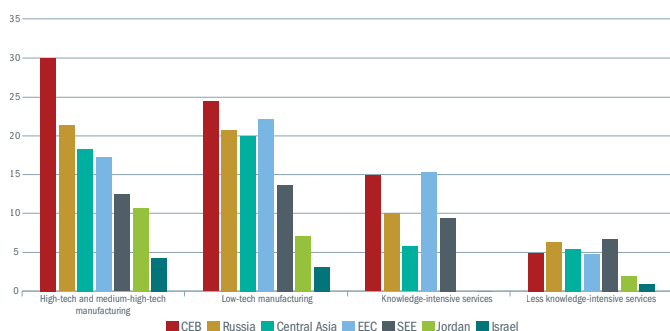
<sup>7</sup> See Eaton and Kortum (1996).

<sup>8</sup> See Eurostat and OECD (2005).

**CHART 1.3. Incidence of product innovation in selected industries**


Source: BEEPS V, MENA ES and authors' calculations.

Note: Based on the International Standard Industrial Classification (ISIC), Rev. 3.1. High-tech and medium-high-tech manufacturing sectors include chemicals (24), machinery and equipment (29), electrical and optical equipment (30-33) and transport equipment (34-35, excluding 35.1). Low-tech manufacturing sectors include food products, beverages and tobacco (15-16), textiles (17-18), leather (19), wood (20), paper, publishing and printing (21-22) and other manufacturing (36-37). Knowledge-intensive services include water and air transport (61-62), telecommunications (64) and real estate, renting and business activities (70-74). Data represent unweighted cross-country averages and indicate the percentage of surveyed firms that have introduced new products in the last three years, on the basis of cleaned measures of innovation.

**CHART 1.4. Incidence of process innovation in selected industries**


Source: BEEPS V, MENA ES and authors' calculations.

Note: Based on ISIC Rev. 3.1. High-tech and medium-high-tech manufacturing sectors include chemicals (24), machinery and equipment (29), electrical and optical equipment (30-33) and transport equipment (34-35, excluding 35.1). Low-tech manufacturing sectors include food products, beverages and tobacco (15-16), textiles (17-18), leather (19), wood (20), paper, publishing and printing (21-22) and other manufacturing (36-37). Knowledge-intensive services include water and air transport (61-62), telecommunications (64) and real estate, renting and business activities (70-74). Data represent unweighted cross-country averages and indicate the percentage of surveyed firms that have introduced new processes in the last three years, on the basis of cleaned measures of innovation.

**TABLE 1.1. Examples of innovation from BEEPS V and MENA ES**

Innovation	Not innovation
• Product innovation: A manufacturer of PVC windows introduces a new type of window with energy-saving features	• A cosmetics retailer introduces a new brand of cosmetics
• Product innovation: A metal wholesaler starts offering to deliver products to customers (which is not the core business of a wholesaler)	• Accounting software undergoes a routine annual upgrade
• Process innovation: A company introduces energy-efficient machinery and equipment	• A wine producer reintroduces a special type of wine that used to be made a couple of years ago
• Marketing innovation: A manufacturer of interior wooden doors introduces a new model (changing the design of the product)	• A manufacturer of interior wooden doors starts producing doors in accordance with clients' individual requests (customisation does not constitute innovation)
• Marketing innovation: A home appliances wholesaler begins selling online (new product placement)	• A retail company opens new branches (expanding its business)

Source: BEEPS V and MENA ES.

process innovations entailed changes to production techniques, machinery, equipment or software. Process innovation is most commonly encountered in manufacturing, where it is typically related to the upgrading of machinery and equipment.

### Product and process innovation in different sectors

Firms in high-tech and medium-high-tech manufacturing sectors (such as pharmaceuticals or electronics) – and particularly firms in knowledge-intensive service sectors (such as telecommunications or information technology) – are more likely to introduce new products than firms in low-tech sectors (such as wood processing or textiles; see Chart 1.3).<sup>9</sup> Regional differences in the frequency of product innovation are also larger in these sectors. For instance, in knowledge-intensive service sectors the percentage of firms that have introduced new products in the last three years ranges from 0 per cent in Jordan to over 25 per cent in south-eastern Europe (SEE) and almost 60 per cent in Israel (see Case study 1.1 for an example of an innovative IT firm with its origins in Belarus). In contrast, differences between innovation rates are less pronounced for low-tech sectors, as firms in these industries generally innovate less (even in Israel).

In contrast to product innovation, process innovation is common in low-tech manufacturing sectors, as firms look for new, more efficient production methods (see Chart 1.4). For instance, in Central Asia around 28 per cent of firms operating in low-tech manufacturing sectors have recently introduced a new process. Differences between the process innovation rates of individual countries and regions are substantial across all manufacturing sectors and knowledge-intensive services (albeit process innovation is much less common across the board in less knowledge-intensive service sectors).

<sup>9</sup> See <http://www.oecd.org/sti/ind/48350231.pdf>.



### Organisational innovation

Innovation does not always involve new technologies. For instance, it may take the form of organisational innovation – such as new approaches to business practices, workplace organisation or external relations. As with process innovations, organisational innovations may seek to improve a firm’s performance by reducing administrative or transaction costs, gaining access to non-tradeable assets or reducing the cost of supplies. Unlike process innovations, organisational innovations primarily concern people and the organisation of work flows. Examples of organisational innovations include the introduction of a supply chain management system, the implementation of a database of best practices or the decentralisation of decision-making (which gives employees greater autonomy).

### Marketing innovation

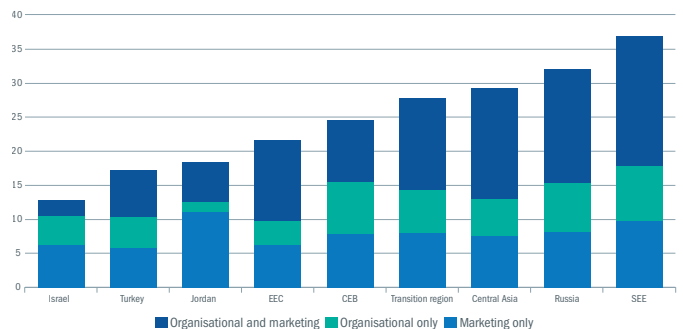
Marketing is another important area of innovation. Marketing innovations could, for instance, be aimed at better addressing customers’ needs, opening up new markets or repositioning a firm’s product on the market. Examples include the introduction of a new flavour for a food product in order to target a new group of customers, product placement in films or television programmes, the establishment of client loyalty cards or the introduction of variable pricing based on demand.

While product, process, organisational and marketing innovations cover a broad range of changes within a firm, not every change can be considered an innovation. For instance, customisation, routine upgrades (minor changes to a good or service that are expected and planned in advance), regular seasonal changes and new pricing methods aimed solely at offering different prices to different groups of customers are not deemed to be innovations. Ceasing to use a particular process to market a product is also not considered to be an innovation. And although a new product represents an innovation for the firm that manufactures it, it does not generally constitute an innovation for firms trading, transporting or storing that new product.

### High incidence of organisational and marketing innovation

Making changes to organisational and marketing arrangements is likely to be cheaper – although not necessarily less risky – than introducing new products and processes. Given the legacy of central planning, where marketing was severely underdeveloped – and, indeed, largely unnecessary – it is not surprising that firms in transition countries are more likely to introduce new organisational or marketing arrangements than firms in Israel (see Chart 1.5). Indeed, around 28 per cent of all surveyed firms in the transition region have adopted new organisational practices or marketing techniques over the last three years, with marketing innovations being the more common of the two. ▶

CHART 1.5. Percentage of firms engaging in organisational or marketing innovation



Source: BEEPS V, MENA ES and authors’ calculations.

Note: This chart is based on self-reported data, as firms were not asked to provide descriptions of their organisational and marketing innovations. Data represent unweighted cross-country averages and indicate the percentage of surveyed firms that have introduced organisational and marketing innovations in the last three years.

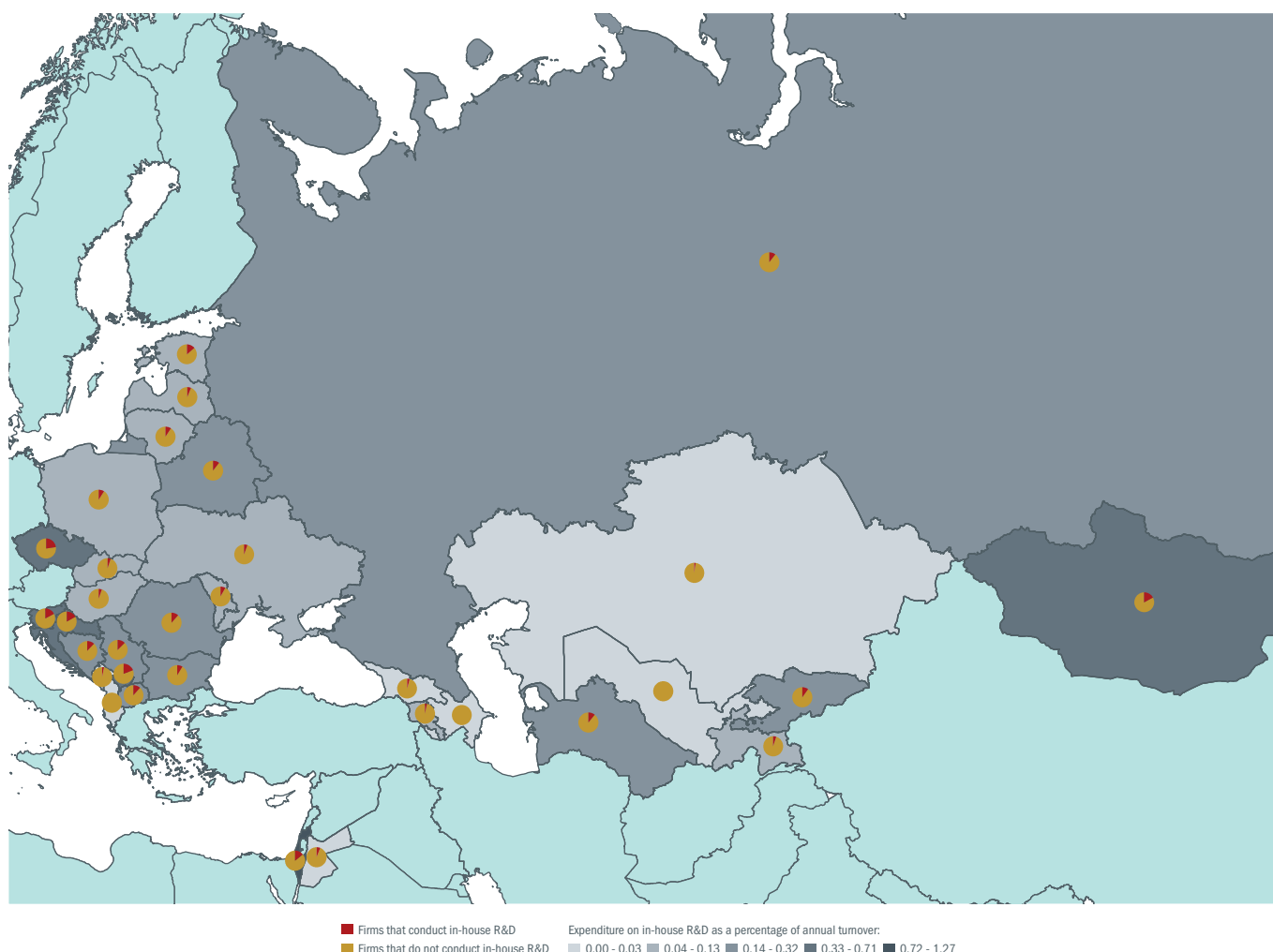
### CASE STUDY 1.1. EPAM

EPAM, a global provider of software development services, has managed to successfully leverage and commercialise the availability of programming talent in a number of countries in central Europe. In just 20 years or so, it has gone from being a small start-up to a global IT services company that is listed on the New York Stock Exchange.

EPAM was founded in 1993 by two native Belarusians, Arkadiy Dobkin and Leo Lozner. The company was based in Princeton, New Jersey, with a development centre in Minsk. As the firm secured more clients on the global market, it gradually expanded, attracting investment from major private equity investors, including EBRD-supported private equity funds such as Russia Partners II and III. In 2012 it then launched an IPO on the New York Stock Exchange, the first time that a software company originating in the region had been floated on a major stock exchange.

EPAM now has development centres in Belarus, Hungary, Kazakhstan, Poland, Russia and Ukraine. The company has more than 10,000 engineers serving firms in a wide variety of industries in both developed and developing markets (with clients such as Google, Barclays, MTV, Expedia and Thomson Reuters). Its current areas of focus include cloud and mobile services and big data.

The company was also one of the first residents of the HTP Belarus high-tech park in Minsk, thereby contributing to the development of the local IT cluster.

**CHART 1.6.** While some transition countries have a higher incidence of in-house R&D than Israel, the amounts of money involved are much smaller


Source: BEEPS V, MENA ES and authors' calculations.

Note: Darker colours correspond to higher expenditure on in-house R&D as a percentage of annual turnover across all firms. The pie charts for each country compare the number of firms that undertake in-house R&D (purple) with the number of firms that do not conduct such R&D (ochre).

### R&D and the acquisition of external knowledge

The introduction of new products and processes often requires specific inputs, such as spending on research and development (R&D) – in other words, creative work undertaken on a systematic basis in order to increase a firm's stock of knowledge. While the concepts of R&D and innovation are sometimes used interchangeably, R&D primarily reflects inputs into the innovation process, while new products and services are innovation outputs. For example, R&D activities do not always lead to successful innovation, as a company may spend money on laboratory research investigating a new chemical compound for its paint, but not have any new paints on offer (at least, not for the time being). And conversely, the introduction of new products or processes may not always require R&D spending.

### Low spending on R&D

Firms in the transition region lag behind Israel in terms of the amounts spent on in-house R&D, despite the fact that some individual transition countries have a higher percentage of firms engaged in in-house R&D than Israel (see Chart 1.6). Slovenia comes closest, with an average of 0.7 per cent of annual turnover being spent on R&D, compared with Israel's 1.3 per cent. While cross-country differences are small in low-tech sectors, where firms in all countries (including Israel) tend not to invest much in R&D, these differences are more pronounced in high-tech and medium-high-tech manufacturing sectors and knowledge-intensive service sectors (see Chart 1.7).

### To make or to buy?

Some R&D can be contracted out to other companies and institutions, rather than being conducted in-house. In fact, BEEPS firms outsource more R&D projects than they conduct in-house. At the same time, in-house R&D projects have a higher average cost. The majority of firms conducting R&D employ a combination of in-house and outsourced work.

The introduction of new products can also be facilitated by acquiring external knowledge. This can be done through the purchase or licensing of patented technologies, non-patented inventions and know-how derived from other businesses or organisations. In short, firms can use a range of different approaches to obtain knowledge.

Chart 1.8 shows how countries compare in terms of whether they “make” knowledge (in-house R&D) or “buy” it (outsourced R&D, or the purchase or licensing of external knowledge). The horizontal axis shows the percentage of firms that only ever buy knowledge, while the vertical axis shows the percentage of firms that only follow a “make” strategy or employ a combination of “make” and “buy” strategies.

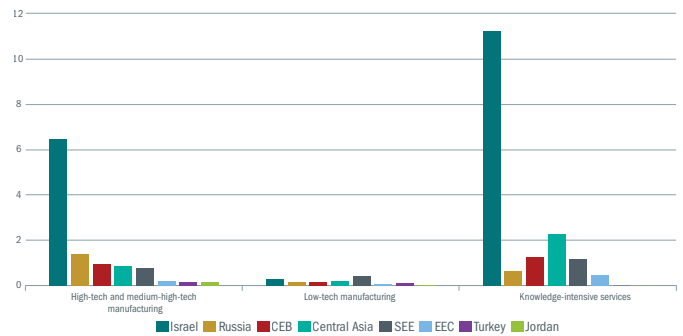
On the basis of firms’ responses to BEEPS V, four broad groups of countries emerge:

- 1. Low innovation:** In this group of countries, located in the bottom left-hand corner of Chart 1.8, few companies spend money on buying or producing knowledge. This group includes countries such as Albania, Armenia, Azerbaijan, Georgia and Uzbekistan.
- 2. Buy:** Firms in this group of countries predominantly buy technology, with the percentage of firms that engage in in-house R&D remaining relatively modest. Countries in this category include Bosnia and Herzegovina, FYR Macedonia, Hungary, Kazakhstan, Kyrgyz Republic, Moldova, Mongolia, Montenegro, Poland, Serbia, Tajikistan, Turkey and Ukraine.
- 3. Make and buy:** Firms in this group of countries, which is located above the sloping line, are more active in terms of in-house R&D relative to the acquisition of external knowledge. This group could be broken down further on the basis of the extent to which firms tend to engage exclusively in in-house R&D or both make and buy knowledge.
- 4. Make:** Finally, Israel (located in the top left-hand corner) is the only country where few firms only follow a “buy” strategy and a relatively large proportion of firms spend money on in-house R&D.

These distinctions are important when designing policies to support innovation in individual countries (as discussed in Chapter 5 of this report).

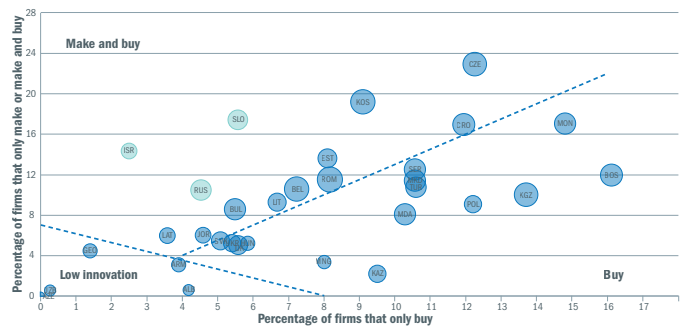
What explains these cross-country differences in firms’ innovation strategies? As one might expect, their level of economic development appears to play an important role. Firms in lower-income countries are generally less likely to engage in either in-house R&D (see Chart 1.9) or the acquisition of external knowledge. However, if they do, they are more likely to simply spend on the acquisition of external knowledge (see Chart 1.10). This is not surprising, since firms in countries that are further

**CHART 1.7. Average expenditure on in-house R&D as a percentage of annual turnover**



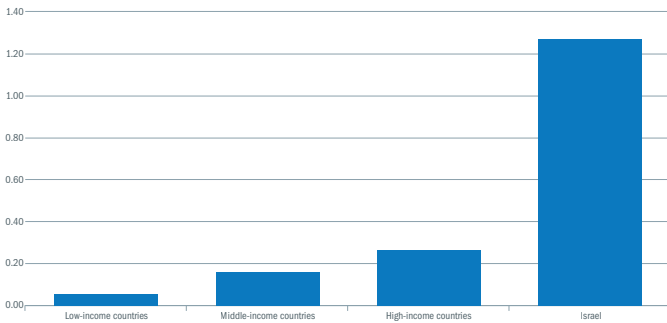
**Source:** BEEPS V, MENA ES and authors’ calculations.  
**Note:** Based on ISIC Rev 3.1. High-tech and medium-high-tech manufacturing sectors include pharmaceuticals (24), machinery and equipment (29), electrical and optical equipment (30-33) and transport equipment (34-35, excluding 35.1). Low-tech manufacturing sectors include food products, beverages and tobacco (15-16), textiles (17-18), leather (19), wood (20), paper, publishing and printing (21-22) and other manufacturing (36-37). Knowledge-intensive services include water and air transport (61-62), telecommunications (64) and real estate, renting and business activities (70-74). Data represent unweighted cross-country averages.

**CHART 1.8. Percentage of firms that make and/or buy knowledge**



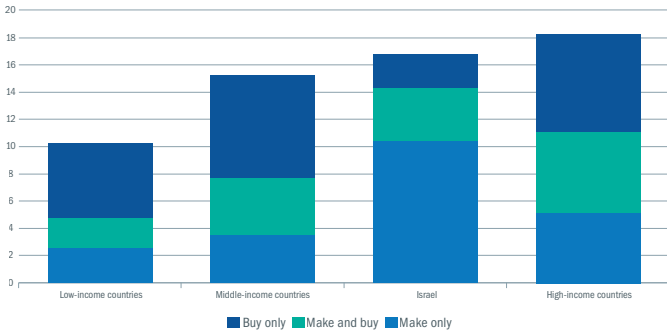
**Source:** BEEPS V, MENA ES and authors’ calculations.  
**Note:** A “make” strategy refers to in-house R&D, whereas a “buy” strategy refers to outsourced R&D and the purchase or licensing of patents and know-how. The lighter colour denotes countries where the percentage of firms that only ever follow a “make” strategy is greater than the percentage of firms that only ever follow a “buy” strategy. The size of the bubble corresponds to the percentage of firms that have engaged in product innovation (on the basis of cleaned data).

**CHART 1.9. Average expenditure on in-house R&D as a percentage of annual turnover**



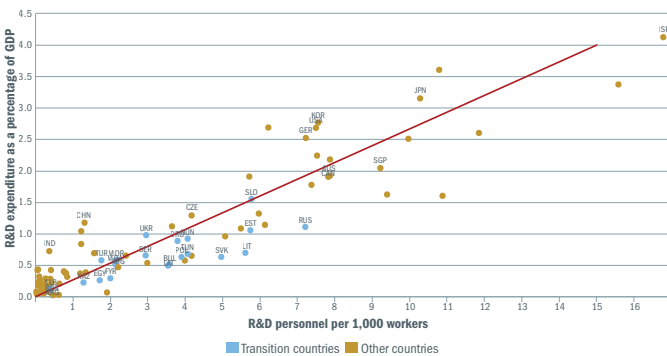
**Source:** BEEPS V, MENA ES and authors' calculations.  
**Note:** Based on the World Bank's income classification as at July 2014. Data represent unweighted cross-country averages.

**CHART 1.10. Percentage of firms following "make" and/or "buy" strategies for the acquisition of external knowledge**



**Source:** BEEPS V, MENA ES and authors' calculations.  
**Note:** Based on the World Bank's income classification as at July 2014. Data represent unweighted cross-country averages.

**CHART 1.11. R&D personnel and expenditure**



**Source:** UNESCO.  
**Note:** The fitted line is produced using a linear regression.

removed from the technological frontier naturally focus more on the adoption of existing technologies. This may also be a reflection of insufficient human capital and other limitations in terms of their capacity to conduct their own R&D.

Such limitations are also reflected in the source of any external knowledge: in higher-income countries it comes predominantly from domestic firms, research institutes and universities, while in lower-income countries it is predominantly imported from foreign firms, research institutes and universities. Although firms in lower-income countries may find it harder to pursue R&D-based strategies, they can achieve productivity gains in a number of other ways, for instance by upgrading their management practices (see Chapter 2).

**Government and university spending on R&D**

Evidence from BEEPS V is in line with country-level data showing that R&D activity tends to be significantly weaker in transition economies than in innovative advanced economies, whether it is measured in terms of R&D spending or the number of people working on R&D (see Chart 1.11). However, these transition countries are not performing any worse than other emerging markets. For instance, Russia and China spend a similar proportion of their GDP on R&D – around 1 per cent. Interestingly, however, the number of R&D personnel in Russia is several times the figure seen in China as a percentage of total employment, partly reflecting a legacy of the Soviet innovation system (see the discussion of science cities in Box 5.4).

Country-level data also reveal that firms are responsible for the majority of R&D spending in advanced economies, accounting for an average of 61 per cent of such spending in OECD economies (see Chart 1.12). Firms in emerging Asia account for a similar percentage.

In the transition region, however, firms account for a much lower percentage of countries' overall R&D spending: around 37 per cent on average. In contrast, governments in the transition region account for a larger percentage of R&D spending (more than a third, compared with 12 per cent in advanced economies).<sup>10</sup> This reflects a legacy of the central planning system, where innovation was often centralised in specialist research institutes, which remain active to this day in some countries.<sup>11</sup>

As the development of new technologies relies on both fundamental and applied research, both governments and universities have an important role to play. For innovation to be successful, the efforts of governments, academia and industry must complement each other effectively (as discussed in Chapter 5 of this report).

<sup>10</sup> Universities account for around a quarter of R&D spending, broadly in line with the shares observed in advanced countries.  
<sup>11</sup> See EBRD (2012), Chapter 7, for a discussion regarding Russia.

## How innovative are transition countries?

BEEPS V provides a valuable snapshot of firm-level innovation in the transition region today. To get a deeper sense of how innovation in economies of the region has evolved over time, this chapter now turns to country-level measures of innovation outputs, which are similar to the country-level measures of innovation inputs that were discussed above.

### Patent quality

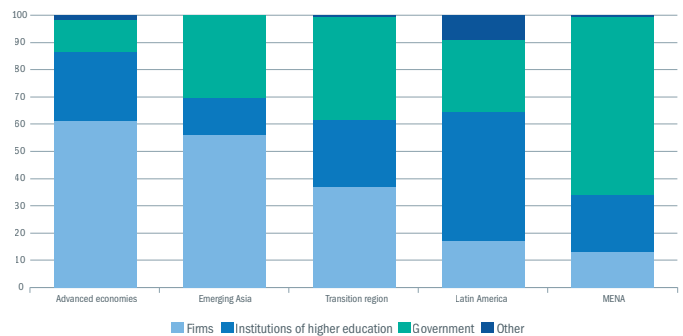
A common country-level measure of innovation at the technological frontier is the number of patents that are held by firms or individuals from a given country. While this has the advantage of comparability (as data are available for a large number of countries), it is a narrow measure which captures a limited range of innovations. Not all innovations are patented, and the likelihood of firms or individuals applying for a patent in a given economy will depend on the legal system, local practices and the sectors in which that economy specialises.<sup>12</sup> The extent to which patents are converted into commercialised innovations will also vary considerably from country to country.

With these caveats in mind, Chart 1.13 shows that there is a positive relationship between R&D expenditure and the number of patents held. However, while this relationship is strong in advanced markets, it is weaker in emerging markets, where levels of R&D spending and patenting are generally lower.<sup>13</sup> A number of countries (including Belarus and Kazakhstan) have more patents than their R&D expenditure would predict, while other countries (including SEMED countries and Turkey) have relatively few patents.

Importantly, not all patents are of equal value: some may represent small modifications to existing products (incremental innovation), whereas others may cover breakthrough technologies such as lasers (radical innovation). One way to distinguish between patents of differing quality is to look at patent citations, as important patents tend to be cited in subsequent patent applications. Citation data suggest that patents in the transition region tend to be of lower quality than those found in more developed economies: only 6 per cent of patents in transition countries are cited at least once, compared with 44 per cent of patents in the United States (see Chart 1.14).

Furthermore, the percentage of patents that are held by firms is much lower in the transition region than it is in the United States. In the United States only 6 per cent of patents are held by universities or public organisations, compared with 11 per cent in the transition region (see Chart 1.15).<sup>14</sup> In fact, in Russia, Poland and Ukraine over a third of all patents are held by universities or research institutes. This reflects the persistent legacy of centralised state-led research. If academic and public institutions have only weak links with industry, and universities and research institutes have limited incentives to commercialise their inventions, the patents they hold may raise the profile of their institutions but contribute little to innovation or productivity growth in the economy. ▶

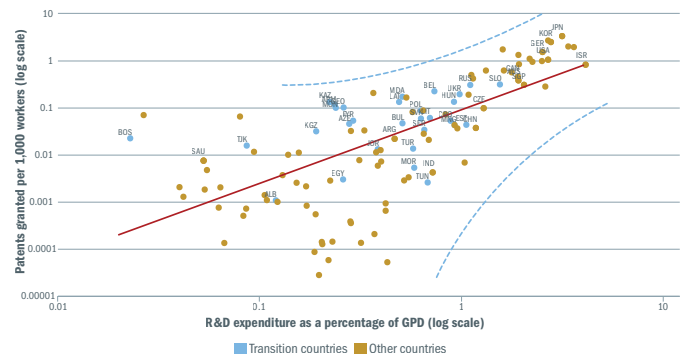
CHART 1.12. Average percentage of R&D expenditure that is funded by firms, universities and governments



Source: UNESCO.

Note: Based on 2011 data for 73 countries worldwide. Figures represent unweighted cross-country averages. In the transition region data are not available for Albania, Bosnia and Herzegovina, Egypt, Jordan, Kosovo, Morocco, FYR Macedonia, Tunisia, Turkmenistan or Uzbekistan.

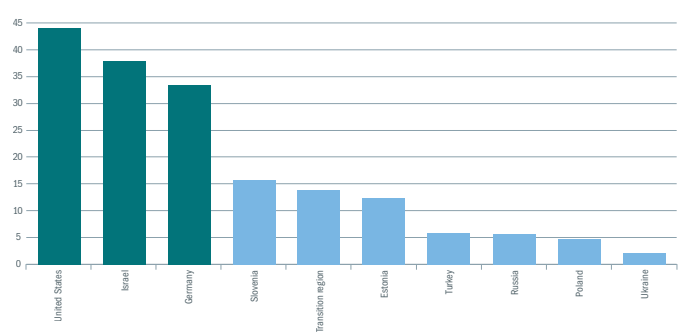
CHART 1.13. Patents and R&D spending



Source: UNESCO and WIPO.

Note: Data represent averages over the period 1996-2011.

CHART 1.14. Percentage of patents with at least one citation



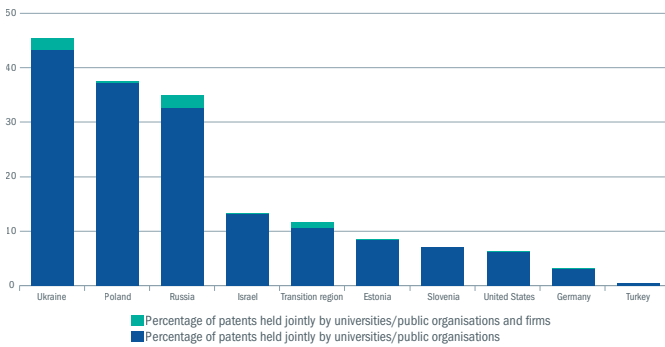
Source: PATSTAT and authors' calculations.

Note: This chart shows the percentage of patents that are cited in at least one other patent application. It is based on data for the period 1999-2011.

<sup>12</sup> See, for instance, Cohen et al. (2000) and Moser (2013).

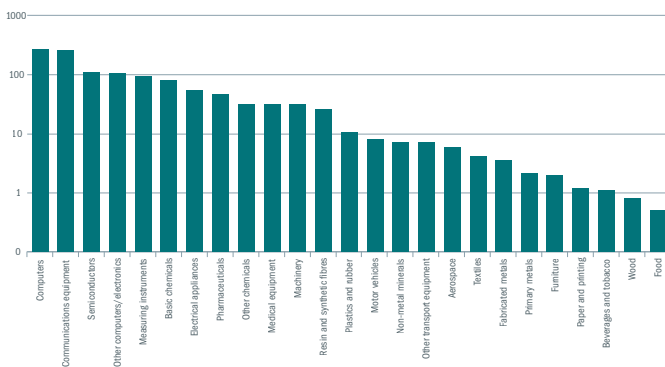
<sup>13</sup> Patents are counted on the basis of the patent holder's country of origin, rather than the country where they are granted. For instance, a patent that is awarded to a Slovak firm by the United States Patent and Trademark Office (USPTO) counts towards the patent output of the Slovak Republic.

<sup>14</sup> The percentage of patents that are owned jointly by industry and research or academic institutions is relatively small in both transition countries and advanced economies.

**CHART 1.15. Breakdown of patents by type of holder**


Source: PATSTAT and authors' calculations.

Note: Based on data for the period 1999-2011. Patents are classified on the basis of the methodology developed by the Katholieke Universiteit Leuven. See European Commission (2011) for more details.

**CHART 1.16. Innovation intensity of various industries**


Source: USPTO.

Note: This chart is based on averages for the period 2004-08 and uses a logarithmic scale. Figures correspond to the number of patents granted per 1,000 workers in the United States.

### Adoption of existing technology

Measures of innovation output such as patents do not take full account of the adoption of existing technology. Ideally, one would like to have a broader measure of how innovative countries are. This measure would not only include information on innovation at the technological frontier (in other words, information derived from patents), but also cover the sophistication of each country's output (for instance, by accounting for countries' export mixes).<sup>15</sup>

In order to develop such a measure of country-level innovation, the first step is to ascertain the innovation content of various industries. We can then assess the export mixes of individual countries on the basis of the innovation content of these exporting industries.

This kind of comprehensive measure is attractive because it looks at what countries produce competitively, rather than simply looking at what they patent. It also provides valuable insight, as a more sophisticated export structure is associated with better long-term growth prospects, as discussed in the *Transition Report 2008*.<sup>16</sup> (Furthermore, the analysis in Chapter 2 shows that exports of innovation-intensive industries grow faster in countries with a favourable business environment.)

In this first step, the intrinsic innovation intensity of various industries is measured using data on the number of patents granted per worker in these industries in the United States. While the figures are not a perfect reflection of the degree of innovation in the various industries (as incentives to submit patent applications may vary across industries), they do, on balance, provide a reasonable approximation of the role played by innovation in the various sectors and are based on observable data.

On average, firms in industries that patent more tend to introduce new products more frequently (as can be seen from the BEEPS data), and the lifespan of these products tends to be shorter, prompting firms to innovate continuously. The United States is used as a reference point because it is a highly diversified economy, the world's largest consumer market (resulting in strong incentives to patent) and a world leader in R&D. This means that it is easier for an industry to fully realise its innovation potential in the United States.

Since the innovation intensity of all industries is measured using US data, these estimates are not affected by differences between the legal systems and business cultures of individual countries. Consequently, if one country has a lower patent output than another for a given industry, this will reflect a combination of lower incentives to patent and a less supportive innovation environment.

Unsurprisingly, computing equipment, communications equipment, chemicals and pharmaceuticals are among the most innovation-intensive industries, while textiles, food and beverages, and wood processing are among the least innovation-intensive (see Chart 1.16).

This measure is based on the innovation potential of the various industries, rather than the innovation realised in these industries in the various countries. Indeed, while emerging market firms operating in innovation-intensive industries will not

<sup>15</sup> See EBRD (2008) and Hausmann and Klinger (2007), as well as Box 1.4 of this report.

<sup>16</sup> See also Hausmann et al. (2007).

necessarily be directly involved in innovation at the technological frontier, the nature of these industries suggests that such emerging market exporters will tend to roll out new products more often.

For instance, Box 3.1 in Chapter 3 shows that, by participating in global value chains in such industries, firms tend to develop skills and expertise and that, over time, this enables them to move up the value-added chain<sup>17</sup> and produce original innovation. The manufacturing of telecommunications equipment in China is one example of how this transformation may occur. While foreign direct investment has played a key role in the development of this sector in China, local firm Huawei has gradually become a major international player and a world leader in this industry. Likewise, new or modernised industries tend to foster the development of local supply chains. For instance, top-tier suppliers of automotive parts in emerging markets can achieve quality that is close to international best practices.<sup>18</sup>

We can now calculate the innovation intensity of a country's exports by producing a weighted average of the innovation intensity of its exported goods.<sup>19</sup> If we look at the innovation intensity of world exports as a whole, we can see that major contributions are made not only by the sectors with the greatest innovation intensity, but also by key manufacturing sectors such as machinery and motor vehicles (see Chart 1.17).

Thus, a high degree of innovation intensity in a country's exports reflects not only comparative advantages in high-tech sectors such as computing equipment, but also strong positions in sectors with moderate innovation intensity that account for a large percentage of international trade. The innovation intensity of an economy's exports is expressed as a percentage of the average innovation intensity of global exports as a whole. Therefore, an innovation intensity score of more than 100 means that the innovation intensity of a country's exports is above the global average.

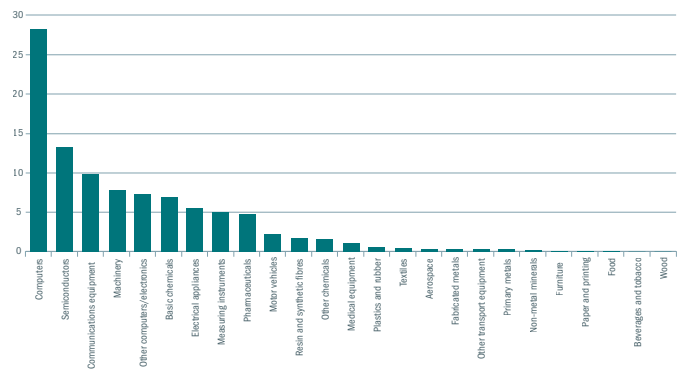
Looking at exports, rather than the total output of a particular industry, has the advantage of picking out goods that are competitive in international markets and thus more likely to be closer to the technological frontier. However, an analysis of exports also has its limitations. In particular, comprehensive data on the structure of exports are available only for goods. Thus, service sectors (such as call centres or IT consulting) are not covered, and services are becoming increasingly innovation-intensive.

### Changes in the innovation intensity of countries' exports

How has the innovation intensity of exports evolved over time? Globally, innovation activity has increasingly shifted from advanced economies to emerging markets. The last few decades have seen a major shift in the production of innovative goods, with a growing role for foreign direct investment and the rapid globalisation of production chains. In addition, emerging markets now account for an increasing share of both global R&D spending and R&D output.<sup>20</sup>

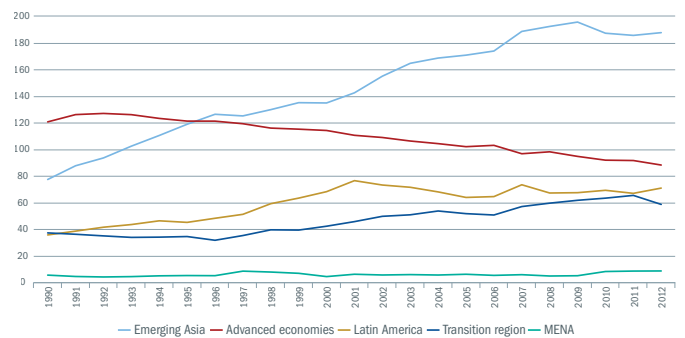
These broader trends are reflected in the innovation intensity of the various regions' exports (see Chart 1.18). In line with these developments, the innovation intensity of the transition

**CHART 1.17. Contributions made by various industries to the innovation intensity of world exports**



Source: USPTO, UN Comtrade, Feenstra et al. (2005) and authors' calculations.  
Note: Based on 2012 trade flow data. Contributions are calculated as the product of industries' innovation intensities and their shares in world trade, before being normalised so that they total 100 per cent.

**CHART 1.18. Changes in the innovation intensity of exports**



Source: USPTO, UN Comtrade, Feenstra et al. (2005) and authors' calculations.  
Note: Data represent weighted averages, with the innovation intensity of exports being measured as a percentage of the average innovation intensity of world exports. The MENA region excludes SEMED countries.

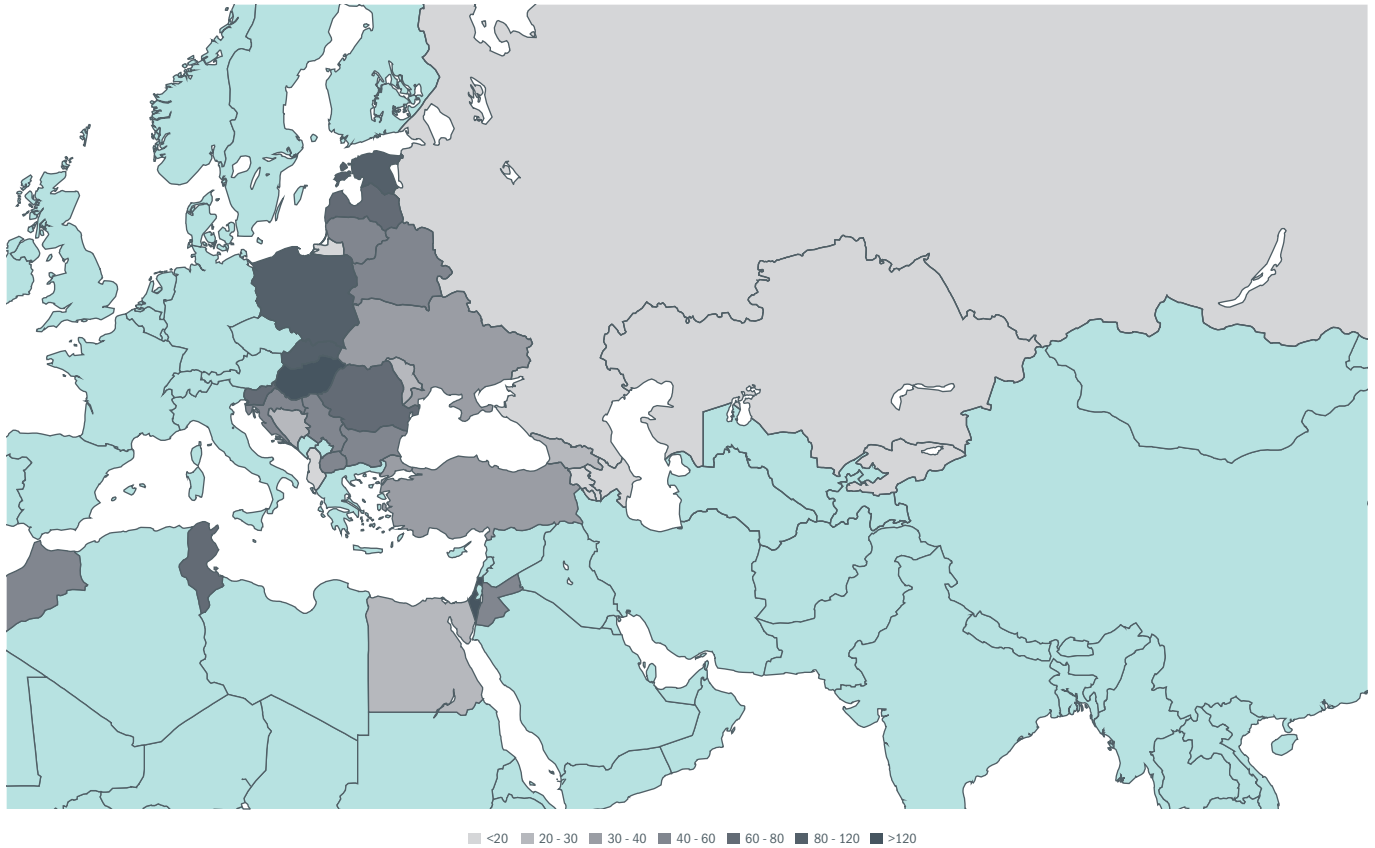
<sup>17</sup> See Hwang (2007).

<sup>18</sup> See Sutton (2005) for evidence on China.

<sup>19</sup> Export values are expressed in base year prices, using US industry-specific deflators (as deflators for specific industries in individual countries are not available).

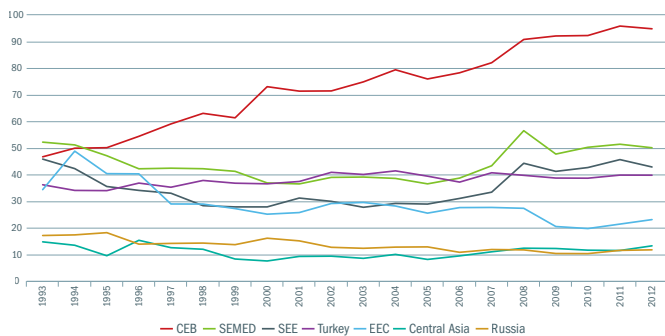
<sup>20</sup> See, for instance, Thursby and Thursby (2006) and Baldwin (2011).

**CHART 1.19. Innovation intensity of exports**



**Source:** USPTO, UN Comtrade, Feenstra et al. (2005) and authors' calculations.  
**Note:** Based on data for 2012. The innovation intensity of exports is measured as a percentage of the average innovation intensity of world exports. Darker colours denote higher levels of innovation intensity. Israel is included as a comparator country.

**CHART 1.20. Changes in the innovation intensity of exports within the transition region**



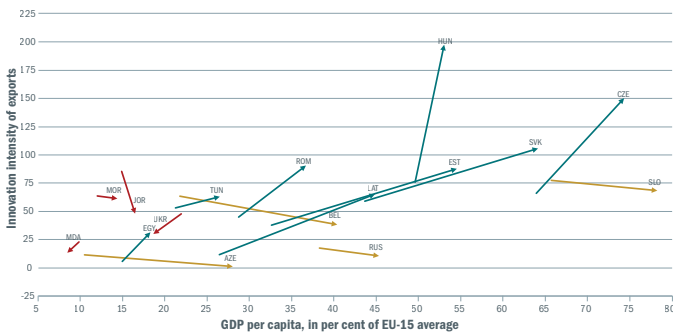
**Source:** USPTO, UN Comtrade, Feenstra et al. (2005) and authors' calculations.  
**Note:** Data represent simple averages of the innovation intensity of individual countries' exports (expressed as a percentage of the average innovation intensity of world exports).

region's exports has risen over time. Of the various emerging markets, Asia has seen the fastest growth in innovation intensity, while overall growth in the transition region has been similar to that observed in Latin America. Innovation intensity has generally remained low in the Middle East and North Africa.

These overall trends mask substantial heterogeneity at the level of individual countries, in terms of both the level of innovation intensity (see Chart 1.19) and its evolution over time (see Chart 1.20). In central Europe and the Baltic States (CEB) innovation intensity increased rapidly in the 2000s, reaching levels comparable to those seen in OECD countries. This structural change was, to a large extent, facilitated by foreign direct investment on the part of core EU countries and the integration of CEB producers into European value chains. The innovation intensity of exports has also increased moderately in the SEE and SEMED regions. Overall, though, changes outside the CEB region have been modest and levels have remained below 60 per cent of the average innovation intensity of world exports. Israel, the main comparator country in BEEPS V and MENA ES, has highly innovation-intensive exports.



**CHART 1.21. Changes in the innovation intensity of exports and income per capita between 1993-94 and 2010-11**



**Source:** USPTO, UN Comtrade, Feenstra et al. (2005) and authors' calculations.  
**Note:** Arrows show changes over time for selected countries, indicating the difference between average values in the period 1993-94 and average values in the period 2010-11. GDP per capita is based on 2005 constant prices at purchasing power parity and is expressed as a percentage of average GDP per capita in the EU-15 countries (which is calculated as a simple average).

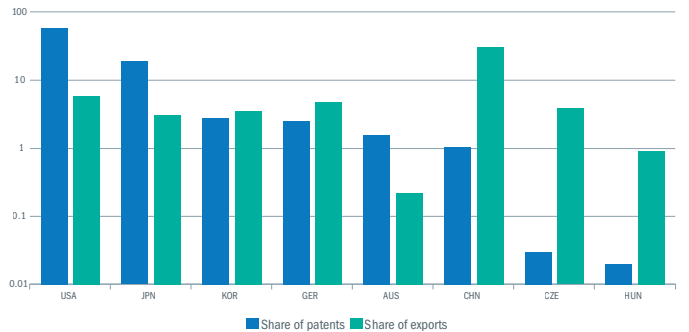
Since the start of the transition process, a number of countries have succeeded in increasing the innovation intensity of their exports and raising income per capita, moving upwards and to the right in Chart 1.21. These include Estonia, Hungary, Latvia, Romania, Slovak Republic and Egypt – although in the case of Egypt, both the innovation intensity of exports and income per capita remain relatively low, highlighting the fact that significant challenges still lie ahead. Notably, there have been no instances where the innovation intensity of exports has improved without commensurate growth in income per capita.

However, a number of other economies have remained “stuck”, with production concentrated in less innovation-intensive industries and modest levels of income per capita. This group of countries includes Moldova, Ukraine and – at a somewhat higher level of innovation intensity – Jordan and Morocco. A number of countries have seen rapid growth in per capita income in the absence of improvements in the innovation intensity of their exports. These include exporters of commodities (such as Azerbaijan and Russia) and a number of other countries (such as Belarus). These countries face the challenge of sustaining growth once commodity prices stop rising and/or higher incomes erode their competitive advantages in their traditional export markets.

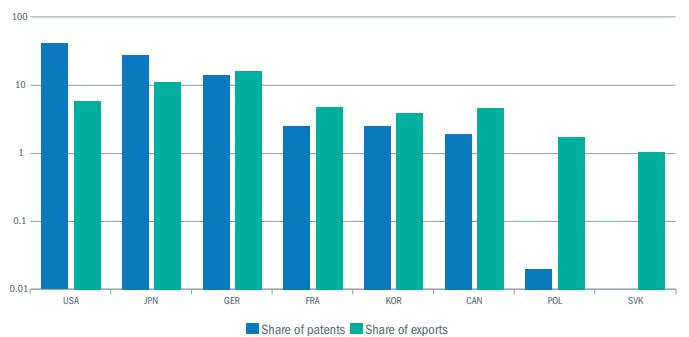
**Innovation intensity of exports and patents**

This measure of innovation intensity emphasises the adoption of existing technology, rather than innovation at the technological frontier. This is an important distinction, as in the most innovation-intensive industries the countries that account for the largest shares in the world’s patents may be different from those that account for the largest shares in international trade (see Chart 1.22). In other industries (such as vehicle manufacturing) shares in patents and exports are broadly aligned. Thus, certain countries may be good at adopting technologies without making a major contribution to their development. The innovation intensity of a country’s exports captures this important aspect. ➔

**CHART 1.22. Exports and patents in the computing equipment and motor vehicle sectors (a) Computing equipment**

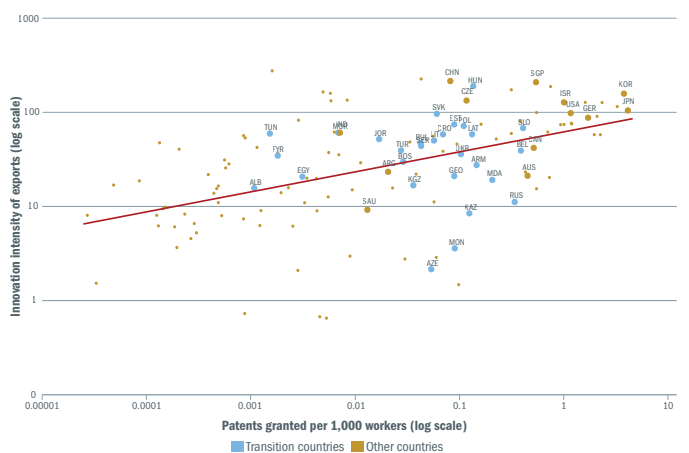


**(b) Motor vehicles**



**Source:** USPTO, UN Comtrade and authors' calculations.  
**Note:** Based on data for 2012. Figures denote the various countries' shares in total patents and exports in the two sectors in question (expressed as percentages).

**CHART 1.23. Patents and the innovation intensity of exports**



**Source:** USPTO, UN Comtrade, Feenstra et al. (2005), WIPO, Penn World Tables and authors' calculations.  
**Note:** Based on averages for the period 1996-2011. The innovation intensity of a country’s exports is measured as a percentage of the average innovation intensity of world exports.

Despite these differences, there is a positive relationship between the innovation intensity of exports and patents (see Chart 1.23). Indeed, many mature economies (including the United States, Israel, Japan and South Korea) tend to be among the strongest performers in terms of both patents and the innovation intensity of exports.

Meanwhile, a number of emerging markets appear to be better at adopting existing technologies, which is reflected in a high innovation intensity for exports but lower patent output. One notable example here is China. A similar pattern can be observed in the Czech Republic and a number of CEB economies (including Hungary and the Slovak Republic).

Conversely, Belarus, Russia, Kazakhstan and Ukraine have a relatively high incidence of patents, but appear to be less successful at commercialising the underlying inventions and adopting existing technologies. This may also be due to the fact that in some of these countries a large percentage of patents are held by universities and research institutes (see Chart 1.15), which have fewer incentives to commercialise their inventions.

## Conclusion

Aggregate productivity growth in the economy is largely a reflection of the productivity growth of individual firms, and that stems, in turn, from all the various forms of innovation at firm level – new products, new processes, new marketing techniques and new organisational methods. Most of these innovations do not advance the global technological frontier, simply representing the adoption of existing technologies in order to help firms to boost their productivity. Chapter 2 looks at the link between productivity and innovation in greater detail.

As the analysis in this chapter shows, innovation rates vary considerably, both across industries and across countries. Some countries – particularly in the CEB region – have succeeded in increasing the innovation intensity of their exports, while the innovation intensity of other countries' exports has stagnated at low levels or declined. There are many factors that may account for these differences, and these are discussed in Chapter 3 of this report. Chapter 4 then examines the specific role played by access to finance.

Countries also differ in terms of the strategies that firms use in order to obtain the knowledge that underpins innovation. In some cases firms tend to focus on in-house R&D, while in other cases firms tend to purchase technology or know-how. Chapter 5 examines various policies that can be pursued in order to support innovation, taking these differences into account.

### BOX 1.1. BEEPS V and MENA ES

The Business Environment and Enterprise Performance Survey (BEEPS) is a joint initiative conducted by the EBRD and the World Bank. BEEPS is a firm-level survey based on face-to-face interviews with managers which examines the quality of the business environment. It was first undertaken in 1999-2000, when approximately 4,100 firms in 25 countries in eastern Europe and Central Asia (including Turkey) were surveyed in order to assess the environment for private enterprise and business development.

It has since been conducted every three to four years or so. The recent fifth round of the survey (BEEPS V) was completed in 2012 in Russia and 2014 in all other countries. BEEPS V involved more than 15,500 interviews with firms in 30 different countries.

The Middle East and North Africa Enterprise Surveys (MENA ES) are a joint initiative administered by the World Bank, the EBRD and the European Investment Bank (EIB). They were first conducted in selected MENA countries in 2013 and 2014. The surveys cover the countries of the southern and eastern Mediterranean (SEMED) – namely Egypt, Jordan, Morocco and Tunisia – as well as Djibouti, Israel, Lebanon and Yemen. Of the SEMED countries, only data for Jordan are available at the time of writing.

Both surveys cover the majority of manufacturing sectors (excluding mining), as well as retail and other sectors – including most service sectors (such as wholesaling, hotels, restaurants, transport, storage, communications and IT) and construction. Only official – in other words, registered – companies with five employees or more are eligible to participate.

In some larger economies (such as Russia, Turkey and Ukraine) the survey is representative across additional subsectors for some of the sectors that make the largest contributions to employment and value added. Firms that are wholly owned by the state are not eligible to participate.<sup>21</sup>

#### Measuring firm-level innovation

The innovation sections of BEEPS V and MENA ES build on the established guidelines contained in the third edition of the Oslo Manual,<sup>22</sup> covering product and process innovation, organisational and marketing innovation, R&D spending and the protection of innovation.

In the main questionnaire, respondents are asked – by means of simple yes/no questions – whether their firm has introduced any new or significantly improved products, processes, organisational arrangements or marketing methods in the last three years, and whether that firm has spent money on R&D during that period. In order to foster a common understanding of what innovation is, respondents are shown cards containing examples of innovative products, processes, organisational arrangements and marketing methods.<sup>23</sup> Firms that have engaged in any of these innovation activities are asked more detailed questions in the innovation module. Crucially, firms are asked to provide a detailed description of their main product or process innovation.

These descriptions of new products and processes are then compared with the description of the firm's main business, bearing in mind the formal definitions of product and process innovation.

<sup>21</sup> See <http://ebrd-beeps.com> for further details.

<sup>22</sup> See OECD and Eurostat (2005).

<sup>23</sup> There are slight differences between the wording used for manufacturing firms and the wording used for service-sector firms.

As a result of this process, innovations are sometimes reclassified. For instance, they may be changed from a product innovation to a marketing innovation – or even classified as non-innovations. In fact, in BEEPS V only around a third of all self-reported product innovations complied with the relevant definition. A total of 24 per cent were deemed not to represent innovation at all, while the rest were reclassified as other types of innovation. Chart 1.1.1 shows the percentage of self-reported product and process innovations that were reclassified as part of that cleaning process. Two types of misunderstanding were particularly common in this regard:

- **The customisation of products was widely regarded as a product innovation.** In many cases such customisation does not count as innovation. For instance, seasonal changes to clothing lines and the trading of new products by a wholesaler do not count (unless this concerns a new type of product altogether).
- **Firms often failed to distinguish between product innovation and marketing innovation.** A change of design is deemed to be a marketing innovation, as long as the characteristics of the product are not altered. If a garment manufacturer introduces a waterproof outdoor jacket, that is a product innovation, while a new shape for a line of outdoor jackets would be a marketing innovation. Neither would be an innovation for a retail firm selling such jackets. For a retail firm, a marketing innovation might be the introduction of internet sales. In turn, for an e-commerce firm, a significant improvement in the capabilities of its website would be a product innovation.

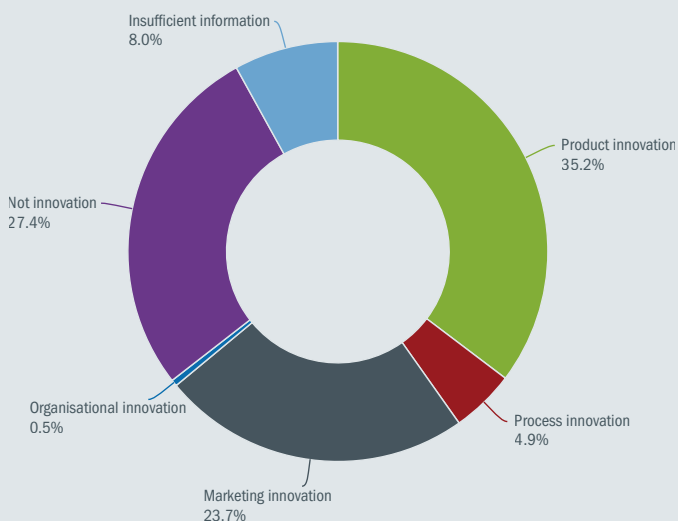
Even in Israel – which arguably has the most highly developed innovation system of all the countries in the sample – around 60 per cent of all self-reported product and process innovations had to be reclassified.

The innovation module also asks firms to indicate whether the relevant product or process is new to the local, national or international market (thereby providing information on its degree of novelty). While it is difficult to distinguish between innovations that are new to a local market and innovations that are new to a national market, truly world-class innovations can be detected with the aid of internet research on the relevant product or process. Thus, internet checks and information regarding patents and trademarks allow us to see whether a product that is reported as being new to the international market can indeed be considered a global innovation.

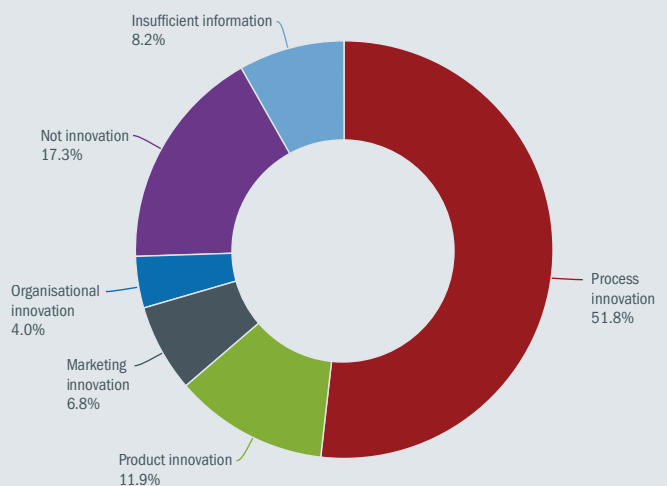
All in all, while it is impossible to ensure a common understanding of innovation across all survey respondents, the BEEPS V methodology and the efforts made to cross-check and reinterpret individual responses go a long way towards achieving comparability of results across countries and firms.

**CHART 1.1.1. Reclassification of self-reported product and process innovation**

(a) Product innovation classified as:



(b) Process innovation classified as:



Source: BEEPS V, MENA ES and authors' calculations.

**BOX 1.2. What drives the productivity growth of Ukrainian firms?**

This box uses data on almost a quarter of a million Ukrainian firms across all sectors of the economy to provide a breakdown of their productivity growth over the period 2001-09.<sup>24</sup> Total factor productivity (TFP) increased rapidly during that period, rising by a total of 60 per cent.

That period also saw exceptional firm-level dynamics in the form of a considerable reallocation of market shares, as well as massive numbers of firms entering and exiting markets, especially in the service sectors. These dynamics were mostly caused by the liberalisation of trade and services that resulted from Ukraine's accession to the World Trade Organization (WTO) in 2008. While in the case of goods, trade liberalisation was relatively limited, given that import duties were already low prior to 2008, services were liberalised on a large scale, significantly boosting the productivity of individual firms.<sup>25</sup>

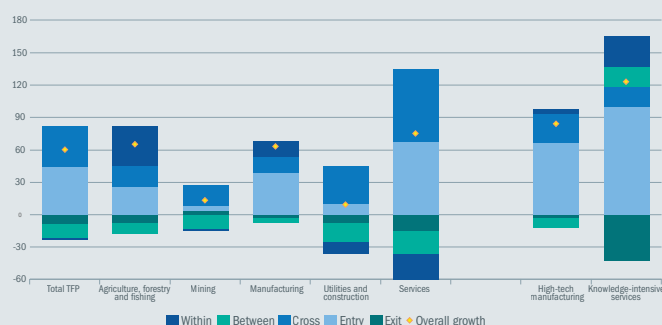
Accession to the WTO entailed the adoption of more than 20 new laws bringing Ukrainian legislation into line with the WTO's requirements, including laws concerning TV and broadcasting, information agencies, banks and banking activities, insurance, telecommunications and business services.

For instance, the law on telecommunications that was adopted in November 2003 allowed all legal persons in Ukraine to operate, service or own telecommunications networks. As a result, competition increased significantly, and the country now has four large and four smaller providers of wireless networks, as well as several dozen internet providers.

Likewise, financial services were gradually liberalised, allowing foreign banks to open branches in Ukraine. In addition, the circumstances under which the National Bank of Ukraine may turn down a foreign bank's application to operate in Ukraine were defined more clearly. Insurance services also underwent considerable liberalisation, and laws on auditing and the legal profession were amended to remove nationality requirements.

The combined impact of these liberalisation measures can be seen in the breakdown of TFP growth shown in Chart 1.2.1. New, more productive entrants to the market made the largest contribution to overall TFP growth (the "entry effect", which contributed a total of 44 percentage points). This contribution was particularly large in high-tech manufacturing sectors, such as pharmaceuticals and communications equipment.

Firms that increased their productivity also increased their market shares, and contributed 38 percentage points to the overall growth in firms' productivity. The other components of the breakdown made negative contributions: average productivity growth within individual

**CHART 1.2.1. Breakdown of TFP growth in Ukraine, 2001-09**


**Source:** Enterprise Performance Statement, Financial Results Statement and Balance Sheet Statement submitted annually to Derzhkomstat (the State Statistics Service of Ukraine), and authors' calculations. **Note:** Based on ISIC Rev. 3.1. High-tech manufacturing sectors include pharmaceuticals (24.4), office machinery and computers (30), radio, television and communications equipment (32), medical, precision and optical instruments (33) and aircraft and spacecraft (35.3). Knowledge-intensive services include water and air transport (61-62), telecommunications (64) and real estate, renting and business activities (70-74). Overall growth is shown in percentages, while contributions are shown in percentage points.

firms (the "within effect") decreased, reducing overall TFP growth by 3 percentage points; the market shares of highly productive firms (the "between effect") contracted, reducing overall TFP growth by 13 percentage points; and firms that exited markets were more productive than the average firm, so this "exit effect" reduced overall TFP growth by 8 percentage points.

The productivity of individual firms did increase in the agriculture and manufacturing sectors, and this component contributed 16 percentage points to the overall TFP growth of manufacturing firms. This largely reflects the provision of better services to manufacturing firms as a result of the liberalisation of services.<sup>26</sup> Indeed, some of the strongest overall productivity growth was observed in the service sectors (where TFP grew by a total of 75 per cent). This was largely a result of the entry of new service providers, which contributed 67 percentage points to overall productivity growth. Knowledge-intensive services recorded the strongest growth. Interestingly, the mining, utilities and construction sectors – none of which underwent liberalisation during that period – grew at a very slow pace.

The analysis in this box shows that policy measures which allow new entrants to challenge incumbents can have a swift and significant positive impact on firms' overall productivity. Box 1.3, on the other hand, will look at how political connections and a lack of competition owing to the abuse of entry regulations can limit productivity growth by keeping firms "stuck" in a low-productivity equilibrium.

<sup>24</sup> TFP is calculated in accordance with Olley and Pakes (1996). The breakdown follows the methodology employed by Foster et al. (2001), as discussed in the main text.

<sup>25</sup> See Shepotylo and Vakhitov (2012).

<sup>26</sup> See Shepotylo and Vakhitov (2012).

**BOX 1.3. Political connections and firm-level dynamics: the SEMED region**

When markets are distorted, various drivers of aggregate productivity growth may cease to work properly, resulting in a stagnant economy. Such distortions often arise from the misuse of political connections.

Political connections can take various forms, ranging from direct ownership, management or control of a firm by political leaders or their relatives to close relationships between the state and the corporate sector, leading to favours being exchanged between politicians and firms (for instance, with firms receiving favourable treatment in return for funding political campaigns).

Politically connected firms may prevent new players from entering the market, which enables them to remain in business despite poor productivity. Shielded from the threat posed by new entrants, such firms will have fewer incentives to innovate and seek efficiency improvements.<sup>27</sup> They may also stifle competition, thereby denying market share to more productive and faster-growing firms through the abuse of regulations or non-transparent contracts. Political connections can also help firms to obtain public bailouts in the event of financial difficulties, reduce their tax bills, benefit from favourable import licensing arrangements or, in some cases, gain preferential access to finance.<sup>28</sup>

Recent evidence shows that political connections have played a major role in limiting the growth of firms in the SEMED region. This may begin to explain why these economies have been struggling to absorb new labour market entrants, while many economies in south east Asia have managed to use their young and fast-growing populations to their advantage.

For instance, while in Egypt the informal economy has grown over the past 20 years, few firms have entered or exited the market and the average firm size is relatively small. In other words, small firms are failing to grow and challenge large incumbents.<sup>29</sup> A recent study shows that trade protection, large energy subsidies and bias in favour of politically

connected firms in the enforcement of rules have all played a major role in stifling firms' growth.<sup>30</sup>

According to this study, in 2010 politically connected firms in Egypt accounted for 60 per cent of net profit in the economy, while their share of employment was only 11 per cent. Over 70 per cent of politically connected firms were protected by at least three non-tariff measures, compared with only 3 per cent of other firms. Meanwhile, more than a third of them operated in highly energy-intensive sectors, compared with a national average of just 8 per cent. Overall, around 20 per cent of the market value of these politically connected firms was attributable to their political connections. Strikingly, these differences between the profitability of politically connected and non-connected firms disappeared after the "Arab Spring" revolution of 2011.

In Tunisia the 220 firms that used to be owned by the Ben Ali family (which were confiscated in the aftermath of the country's revolution) were responsible for 21 per cent of all net private-sector profits, despite accounting for only 3 per cent of private-sector output, according to a recent study.<sup>31</sup> These politically connected firms outperformed their peers, particularly in regulated sectors. Political connections added an average of 6.3 percentage points to each firm's market share, relative to the market share of a non-connected firm with similar characteristics. As in the case of Egypt, political connections were exploited in order to secure beneficial regulations, particularly when it came to preventing firms from entering the market.

All in all, cronyism significantly reduces entrepreneurs' incentives to create new companies and existing firms' incentives to innovate, with negative consequences for the growth rate of the private sector.

Politically connected firms are not the only factor that is distorting markets and impeding structural change in the SEMED region. Other important factors include a potential bias towards investment in capital-intensive – rather than labour-intensive – industries (which is being fuelled by large energy subsidies), cumbersome business regulations, weak and unpredictable enforcement of rules, restrictive trade regimes and pro-cyclical policies undermining macroeconomic stability.<sup>32</sup>

<sup>27</sup> See Aghion et al. (2009).

<sup>28</sup> See Faccio (2007), Claessens et al. (2008), Faccio et al. (2006) and Mobarak and Purbasari (2006).

<sup>29</sup> See Hussai and Schiffbauer (2013).

<sup>30</sup> See Diwan et al. (2013).

<sup>31</sup> See Rijkers et al. (2014).

<sup>32</sup> See Diop et al. (2012).

### BOX 1.4. Economic capabilities and innovation potential

Most innovation occurs within firms and industries through improvements to existing products. However, countries also develop new industries on the basis of skills and other inputs used by existing industries. This enables countries to diversify and alter the range of products that they export. A new index characterising a country's export mix – Whiteshield Partners' capability and innovation potential index (CIPI) – is designed to capture potential in both of these areas.<sup>33</sup>

The starting point for the index is the economic complexity of a country's exports. A country is considered to have a complex economy if it enjoys a revealed comparative advantage in many products that can only be produced and exported by a small number of other countries. A revealed comparative advantage means that the share of a particular good in a country's total exports is larger than the share of that good in total world exports (implying that a country specialises in producing that good in the global market).<sup>34</sup> In contrast, if a country enjoys a comparative advantage in few goods and many other countries have a comparative advantage in those goods, the economic complexity index will be relatively low.<sup>35</sup> Countries with a more complex economic structure tend to innovate more, as more complex industries help to develop the skills, technologies and management expertise that support innovation.

The potential to achieve innovations that help countries to develop comparative advantages in new industries is captured by a related concept – the opportunity value of a country's export structure.

This measure looks at the complexity of goods in which a country does not currently have a comparative advantage and sees how far removed they are from the goods in which it does, thereby seeing how difficult it would be to cover the distance between those exported goods and potential products.

The complexity of products is measured on the basis of the economic complexity of the countries that have a comparative advantage in those products. The "distance" between two products is calculated as the probability of a country exporting both products (in other words, the lower of (i) the probability of it exporting good A, if it exports good B, and (ii) the probability of it exporting good B, if it exports good A).<sup>36</sup>

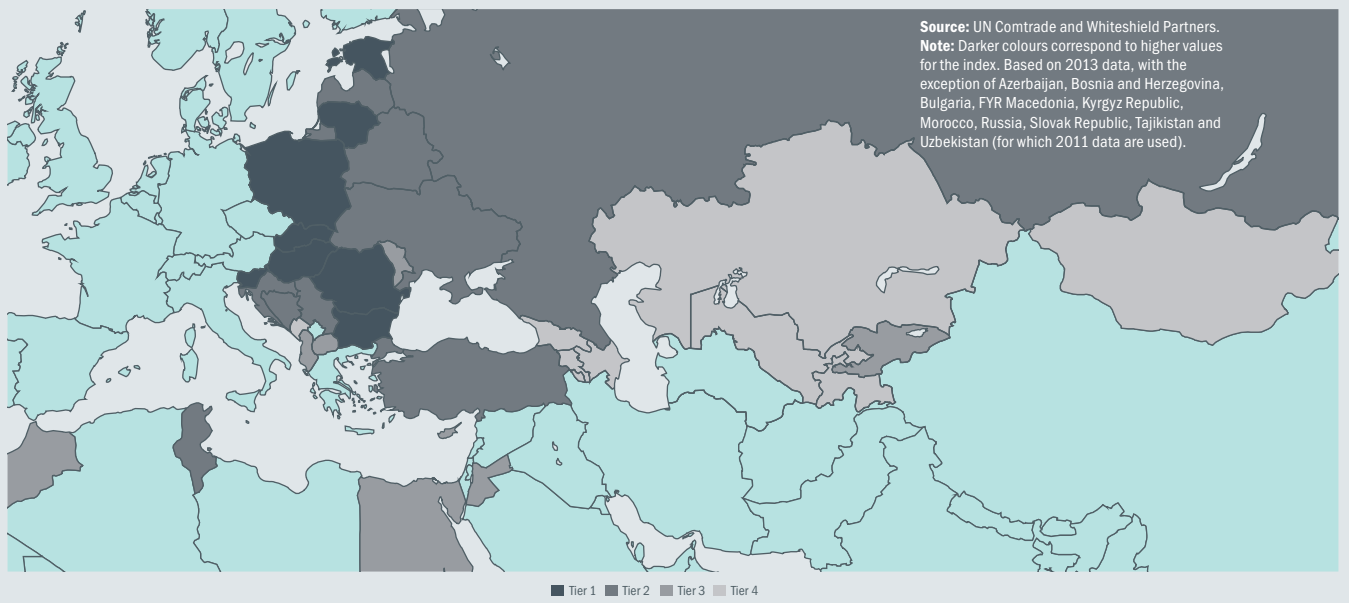
If a country's export structure has many complex industries in close proximity to its existing export industries, it will be easier to innovate and expand into new products, as those products will require similar skills and technologies and will themselves be conducive to innovation.

In contrast, if a country's export structure has few nearby industries and these are less complex, innovation across industries will tend to be more challenging. For example, developing a comparative advantage in the production of buses will be easier for a country with a comparative advantage in the production of trucks than for a country that specialises in oil refining.

The CIPI (see Chart 1.4.1) takes the average of a country's economic complexity and the opportunity value of its exports. On the basis of this index, countries in the transition region can be divided into four tiers, from those with the greatest potential to innovate across sectors to those with the lowest potential:

- **Tier 1** comprises countries that are already members of the European Union.
- **Tier 2** is made up of countries that are in the process of developing strong capabilities and have considerable potential for development. This group includes Russia, Tunisia, Turkey and Ukraine.
- **Tier 3** includes other countries in the southern and eastern Mediterranean, as well as Albania, Cyprus and FYR Macedonia.
- **Tier 4** mainly comprises countries in Central Asia and the Caucasus, which would seem to have limited potential to increase the complexity of their output in the short term.

**CHART 1.4.1. Whiteshield Partners' capability and innovation potential index**



<sup>33</sup> Whiteshield Partners is a global economic and policy advisory firm.

<sup>34</sup> See Balassa (1965) for an early discussion of comparative advantage.

<sup>35</sup> See Hausmann et al. (2011) for a formal definition and a discussion of this issue.

<sup>36</sup> See Hausmann et al. (2011) for a formal definition of the concept of opportunity value and a discussion of this issue.

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# INNOVATION AND FIRM PRODUCTIVITY



## AT A GLANCE

# 40%

AVERAGE INCREASE IN PRODUCTIVITY ASSOCIATED WITH IMPROVED MANAGEMENT PRACTICES IN EASTERN EUROPE AND THE CAUCASUS, COMPARED WITH 6% FOR THE INTRODUCTION OF A NEW PROCESS

## INNOVATION PAYS OFF

LABOUR PRODUCTIVITY IS SIGNIFICANTLY BOOSTED BY INNOVATION



# 43%

AVERAGE INCREASE IN PRODUCTIVITY ASSOCIATED WITH INTRODUCING A NEW PRODUCT

# 19

TRANSITION COUNTRIES WHERE INNOVATIVE FIRMS ARE MORE PRODUCTIVE THAN NON-INNOVATORS



**Around the world, economies remain characterised by large differences in labour productivity across firms. However, the data presented in this chapter show that in less advanced transition economies the percentage of firms that have relatively low labour productivity is high. One way these businesses can become more productive is by innovating, for instance by introducing new products and processes. The analysis in this chapter shows that returns to innovation are sizeable, especially in low-tech sectors, where firms tend to innovate less. Yet many firms can still boost their productivity by simply improving the way they are managed.**

## Introduction

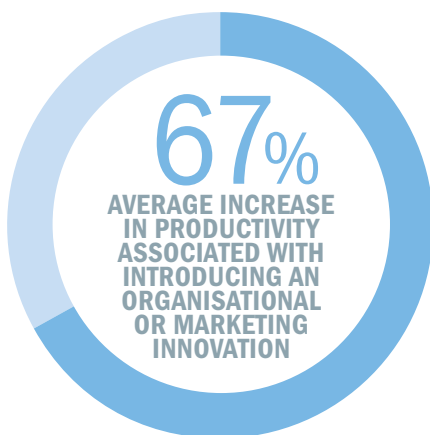
At the beginning of the transition process virtually every country in the EBRD region achieved large one-off productivity gains by laying off excess workers, cutting other costs and improving the use of capacity. There remains scope for leveraging such drivers of productivity in those countries that are still at a relatively early stage of the process. In those countries, improving management practices may also have a large positive impact on productivity. In more advanced transition countries, firm-level innovation plays a more important role in boosting firms' productivity.

This chapter looks at the impact that different forms of innovation and the quality of management practices have on firms' labour productivity<sup>1</sup> (calculated as turnover per worker), using the EBRD and World Bank's fifth Business Environment and Enterprise Performance Survey (BEEPS V) and the Middle East and North Africa Enterprise Surveys (MENA ES) conducted by the EBRD, the World Bank and the European Investment Bank. It first presents basic information about the labour productivity of firms across the transition region, before investigating the relationship between innovation and productivity and comparing the effect that innovation has on productivity in high and low-tech sectors. The chapter then examines productivity gains stemming from improvements in management practices, comparing them with returns to process innovation in various regions. It concludes by examining the relative export performances of innovative and less innovative industries.

### Labour productivity across firms and countries

All over the world, large and persistent differences in productivity continue to exist across both firms and countries.<sup>2</sup> Transition countries are no exception in this regard. There are firms with low and high productivity in each of these countries: there are highly productive firms in Central Asia and poorly performing firms in the EU. What determines aggregate productivity is the percentage of firms with low productivity relative to the percentage of firms with high productivity. Compared with Israel, an advanced industrialised country with several innovation successes,<sup>3</sup> transition countries have a higher percentage of firms with low productivity and a lower percentage of highly productive firms (see Chart 2.1). This, of course, results in lower average productivity at the country level.

Israel also has a more compressed distribution of firm productivity than any of the other countries shown – possibly because Israeli firms tend to be more advanced in terms of the technology they are using, but also because Israel is more competitive than the average transition country.<sup>4</sup> The ratio of the 90th to the 10th percentiles of the log of labour productivity – a measure of variation in productivity across firms – ranges from 1.19 in Israel to 1.59 in Tajikistan. In most EBRD countries and regions this ratio tends to be higher for services than it is for manufacturing. Within manufacturing, the productivity spread tends to be lowest in high-tech sectors, which face



<sup>1</sup> Since the BEEPS V and MENA ES data simply provide a snapshot of the current situation, this chapter looks only at the impact that innovation is having on current labour productivity.

<sup>2</sup> See, for example, Arnold et al. (2008) for OECD countries, Foster et al. (2008) for the United States, and Hsieh and Klenow (2009) for China and India.

<sup>3</sup> See, for example, Moss (2011).

<sup>4</sup> Israel outperforms the EBRD transition countries in the Global Competitiveness Index 2013-2014 (see World Economic Forum, 2013). It also performs better than the transition region in several Economic Freedom of the World indices – particularly those relating to (i) judicial independence; (ii) impartial courts; (iii) protection of property rights; (iv) integrity of the legal system; (v) compliance costs associated with importing and exporting; (vi) regulatory trade barriers; and (vii) restrictions on foreign ownership/investment (see Gwartney et al., 2013).

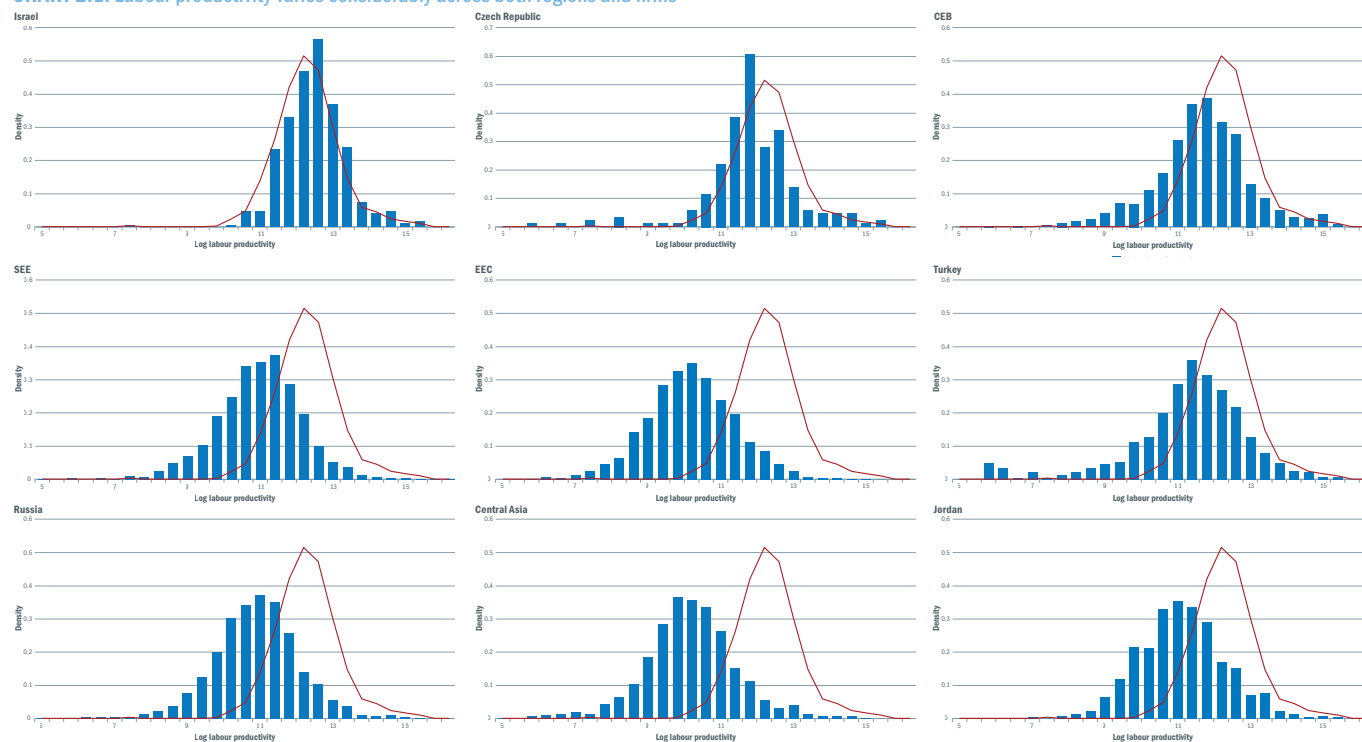
strong competitive pressure to innovate and reduce costs. The spread is highest among providers of services, which (unlike producers of manufactured goods) do not face such strong competition from imports.

There is evidence that the performance of sectors which produce or are heavily reliant on information and communication technology (ICT) and their ability to innovate and adopt technology are important drivers of cross-country differences in aggregate productivity.<sup>6</sup>

ICT-intensive sectors are characterised by high levels of labour productivity, and this holds for the transition region as well. The

largest productivity premiums for these sectors relative to other manufacturing industries can be found in central Europe and the Baltic states (CEB), south-eastern Europe (SEE), and eastern Europe and the Caucasus (EEC). Within the EEC region, this is particularly true of Armenia and Azerbaijan, two countries with a strong focus on ICT in their innovation policies.<sup>7</sup> However, in most countries differences between the productivity levels of individual firms are also large within ICT-intensive sectors. Thus, even in these sectors, it seems that many firms have ample scope for improving their productivity.

**CHART 2.1. Labour productivity varies considerably across both regions and firms**



**Source:** BEEPS V, MENA ES and authors' calculations.

**Note:** The red line is the fitted distribution for Israel. Firm-level labour productivity is measured in logs and defined as turnover per employee. Cross-country differences in sectoral composition are controlled for. Turnover in local currency is converted to US dollars using the average official exchange rate.<sup>8</sup> Density is calculated by dividing the relative frequency (in other words, the number of values that fall into each class, divided by the number of observations in the set) by the width of the class.

<sup>6</sup> The results do not change significantly if purchasing power parities are used instead.

<sup>8</sup> See, for example, Bosworth and Triplett (2007), Bartelsman et al. (2004), and Brynjofsson and Hitt (2000).

<sup>7</sup> See Chapter 5 for more details.

### Does firm-level innovation pay off?

Our analysis now turns to the relationship between innovation and the productivity of firms. Policy-makers and researchers widely acknowledge that innovation is essential for increasing productivity.<sup>8</sup> However, while a positive correlation between product innovation and firms' performance has been established for European firms, evidence for developing countries has been mixed.<sup>9</sup> Similar studies exist only for a subset of transition countries. Indeed, for many of them, the data required for such analysis have not existed until now.

A simple comparison of the average labour productivity of innovative and non-innovative firms does not point to a strong relationship between innovation and productivity. Innovative firms have higher average productivity in less than half of all countries. Differences between innovative and non-innovative firms also depend on the type of innovation. Only in Jordan are innovative firms significantly more productive than non-innovative firms across all types of innovation (see Table 2.1).

There may be reasons why the correlation observed between innovation and productivity is weaker than the true underlying impact that innovation has on productivity. For example, if poorly performing firms find themselves under greater pressure to innovate, innovation may appear to be linked to poor short-term performance, despite improving firms' productivity in the longer run.

In order to deal with such issues appropriately, we need a more comprehensive analysis of the relationship between innovation and firms' productivity that accounts for factors that may affect both firms' productivity and the decision to innovate. To this end, this chapter uses a well-known model devised by Crépon, Duguet and Mairesse (known as the "CDM model" – see Chart 2.1.1) that links R&D, innovation and labour productivity.<sup>10</sup> The model controls for other factors that can affect R&D, innovation and labour productivity, such as a firm's size and age, the skills of the workforce, the level of competition and the type of industry (see Box 2.1 for details).

Once these factors are taken into account, the impact that innovation has on productivity becomes stronger.<sup>11</sup> Product innovation is associated with a 43 per cent increase in labour productivity, and this effect has a high degree of statistical significance. This suggests that a firm with median labour productivity would move from the 50th to the 60th percentile of the labour productivity distribution after introducing a new product. Labour productivity also benefits from the implementation of process innovations. Although this effect is smaller (with the introduction of new processes being associated with a 20 per cent increase in labour productivity), it is also statistically significant. A firm with median labour productivity would move from the 50th to the 55th percentile of the labour productivity distribution after introducing a new process. These effects are somewhat stronger than those found for developed economies, but they are comparable to those observed in developing economies.<sup>12</sup>

Interestingly, the increase in labour productivity is smaller for firms that engage in product and process innovation

TABLE 2.1. Firms that innovate are more productive in less than half of all transition countries

Type of innovative activity	Level of significance		
	1%	5%	10%
R&D	Jordan, Moldova, Romania, Russia	Armenia, Croatia, FYR Macedonia	Uzbekistan
Product and process (self-reported)	Jordan	Kyrgyz Rep., Moldova, Mongolia	Armenia, FYR Macedonia, Uzbekistan
Organisational and marketing (self-reported)	Belarus, Jordan, Latvia, Russia, Slovenia	Kyrgyz Rep., Lithuania, Mongolia, Romania, Tajikistan, Turkey	Kazakhstan, Montenegro
Product and process (cleaned)		Jordan, Moldova, Mongolia, Ukraine	

Source: BEEPS V, MENA ES and authors' calculations.

Note: There are no BEEPS firms engaged in research and development (R&D) in Azerbaijan. Cleaned data on product and process innovation were not available for the Slovak Republic, Tajikistan or Turkey at the time of writing.

TABLE 2.2. The impact of innovation on labour productivity depends on the type of innovation

Type of innovation	Associated impact on firm-level productivity	
	(1) Cleaned	(2) Self-reported
Product innovation	0.355*** (0.024)	0.524*** (0.032)
Process innovation	0.179*** (0.021)	0.256*** (0.021)
Product or process innovation	0.227*** (0.024)	0.448*** (0.028)
Non-technical innovation (marketing or organisational)		0.511*** (0.019)

Source: BEEPS V, MENA ES and authors' calculations.

Note: This table reports regression coefficients for the occurrence of innovation at firm level, reflecting the impact on the dependent variable firm-level productivity, which is measured as turnover (in US dollars) per employee in log terms. The results are obtained by estimating a three-stage CDM model by asymptotic least squares (ALS), where productivity is linked to innovation, and innovation, in turn, is related to investment in R&D. For a detailed description and the set of control variables included, refer to Box 2.1. Standard errors are reported in parentheses below the coefficient. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels respectively.

simultaneously than it is for those that engage exclusively in either product or process innovation. This can be explained by the fact that simultaneous product and process innovation is more complex and takes longer to be fully reflected in increased labour productivity, while BEEPS data only enable us to look at the short-term impact of new products and processes.

The estimated effects are stronger when using self-reported measures of innovation than when using cleaned measures. In the case of product innovation, the estimated improvement in productivity is 69 per cent when a self-reported measure of innovation is used, compared with a 43 per cent improvement when using a cleaned measure. This could be because almost a quarter of all self-reported product innovations and 11 per cent of all self-reported process innovations were in fact either

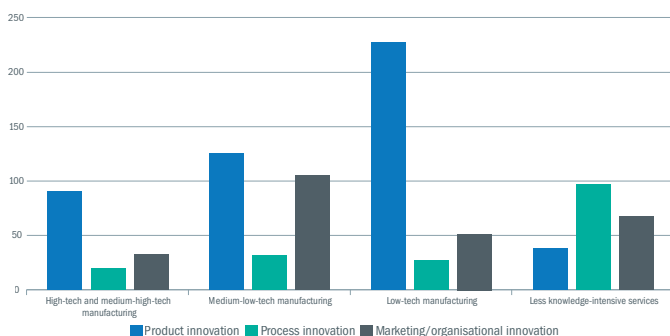
<sup>8</sup> See European Commission (2014) and Rosenbusch et al. (2011).

<sup>9</sup> See Mohnen and Hall (2013) for an overview.

<sup>10</sup> See Crépon et al. (1998).

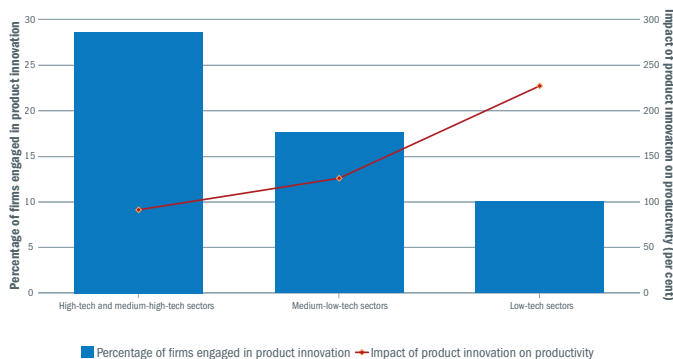
<sup>11</sup> The estimation results for the first two stages (in other words, the determinants of innovation) are discussed in detail in Chapter 3.

<sup>12</sup> See Mohnen and Hall (2013) for an overview. Raffo et al. (2008) found that a rise in product innovation increased labour productivity by 7.8 per cent, 24.6 per cent and 36.8 per cent in France, Brazil and Mexico respectively.

**CHART 2.2. Product innovation strongly increases labour productivity in low-tech manufacturing sectors**


Source: BEEPS V, MENA ES and authors' calculations.

Note: This chart reports the impact of innovation at firm level by sector, reflecting the impact on the dependent variable firm-level productivity, which is measured as turnover (in US dollars) per employee. The results are obtained by estimating a three-stage CDM model by ALS, where productivity is linked to innovation, and innovation, in turn, is related to investment in R&D. For a detailed description and the set of control variables included, refer to Box 2.1. The baseline model is adjusted slightly to account for the smaller sample size resulting from regressions on sector subsamples. State ownership variables are not included, as there are too few observations in some regions; the use of email is not included when explaining the incidence of R&D, as in some regions all firms make use of email. A robustness check on the baseline regression in Table 2.2 indicates that the main results remain valid after applying these adjustments. All coefficients associated with the impacts shown are statistically significant at the 1 per cent level. Sectors are based on ISIC Rev. 3.1. High-tech and medium-high-tech manufacturing sectors include chemicals (24), machinery and equipment (29), electrical and optical equipment (30-33) and transport equipment (34-35, excluding 35.1). Low-tech manufacturing sectors include food products, beverages and tobacco (15-16), textiles (17-18), leather (19), wood (20), paper, publishing and printing (21-22) and other manufacturing (36-37). Knowledge-intensive services include water and air transport (61-62), telecommunications (64) and real estate, renting and business activities (70-74).

**CHART 2.3. The potential pay-off from innovation is highest among the type of firms that tend to innovate the least**


Source: BEEPS V, MENA ES, Chart 2.2 and authors' calculations.

Note: For definitions of sectors, see the note accompanying Chart 2.2.

organisational or marketing innovations (see Box 1.1), which nevertheless result in increased turnover per worker. Indeed, the increase in labour productivity associated with self-reported organisational and/or marketing innovation is estimated at 67 per cent.<sup>13</sup> Organisational and marketing innovations are probably less risky and costly for firms than technological innovations and, given these high productivity yields, it is perhaps surprising that less than a third of all BEEPS firms engage in either. This could be due to a lack of information on new organisational and marketing methods, scepticism regarding their effectiveness or resistance to change within organisations.<sup>14</sup>

## Differences in returns to innovation by sector

In which sectors does innovation boost labour productivity most? Chapter 1 showed that product innovation is more prevalent in high-tech manufacturing sectors and knowledge-intensive services. However, these are not necessarily the sectors with the largest returns to innovation (see Chart 2.2).

On the contrary, returns to product innovation are particularly large for firms in low-tech manufacturing sectors (such as food products or textiles), where introducing a new product typically results in labour productivity more than doubling (for an example of an innovative firm in the food sector in Romania, see Case study 2.1 on page 38). In medium-low-tech manufacturing sectors (such as plastic products and basic metals)<sup>15</sup>, introducing a new product is associated with a 126 per cent increase in labour productivity, while in high-tech and medium-high-tech ("higher-tech") manufacturing sectors (such as machinery and equipment or chemicals) the average increase is 91 per cent.<sup>16</sup>

These effects are fairly sizeable, but they are not as large when placed in the context of the labour productivity distribution. A low-tech manufacturing firm with median labour productivity would move from the 50th to the 82nd percentile of the labour productivity distribution after introducing a new product. A higher-tech manufacturing firm, on the other hand, would move from the 50th to the 69th percentile of the labour productivity distribution.<sup>17</sup>

This variation in estimated returns to innovation can be explained by differences in the probability of introducing new products and the level of competitive pressures faced. Firms in high-tech manufacturing sectors are more likely to introduce new products (see Chart 2.3) and more likely to compete in national or international markets (as opposed to local markets). While these competitive pressures may explain why firms have greater incentives to introduce new products, they may also limit returns to innovation because such firms tend to be fairly productive in the first place. In low-tech manufacturing sectors, on the other hand, most innovations come from suppliers of equipment and materials,<sup>18</sup> so low-tech firms' ability to innovate depends crucially on their ability to adapt their production processes and the adaptability of their employees.<sup>19</sup> The relatively small number of firms that manage to adapt and introduce new products successfully may manage to capture a larger market share as a result of their innovations, thereby increasing their output per worker. Some innovations by firms in low-tech manufacturing

<sup>13</sup> Only self-reported data are available for organisational and marketing innovations, as firms were not asked to describe these innovations (see Box 1.1).

<sup>14</sup> See, for example, Atkin et al. (2014).

<sup>15</sup> See <http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=17&Lg=1&Co=27> (last accessed on 18 September 2014).

<sup>16</sup> Mairesse et al. (2005), who looked at the situation in France, also found that product innovation had a greater impact in low-tech manufacturing sectors than it did in high-tech manufacturing sectors.

<sup>17</sup> Comparisons with estimates from other studies are not straightforward, owing to differences in the specifications and estimation methods used. That being said, Hall et al. (2009), who looked at small and medium-sized enterprises (SMEs) in Italy, found that the labour productivity of process innovators was approximately two and a half times that of non-innovators, everything else being equal.

<sup>18</sup> See Heidenreich (2009).

<sup>19</sup> See, for instance, Atkin et al. (2014) for an example of the misalignment of incentives within firms as an obstacle to the adoption of technology.

sectors may be due to firms moving production from China to eastern Europe owing to rising wage costs in China and the increasing cost of fossil fuels.<sup>20</sup>

### Management quality and the productivity of manufacturing firms

Besides innovation, there are other ways of improving firm-level labour productivity. Firms can make better use of their excess capacity (provided there is any) or improve their management practices. BEEPS V offers valuable insight into the role of these factors in manufacturing firms.<sup>21</sup>

Recent studies show that there is a strong correlation between the quality of management practices and firms' performance, and this also applies to transition countries and other emerging markets. Furthermore, a lack of managerial skills is one explanation for the low productivity of state-owned and formerly state-owned firms.<sup>22</sup>

In a management field experiment looking at large Indian textile firms, improved management practices resulted in a 17 per cent increase in productivity in the first year through improvements in the quality of products, increased efficiency and reduced inventories.<sup>23</sup> This suggests that improving management practices may be a relatively low-cost and low-risk way of boosting firms' productivity across the transition region.

BEEPS V includes a subset of questions on management practices taken from the Management, Organisation and Innovation (MOI) survey conducted by the EBRD and the World Bank.<sup>24</sup> These questions look at core management practices relating to operations, monitoring, targets and incentives. They range from dealing with machinery breakdowns to factors determining the remuneration of workers. On the basis of firms' answers, the quality of their management practices can be assessed and given a rating, which can then be used to explain productivity levels (see Box 2.2 for details).

Estimates suggest that improving the average firm's management practices from the median to the top 12 per cent is associated with a 12 per cent increase in labour productivity, everything else being equal (see Table 2.3). The estimated impact on productivity is larger still when process innovation is also accounted for (standing at 19 per cent). Despite these sizeable effects, estimated returns to better management practices tend to be somewhat lower than returns to innovation, regardless of the type of innovation.

There are significant differences across regions in terms of the role played by improved management practices in boosting firms' productivity. In EU member states, candidate countries and potential candidate countries (in other words, the CEB and SEE regions), where the quality of management practices tends to be higher, returns to further improvements in management practices are lower than returns to process innovation (see Chart 2.4). In the SEE region, process innovation is associated with an increase in labour productivity of more than 150 per cent. This may be largely due to the upgrading of production facilities with the aim of being more competitive in the EU market. ▶

TABLE 2.3. Labour productivity, innovation, capacity utilisation and management practices

	Log of labour productivity			
Product innovation (cleaned)	0.575*** (0.073)			
Process innovation (cleaned)		0.178*** (0.062)		
Product or process innovation (cleaned)			0.415*** (0.073)	
Non-technical innovation (organisational or marketing innovation)				0.226*** (0.059)
Management quality	0.115*** (0.037)	0.176*** (0.037)	0.132*** (0.037)	0.135*** (0.037)
Capacity utilisation	0.004** (0.002)	0.003* (0.002)	0.004** (0.002)	0.007*** (0.002)
Log of fixed assets per employee	0.178*** (0.015)	0.191*** (0.015)	0.179*** (0.015)	0.197*** (0.015)

Source: BEEPS V, MENA ES and authors' calculations.

Note: This table reports regression coefficients for firm-level innovation, management quality, capacity utilisation and capital intensity in the manufacturing sector, reflecting the impact on the dependent variable firm-level productivity, which is measured as turnover (in US dollars) per employee in log terms. The results are obtained by estimating a three-stage CDM model by ALS, where productivity is linked to innovation, and innovation, in turn, is related to investment in R&D. For a detailed description and the set of control variables included, refer to Box 2.1. Standard errors are reported in parentheses below the coefficient. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels respectively.

20%  
AVERAGE INCREASE IN  
PRODUCTIVITY ASSOCIATED  
WITH INTRODUCING A NEW  
PROCESS

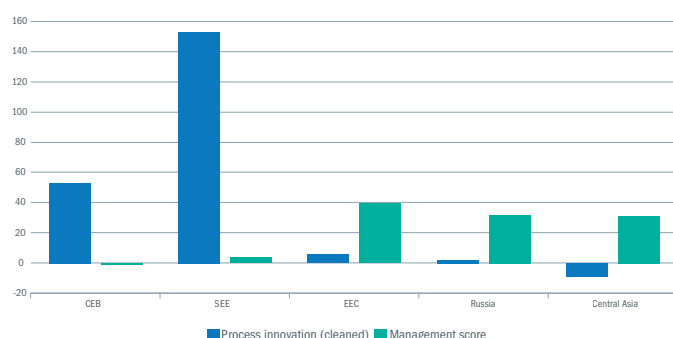
<sup>20</sup> Examples include lingerie manufacturer La Perla moving production from China to Tunisia and Turkey, French fashion house Barbara Bui moving production to Bulgaria, Hungary, Romania and Turkey, and ready-to-wear group Etam moving production to Morocco, Tunisia and Turkey (see Wendlandt, 2012).

<sup>21</sup> Questions on management practices were only answered by manufacturing firms with at least 20 employees (at least 50 employees in the case of Russia).

<sup>22</sup> See Brown et al. (2006), Estrin et al. (2009), Steffen and Stephan (2008), Bloom and Van Reenen (2010), Bloom et al. (2012) and Bloom et al. (2013).

<sup>23</sup> See Bloom et al. (2013).

<sup>24</sup> See EBRD (2009) and Bloom et al. (2012).

**CHART 2.4. Impact of process innovation and quality of management on labour productivity**


Source: BEEPS V, MENA ES and authors' calculations.

Note: This chart reports the impact of firm-level process innovation and firms' management quality by region, reflecting the impact on firm-level productivity, which is measured as turnover (in US dollars) per employee in log terms. The results are obtained by estimating a three-stage CDM model by ALS, where productivity is linked to innovation, and innovation, in turn, is related to investment in R&D. For a detailed description and the set of control variables included, refer to Box 2.1. The reported coefficients for process innovation are significant at the 1 per cent level in the CEB region, the SEE region and Russia, and at the 5 per cent level in the EEC region. The reported coefficients for management scores are significant at the 1 per cent level in the EEC region and Russia, and at the 5 per cent level in Central Asia. Other reported coefficients are not significantly different from zero.

On the other hand, in less developed countries, where the quality of management is generally lower, returns to better management practices are much higher than returns to process innovation. In the EEC region, for example, better management practices are associated with a 40 per cent increase in labour productivity, whereas the introduction of a new process is associated with a mere 6 per cent increase. In Russia returns to better management and process innovations are estimated at 32 and 2 per cent respectively.

These findings raise the question of why firms in these regions (and less developed countries more generally) do not adopt better management practices. The recent management field experiment looking at large Indian textile firms suggests that this may be due to information barriers. Firms might not have heard of some management practices, or they may be sceptical regarding their impact.<sup>25</sup> Improvements to certain management practices – particularly those relating to underperforming employees, pay or promotions – may also be hampered by regulations or a lack of competition (since competition could force badly managed firms to exit the market).

Training programmes covering basic operations (such as inventory management and quality control) could be helpful, but suitable consultancy or training services offering such products may not exist in a given market or may be geared towards large firms, making them too expensive for SMEs.<sup>26</sup>

The EBRD's Business Advisory Services (BAS) and Enterprise Growth Programme (EGP) promote good management practices in micro, small and medium-sized enterprises (MSMEs) in the transition region, providing direct support to individual enterprises.<sup>27</sup> Box 3.4 on page 61 analyses links between the use of consultancy services, innovation, management practices and productivity in the transition region.

## Other drivers of labour productivity

In addition to innovation and the quality of management, other factors do of course also affect labour productivity. Analysis shows that higher levels of capacity utilisation and greater capital intensity (in other words, capital per worker) are typically associated with higher levels of productivity.<sup>28</sup> Firms that are located in a country's capital or main business centre tend to be more productive, as they have access to better supporting infrastructure and a larger pool of skilled labour. Skilled labour is itself an important factor, as firms in which a higher percentage of employees are university graduates tend to be more productive.

The results also confirm that higher levels of competition – particularly competition with foreign firms – can put pressure on firms to improve productivity. Our analysis confirms that BEEPS firms that sell primarily in national or international markets are more productive than firms that primarily target local markets. There is also evidence that majority foreign-owned firms tend to be more productive. The effects of economic openness and firms' integration into global production chains are discussed in more detail in Boxes 2.3 and 3.2.

## The business environment

The relationship between innovation and productivity may also be dependent on the business environment in which firms operate. Business environments are predominantly a country-level characteristic, with some variation across industries and regions within an individual country. Thus, in firm-level analysis they are typically subsumed within "fixed effects" in regressions. In order to see how business environments and innovation may combine to affect growth, the next section makes use of cross-country data.

Examining the relationship between innovation and economic performance at the country level poses its own challenges, as many factors will affect a country's growth and, at the same time, be related to the country's ability to innovate. In an effort to overcome this problem, the analysis below focuses on the performance of individual industries. It seeks to explain differences between the average rates of export growth of industries with different levels of innovation intensity (as defined in Chapter 1) across various countries over the period 1990-2010.<sup>29</sup>

<sup>25</sup> See Bloom et al. (2013).

<sup>26</sup> See McKenzie and Woodruff (2014) for a review of evaluations of business training programmes in developing countries.

<sup>27</sup> The EGP focuses on substantial managerial and structural changes and supports the introduction of international best practices in MSMEs, using experienced international executives and industry experts as advisers. The BAS enable MSMEs to access a wide range of consultancy services by facilitating projects in cooperation with local consultants on a cost-sharing basis.

<sup>28</sup> It should be noted that this estimation does not correct for the endogeneity of capacity utilisation and capital intensity with labour productivity (see, for example, Olley and Pakes, 1996).

<sup>29</sup> As discussed in Chapter 1, focusing on exports has its limitations, but it places emphasis on internationally competitive parts of the industry.

The growth rates of industries' exports can be affected by a number of country-level characteristics (such as macroeconomic conditions or political stability), as well as a number of industry-level characteristics. For instance, industries which cater for consumer demand in emerging markets may grow faster.

In addition, certain industries may grow faster in countries with specific characteristics. In particular, better economic institutions may enable the exports of innovation-intensive industries to grow more rapidly.

Indeed, poor economic institutions – high incidence of corruption, weak rule of law, burdensome red tape, and so on – can substantially increase the cost of introducing new products and greatly increase the uncertainty of returns to investment in new products and technologies. As a result, risk-adjusted returns to innovation may look less attractive when economic institutions are weak. This will primarily affect industries where the introduction of new products and technologies is essential in order to maintain the competitiveness of exports, so firms tend to introduce new products more frequently – in other words, innovation-intensive industries.

The BEEPS results provide some support for this view. Firms that have introduced a new product in the last three years regard all aspects of their immediate business environment as a greater constraint on their operations than firms that do not innovate. Such differences between innovative and non-innovative firms' perception of their business environment are particularly large when it comes to the skills of the workforce, corruption and customs and trade regulations (as discussed in more detail in Chapter 3).

In order to examine the relationship between the quality of economic institutions and the growth of innovative industries, we can look at growth rates for the exports of various industries in various countries.<sup>30</sup> These can be explained by country fixed effects (roughly corresponding to the average growth rates of total exports in individual countries) and industry fixed effects (namely the average growth rates of global exports for individual industries), as well as the initial exports of a given industry in a given country, expressed as a percentage of that country's total goods exports. In addition, regressions include interaction terms between the innovation intensity of a given industry and a country-level characteristic: either the quality of economic institutions or the level of financial development. A positive and significant coefficient for the interaction term between innovation intensity and the quality of economic institutions would imply that innovation-intensive exports grow relatively fast compared with other exports in countries that have superior economic institutions.

The quality of economic institutions is measured using the average of four of the World Bank's Worldwide Governance Indicators (control of corruption, regulatory quality, government effectiveness and rule of law).<sup>31</sup> These indicators range from -2.5 to 2.5, with higher values corresponding to stronger underlying economic institutions. Financial development is captured by the ratio of private-sector credit to GDP (as reported in the World Bank's Global Financial Development Database)<sup>32</sup> and primarily

TABLE 2.4. Determinants of growth in innovation-intensive industries

Dependent variable	[1]	[2]	[3]	[4]
	Industry's average annual export growth, 1990-2010 (per cent)			
Industry's share in total exports in 1990	-0.176*** (0.020)	-0.175*** (0.020)	-0.175*** (0.021)	-0.175*** (0.021)
Innovation intensity * WGIs	0.008*** (0.0030)			
Innovation intensity * WGIs * advanced		0.013*** (0.004)		
Innovation intensity * WGIs * emerging		0.022*** (0.006)		
Innovation intensity * private credit (log)			0.007** (0.004)	
Innovation intensity * private credit (log) * advanced				0.010** (0.004)
Innovation intensity * private credit (log) * emerging				0.013** (0.006)
Industry fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Number of observations	3,069	3,069	3,001	3,001
Number of countries	144	144	140	140
R <sub>2</sub>	0.501	0.503	0.500	0.500

Source: Authors' calculations using data from UN Comtrade and Feenstra et al. (2005) (exports data), US Bureau of Labor Statistics (deflators, employment), USPTO (US patent grants), and the World Bank's Worldwide Governance Indicators (ratio of private-sector credit to GDP).

Note: The dependent variable is average annual growth in exports for a given industry in a given country between 1990 and 2010. Export values have been deflated using industry-specific deflators calculated for US industries. As the United States is used to estimate the innovation intensity of industries, it is excluded from all regressions. All regressions include country and industry fixed effects. Data on Worldwide Governance Indicators are averages for the period 1996-2010; data on the ratio of private-sector credit to GDP are averages for the period 1990-2010. Robust standard errors are indicated in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels respectively.

reflects the level of development of banking services. In order to see whether these same factors influence the incidence of innovation in advanced economies and emerging/developing economies, the relevant coefficients were allowed to vary between the two groups of countries.<sup>33</sup>

The results are presented in Table 2.4. They suggest that the exports of innovation-intensive industries do grow faster relative to other exports in countries with stronger economic institutions and that this effect is statistically significant. These estimates also indicate that the impact the quality of institutions has on the relative performance of innovation-intensive exports is greater in emerging/developing economies than it is in advanced economies (where the quality of economic institutions tends to be higher).

In order to understand the magnitude of this effect, we can look at one industry which is in the top 25 per cent in terms of innovation intensity (for instance, pharmaceuticals) and another which is in the bottom 25 per cent (such as basic metals). A 1-standard-deviation improvement in the quality of economic institutions (say, from the level of Albania to that of Poland) ◉

<sup>30</sup>This is in line with the approach adopted by Rajan and Zingales (1998).

<sup>31</sup>See Kaufmann et al. (2009) for a discussion.

<sup>32</sup>See Beck et al. (2000) for definitions and sources.

<sup>33</sup>The relevant variable (interaction term between the country-level and sector-level characteristic) was interacted with the dummy variable for emerging/developing economies. The IMF's classification was used to define advanced economies.

will boost the average growth rate of the exports of the more innovation-intensive industry, pharmaceuticals, by an extra 0.35 percentage point a year relative to the growth rate of basic metals. In the case of emerging markets, the extra growth premium for the more innovation-intensive industry stands at 0.95 percentage point a year. This is a sizeable difference, given that the median rate of growth across all industries and countries in the sample is around 8 per cent.

The specifications reported in columns 3 and 4 suggest a similar relationship with financial development, with the exports of innovation-intensive industries also growing faster relative to other exports in countries with higher credit-to-GDP ratios. This reflects the fact that industries that are more innovation-intensive may be more reliant on the availability of credit in order to fund investment in the development of new products (as discussed in more detail in Chapter 4 of this report).

### CASE STUDY 2.1. Sam Mills

Sam Mills is an interesting case – an agribusiness company which has managed to significantly increase the value added by its products through substantial R&D activities.

Sam Mills is a Romanian group specialising in corn processing, corn-based food ingredients and, more recently, snacks and gluten-free products. The group's first company was founded in 1994 and focused on corn milling. Sam Mills has grown over the years and now comprises a total of 10 companies with a wide range of activities, including the production and distribution of many different corn and pasta products.

Substantial investment in R&D activities since the mid-2000s has enabled the group to develop higher-value-added products such as feed, corn-based food ingredients and, more recently, healthy snacks and food products (mainly gluten-free pasta, cereals and products with a low glycaemic index). As a result, the group is one of the few companies in Romania that sells products through established retail chains in the United States, the EU and Asia (including chains such as Walmart, Wegmans and Delhaize), as well as selling products via Amazon and in specialist health food stores.

## Conclusion

All in all, there are large differences in labour productivity across both firms and countries in the transition region. Every transition country has firms with high and low labour productivity. However, in less developed transition countries the percentage of firms with poor productivity is higher.

How can firms boost their productivity? Analysis suggests that all types of innovation – product, process, marketing and organisational innovation – play an important role. Moreover, even if they do not advance the technological frontier, innovations which are new to an individual firm can still result in large productivity dividends. Returns to innovation are particularly high in low-tech manufacturing sectors, where innovation is less common.

Another important source of labour productivity gains is improvements in the quality of management. In less developed transition countries, where the quality of management is generally poor, returns to improvements in management are high, while returns to process innovation are generally low. This suggests that management practices need to be improved before new processes can lead to sizeable productivity gains. In contrast, in the CEB and SEE regions, where management practices tend to be better, returns to the introduction of new processes exceed returns to further improvements in management.

Cross-country analysis of the exports of various industries suggests that industries involving higher levels of innovation are able to grow faster, thereby driving overall economic growth – provided that the business environment is accommodative. These estimates also imply that the quality of the business environment is particularly important for the development of innovation-intensive industries. The results suggest that improvements in the quality of economic institutions are associated with increases in the innovation intensity of exports and output over time as innovation-intensive industries grow faster and their relative contribution to the country's exports rises. Chapter 3 examines the relationship between the quality of the business environment and firm-level innovation in more detail.

## RETURNS TO INNOVATION

ARE PARTICULARLY HIGH  
IN LOW-TECH MANUFACTURING  
SECTORS, WHERE INNOVATION  
IS LESS COMMON.



**BOX 2.1. Estimating the impact that innovation has on labour productivity**

The impact that innovation has on productivity is estimated here using a well-established three-stage model which links productivity to firms' innovation activities and, in turn, treats innovation as an outcome of firms' investment in R&D.<sup>34</sup> This three-stage structure (explaining: (i) the decision to engage in R&D; (ii) the decision to introduce a new product or process; and (iii) the firm's labour productivity) is used because the management's decisions to invest in R&D and develop/introduce innovations are likely to influence each other. In addition, these processes often take place simultaneously (see Chart 2.1.1).<sup>35</sup>

As a result, all stages are estimated simultaneously in order to address the endogeneity bias, using an asymptotic least squares (ALS) estimator and the BEEPS V and MENA ES datasets. The first stage estimates the innovation input equation:

$$(1) \quad R\&D_i = 1[R\&D_i^* > 0] \text{ where } R\&D_i^* = X_{i1}\beta_1 + \varepsilon_{i1}$$

This represents the probability of R&D investment being conducted by firm  $i$ , where  $R\&D_i$  takes the value of 1 whenever the latent value of R&D reported by the firm,  $R\&D_i^*$ , is larger than zero.  $X_{i1}$  is a vector of variables explaining the occurrence of R&D investment, including the firm's size, age, direct exporter status, percentage of employees with a completed university degree, and ownership structure (whether the majority of the firm is owned by a foreign company or the state), and the percentages of working capital and fixed assets that are financed by bank loans or loans from non-bank financial institutions (NBFIs). To account for sector and country-specific differences in firm-level investment in R&D, sector and country fixed effects are included. This set of variables is assumed to influence not only R&D investment, but also productivity and innovation, as shown in Chart 2.1.1.

The second stage of the model determines the probability of a firm implementing innovation, taking into account its investment in R&D. The latent variable  $R\&D_i^*$  which was derived from the first

stage is used to explain the impact that R&D investment has on innovative activities. This solves the aforementioned problem of the endogeneity bias:

$$(2) \quad Innovation_i = 1[Innovation_i^* > 0] \\ \text{where } Innovation_i^* = X_{i2}\beta_2 + \gamma R\&D_i^* + \varepsilon_{i2}$$

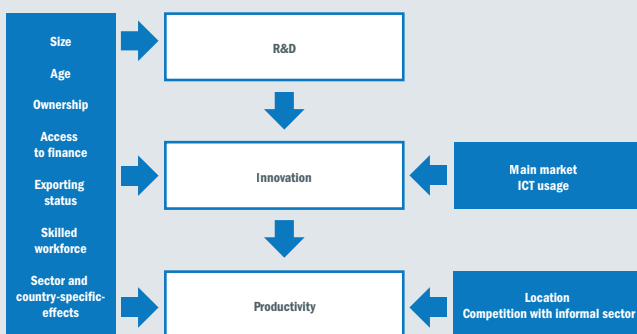
In this equation, the coefficient  $\gamma$  denotes the impact that R&D investment has on the probability of a firm introducing an innovation (as discussed in more detail in Chapter 3).  $Innovation_i$  refers to the occurrence of the various types of innovation introduced in Chapter 1. The probability of observing such an innovation is explained by the vector  $X_{i2}$ , which includes the set of variables that were introduced in the first stage, plus measures reflecting the firm's level of geographical expansion (that is to say, whether the firm's main product is mostly sold in the local market) and the firm's level of ICT use (in other words, whether it uses email to communicate with its clients; see Chart 2.1.1).

The final stage of the model relates the firm's innovative activities – explained by its investment in R&D – to labour productivity (measured as turnover per employee, converted into US dollars, in log terms), again using the latent inferred variable to explain differences across firms with regard to productivity:

$$(3) \quad Productivity_i = X_{i3}\beta_3 + \xi Innovation_i^* + \varepsilon_{i3}$$

In this chapter, the focus is on the coefficient  $\xi$ , which reflects the impact that innovation has on labour productivity. In addition to the set of control variables used in the first and second stages, vector  $X_{i3}$ , which is used to explain variations in productivity, includes information on whether the firm is located in the country's capital or main business centre, and whether the firm competes with unregistered or informal firms (see Chart 2.1.1).

CHART 2.1.1. The concept behind the CDM model



Source: Authors' representation of the model.  
Note: Based on Crépon et al. (1998).

<sup>34</sup>The model in question was developed by Crépon et al. (1998) and is known as a "CDM model".

<sup>35</sup>The model also addresses issues relating to measurement errors in innovation surveys.

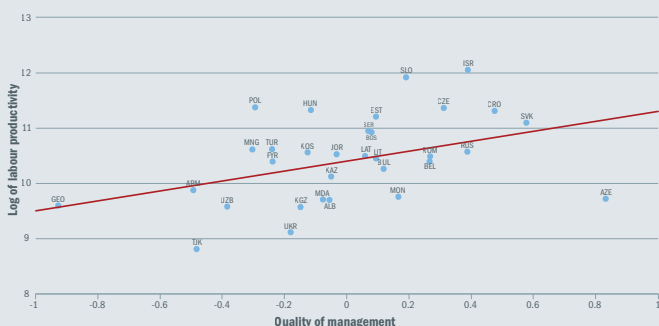
### BOX 2.2. Management practices in the transition region

BEEPS V and MENA ES included a section on management practices in the areas of operations, monitoring, targets and incentives. The operations question focused on how the firm handled a process-related problem, such as machinery breaking down. The monitoring question covered the collection of information on production indicators. The questions on targets focused on the timescale for production targets, as well as their difficulty and the awareness of them. Lastly, the incentives questions covered criteria governing promotion, practices for addressing poor performance by employees and the basis on which the achievement of production targets was rewarded. These questions were answered by all manufacturing firms with at least 20 employees (at least 50 employees in the case of Russia). The median number of completed interviews with sufficiently high response rates was just below 55 per country, with totals ranging from 15 in Montenegro to 626 in Turkey.<sup>36</sup>

The scores for individual management practices (in other words, for individual questions) were converted into z-scores by normalising each practice so that the mean was 0 and the standard deviation was 1. To avoid putting too much emphasis on targets or incentives, unweighted averages were first calculated using the z-scores of individual areas of the four management practices. An unweighted average was then taken across the z-scores for the four practices. Lastly, a z-score of the measure obtained was calculated. This means that the average management score across all firms in all countries in the sample is equal to zero, with the management practices of individual firms deviating either left or right from zero, with the former denoting bad practices and the latter indicating good practices.

There is a significant positive correlation between average labour productivity and the average quality of management practices (see Chart 2.2.1). As with labour productivity, there are firms with good and bad management practices in all countries. However, countries where the average quality of management is lower have a smaller percentage of firms with good management practices than countries where the quality of management tends to be higher.

**CHART 2.2.1. There is a strong positive correlation between the average quality of management practices and average labour productivity**



Source: BEEPS V, MENA ES and authors' calculations.

### BOX 2.3. Global production chains and the competitiveness of individual countries

Competitiveness can be understood as a country's ability to sell its products in the global market, so it has traditionally been measured as a country's gross share of export markets. However, over the past two decades the world has witnessed rapid cross-border integration of production networks. This deep global integration means that analysis of a country's gross export market share may result in misleading conclusions, since it does not account for the domestic share of value added in products. For example, if a particular export good contains many imported intermediate goods, the domestic share of value added will be small and gross export flows will say little about the country's true competitiveness.

To provide an accurate picture of competitiveness trends across the transition region, this box uses a methodology proposed by Benkovskis and Wörz<sup>37</sup> to account for changes in the value-added content of trade. It combines a theoretically consistent breakdown of changes in export market shares with highly disaggregated trade data from UN Comtrade and information from the World Input-Output Database. This allows the traditional approach to measuring a country's competitiveness (that is to say, changes in gross export market shares) to be compared with a value-added approach (in other words, changes in a country's value added content in its gross export market share).

Both approaches allow changes in competitiveness to be broken down into two main components: the extensive margin of trade (in other words, changes that are due to new products or markets) and the intensive margin (that is to say, export growth in existing markets). In turn, the contribution made by the intensive margin can be broken down into four elements: price factors (such as the exchange rate); non-price factors (such as quality and taste); shifts in the structure of global demand (triggered, for instance, by shifts in preferences for individual products); and changes in the set of competitors (for instance, the emergence of new suppliers providing identical or similar products). The value-added approach introduces a new component that captures the role played by a country's integration into global production chains.

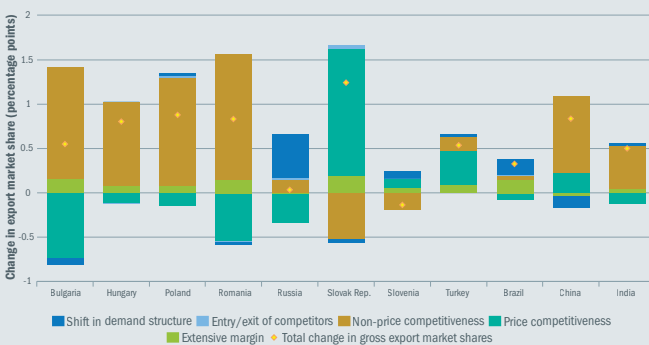
The diamonds in Charts 2.3.1 and 2.3.2 indicate cumulative changes in selected transition countries' global market shares for final goods in the period 1996-2011. The two charts paint a similar picture in terms of the growth of market shares. Bulgaria, Hungary, Poland, Romania, Slovak Republic and Turkey all increased their market shares, while Slovenia saw its global competitiveness decline. Thus, the trend in these countries was similar to that observed in other emerging economies, such as Brazil, China and India, which saw their global market shares rise overall during this period.

The new breakdown described in this box reveals that the underlying determinants of increases in global competitiveness are very different when the focus shifts to value added. For a number of countries (including Bulgaria, Hungary, Poland, Romania and Russia), the contributions made by price and non-price factors are the opposite of what one would see using traditional statistics. As in other emerging markets, traditional trade statistics overestimate improvements in the quality of exported products in the transition region.

<sup>36</sup>The questions on management practices came at the end of a long face-to-face interview. This resulted in an unusually large number of people responding "don't know" or refusing to answer.

<sup>37</sup>See Benkovskis and Wörz (2013 and 2014).

**CHART 2.3.1.** Breakdown of cumulative changes in gross export market shares for final goods, 1996-2011



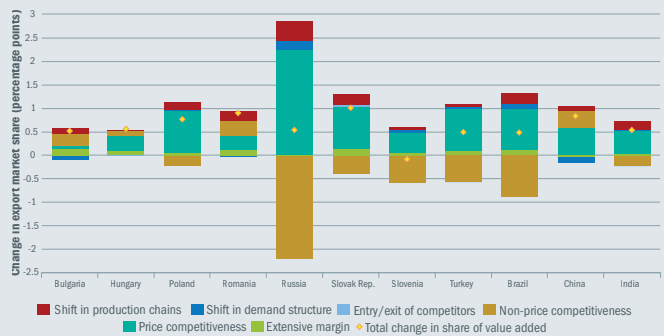
Source: UN Comtrade and authors' calculations.

The traditional approach suggests that improvements in non-price competitiveness have led to increases in market shares, while price developments have curbed competitiveness. A decline in the price competitiveness of Romania, for instance, means that, overall, the price of products that it exports in a given market has increased relative to the price of identical products sold by its competitors. Rising non-price competitiveness, on the other hand, could mean that the quality of products exported by Romania has increased overall relative to the average quality of identical products exported by other providers.

The new breakdown reveals that the price competitiveness of transition economies has in fact increased, while the contribution made by non-price factors has declined considerably (even becoming negative in the case of Poland). For instance, an increase in the price of products sold by Romania (a decline in price competitiveness) may actually be due to an increase in the price of the inputs that it imports in order to manufacture those products, rather than being due to an increase in its own production costs. Similarly, improvements to the quality of the products exported by Romania may have been made upstream in another country (rather than being made in Romania). The new breakdown based on value added distinguishes between these different effects.

Similar results are recorded for Brazil, China and India. Non-price competitiveness showed a negative – or, in the case of China, reduced – contribution to value-added market share gains.

**CHART 2.3.2.** Breakdown of cumulative changes in shares of value added in global export markets for final goods, 1996-2011



Source: UN Comtrade and authors' calculations.

Thus, for all of these countries, their apparent non-price competitiveness based on their shares of gross export markets is largely the result of deeper integration into global value chains. Foreign consumers seem to attach a greater value to products from these countries because they are perceived to involve higher-quality inputs and carry better branding owing to outsourcing. In the case of Russia, this change of approach reveals an extraordinarily strong positive contribution by price competitiveness and a shift in global production chains owing to its energy-dependent export basket.

In conclusion, this box shows that transition countries have been able to increase their share of global markets thanks to their ability to participate in global production chains. Poland, Romania and the Slovak Republic have been the primary beneficiaries of this change in global production. At the same time, the cost competitiveness of firms in the transition region allows them to build on their increased market shares. These firms' ability to maintain price competitiveness despite unit costs converging with the levels seen in western Europe is an encouraging sign. Looking ahead, however, better branding and higher-quality production will remain key for all firms – irrespective of their participation in global value chains – when it comes to increasing their shares of world markets.

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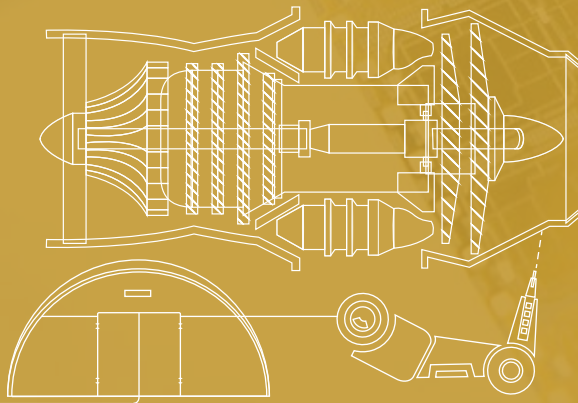
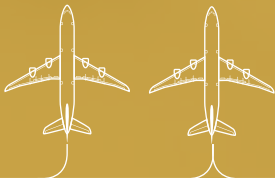
# DRIVERS OF INNOVATION



## AT A GLANCE

# 29%

OF EXPORTERS HAVE INTRODUCED A NEW PRODUCT OR PROCESS, COMPARED WITH 15% OF NON-EXPORTERS



R&D INCREASES THE LIKELIHOOD OF INTRODUCING NEW PRODUCTS OR PROCESSES BY

# 26%

FOR HIGH-TECH MANUFACTURING FIRMS

FIRMS THAT USE ICT ARE

# 9%

MORE LIKELY TO INTRODUCE NEW PRODUCTS OR PROCESSES



**Firms that innovate are more sensitive to the quality of their business environment. They tend, in particular, to complain about corruption, the limited skills of the workforce and burdensome customs and trade regulations. Reducing such business constraints can have a significant positive impact on firms' ability and willingness to innovate. In countries where constraints are less binding, firms tend to innovate more as a result. However, not all firms in such countries are innovative: the age, size, ownership structure and export status of companies also have an impact.**



## Introduction

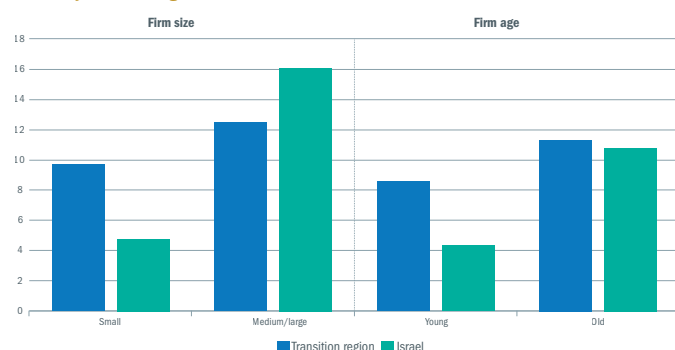
Innovation is an important driver of improvements in productivity. But what drives innovation itself? This chapter looks at the reasons for the significant variation seen in the rates of innovation of individual countries and sectors, as documented in Chapter 1.

Various factors influence firms' incentives and ability to innovate, ranging from the prevalence of corruption to the availability of an adequately skilled workforce and access to finance. Some of these factors are internal, reflecting either characteristics of the firm (its size or age, for instance) or decisions made by the firm (such as the decision to compete in international markets or the decision to hire highly skilled personnel). Other factors are external and shape the general business environment in which firms operate (such as customs and trade regulations).

In some cases, the two are closely related: each firm makes personnel decisions that determine its ability to innovate, but these decisions are, in turn, strongly influenced by the prevailing skills mix and the availability of a sufficiently educated workforce in the region where the firm operates. Similarly, Chapter 4 shows that the local banking structure (an element of the external environment) has an impact on firms' funding structures (an internal aspect), which then affects innovation. Even if firms share the same business environment, they will not necessarily make the same business decisions, and these decisions will influence their innovation activity.

This chapter examines internal and external drivers of innovation, looking at both firm-level and country-level evidence. The firm-level analysis builds on the first two stages of the model discussed in the previous chapter, which explained firms' decisions to engage in research and development (R&D) and introduce new products or processes. This analysis uses a rich set of data looking at firms' perceptions of the business environment. The data were collected as part of the EBRD and World Bank's fifth Business Environment and Enterprise Performance Survey (BEEPS V) and the Middle East and North Africa Enterprise Surveys (MENA ES) conducted by the EBRD, the World Bank and the European Investment Bank. The country-level analysis uses a large sample of countries, including those from the transition region, to explain both innovation at the technological frontier (measured as the number of patents per employee) and the innovation intensity of exports (a broad measure of innovation and the adoption of technology that was introduced in Chapter 1).

The chapter starts by considering drivers of innovation within an individual firm, looking first at firm-level characteristics (such as a firm's size and ownership structure), before turning to decisions made by firms (such as the decision to export or the decision to conduct R&D). The analysis then moves on to external factors, first comparing innovative firms' perception of the business environment with the views of non-innovative firms. These views guide the discussion of the key external factors that affect innovation outcomes at country level. ◉

**CHART 3.1. Percentage of firms that have introduced a new product, broken down by size and age**


Source: BEEPS V, MENA ES and authors' calculations.

Note: Data for the transition region represent unweighted cross-country averages. Small firms have fewer than 20 employees; young firms are less than five years old.

**TABLE 3.1. Determinants of R&D and innovation**

	R&D (1)	Technological innovation (cleaned) (2)	Non-technological innovation (3)
R&D		0.2160*** (0.0678)	0.1973*** (0.0328)
Firm age (years)	0.0003 (0.0002)	0.0010** (0.0004)	0.0004*** (0.0001)
5-19 employees (dummy)	-0.0927*** (0.0088)	-0.0549*** (0.0126)	-0.0973*** (0.0127)
20-99 employees (dummy)	-0.0480*** (0.0070)	-0.0315** (0.0119)	-0.0605*** (0.0121)
Majority foreign-owned (dummy)	0.0142 (0.0113)	0.0235* (0.0130)	0.0428** (0.0140)
Majority state-owned (dummy)	0.0041 (0.0307)	-0.0320** (0.0115)	-0.0075 (0.0130)
Direct exporter (dummy)	0.0635*** (0.0090)	0.0317** (0.0132)	0.0339** (0.0138)
Percentage of working capital financed by banks or non-bank financial institutions	0.0004*** (0.0001)	0.0002** (0.0001)	0.0006*** (0.0002)
Percentage of fixed asset purchases financed by banks or non-bank financial institutions	0.0004*** (0.0001)	0.0010** (0.0004)	0.0007*** (0.0002)
Percentage of employees with a university degree	0.0007*** (0.0001)	0.0001** (0.0000)	0.0004*** (0.0001)
Main market: local (indicator)		-0.0461*** (0.0081)	-0.0423*** (0.0085)
Use email for communication with clients (indicator)		0.0908*** (0.0103)	0.1430*** (0.0104)

Source: BEEPS V, MENA ES and authors' calculations.

Note: This table reports average marginal effects. Standard errors are indicated in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels respectively. The regressions are estimated using an asymptotic least squares estimator based on the model described in Box 2.1.

## Firm-level drivers of innovation

### Size and age of firms

A firm's willingness and ability to innovate will depend on various characteristics. In particular, young, small firms are often perceived to be the main drivers of innovation. While such firms do make an important contribution to the development of new products, they are not necessarily more innovative than other firms when viewed as a whole.

This is partly because when young, innovative firms are successful, they often grow fast, thereby becoming larger firms. Google and Amazon were once start-ups with just a handful of employees, but they have quickly grown and now employ thousands of people. Innovative start-ups that are not successful, on the other hand, typically run out of funding and exit the market.<sup>1</sup> Neither of these types of firm will be categorised as young, small firms in an enterprise survey such as BEEPS V or MENA ES. In addition, not all young, small firms are innovative start-ups. Many will be in conventional service sectors (takeaway restaurants or small convenience stores, for instance).

For these reasons, innovation may be more common among larger firms that have been operating for a longer period of time. Chart 3.1, which uses BEEPS V and MENA ES data, shows that larger and older firms are indeed more likely to introduce new products. The same is true of new processes and marketing and organisational innovations. A similarly positive correlation between the size/age of a firm and its propensity to introduce new products or processes can also be observed in Israel and advanced economies more broadly.<sup>2</sup>

The positive correlation between firm size/age and innovation also holds in firm-level regressions. Table 3.1 presents estimates showing the impact of various firm-level characteristics that influence firms' decisions to engage in R&D and introduce new products and processes. These results are based on the model discussed in Chapter 2 (see Box 2.1). Unlike the simple averages presented above, this model takes into account the industries and countries where firms operate, as well as various other firm-level characteristics (such as the type of firm ownership).

BEEPS V and MENA ES data suggest that economies of scale may also partly explain the positive correlation between firm age/size and innovation. The development of new products often involves high fixed costs and investment spikes. This may simply be easier for larger firms to bear – particularly if large firms enjoy better access to external finance, as discussed in Chapter 4. These large firms may also be more able to absorb new technologies.<sup>3</sup> This may be one reason why small firms (defined as companies with fewer than 20 employees) are less likely to engage in R&D than larger firms (albeit they tend to spend a higher percentage of their annual turnover on in-house R&D; see Chart 3.2). Larger firms may also conduct more innovation projects, making them more likely to successfully introduce at least one new product in the course of a three-year period.

Perhaps unsurprisingly, differences between smaller and larger firms (and older and younger firms) in terms of innovation rates are more pronounced in high-tech manufacturing sectors

<sup>1</sup> See Nightingale and Coad (2013) for a discussion of fast-growing "gazelle firms".

<sup>2</sup> See OECD (2009).

<sup>3</sup> See, for example, Cohen and Levinthal (1989).



such as machinery or pharmaceuticals, as complex technologies are more difficult and costly to absorb and develop.

Similar estimates of the impact of a firm's size and age emerge from the regression analysis, which controls for other firm-level characteristics. Indeed, this analysis suggests that small firms are 5 percentage points less likely to introduce new or improved products or processes than large firms (see Table 3.1, column 2).<sup>4</sup> This is a substantial impact, given that 27 per cent of large firms have introduced new or improved products or processes in the last three years.

What may be surprising is the fact that young and small firms are also less likely to introduce marketing and organisational innovations. This probably reflects the fact that larger firms tend to have employees specialising in marketing (or even whole marketing departments), whose main task is to review existing marketing techniques and develop new approaches to marketing.

### Scarcity of innovative start-ups

Young, small firms may tend to innovate less, but start-ups still represent a very important class of innovators. They are the firms that are most likely to come up with innovations that are new to the global market. In some cases, the innovation is the sole reason for the firm's creation.

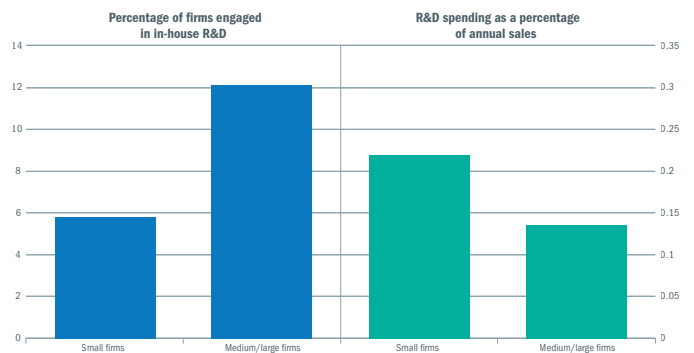
In Israel, two-thirds of small firms introduced product innovations that were new to the international market, compared with 48 per cent for larger firms (see Chart 3.3). Moreover, all young firms (defined as companies that were established less than five years ago) introduced at least one new product that was new to the international market, hence the fact that Israel's start-ups have a reputation as one of the key drivers of economic growth in that country.

In transition countries, by contrast, such start-ups remain rare. In fact, young and small firms in the transition region perform worse than their large and established counterparts when looking at the percentage of them that introduced product innovations new to the global market (see Chart 3.3). Younger firms are somewhat more likely than older firms to introduce world-class process innovations, but instances of such process innovation are very rare overall.

The scarcity of start-ups generating world-class innovation reflects the fact that transition economies are further removed from the technological frontier than advanced economies such as Israel. This may be due to a series of factors constraining the development of innovative start-ups. Among these factors are a lack of specialist financing (such as angel investors, seed financing and venture capital), skill shortages, high barriers to the entry of new firms and weak protection of intellectual property rights (all of which are discussed in more detail in Chapters 4 and 5), as well as the age of firms' senior management.<sup>5</sup>

Faced with these constraints, the most successful innovative entrepreneurs and small firms in the transition region often move to Silicon Valley, Boston, New York and other innovation hubs at the earliest opportunity; some keep their development centres somewhere in eastern Europe (see Box 3.1 for a further discussion and examples). ◉

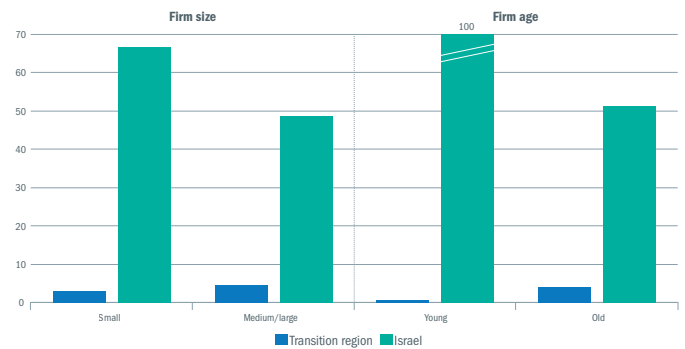
**CHART 3.2. Percentage of firms engaged in R&D and their level of R&D spending, broken down by firm size**



Source: BEEPS V, MENA ES and authors' calculations.

Note: Unweighted averages across transition countries. Small firms have fewer than 20 employees.

**CHART 3.3. Percentage of firms with product innovations that are new to the global market**



Source: BEEPS V, MENA ES and authors' calculations.

Note: Data for the transition region represent unweighted cross-country averages. This chart is based on cleaned innovation data. In Israel, all young firms introduced at least one new product that was new to the international market. Small firms have fewer than 20 employees; young firms are less than five years old.

**27%**  
OF LARGE FIRMS IN THE  
TRANSITION REGION HAVE  
INTRODUCED NEW OR  
IMPROVED PRODUCTS OR  
PROCESSES IN THE LAST  
THREE YEARS

<sup>4</sup> Griffith et al. (2006) find that large firms are more likely to engage in R&D in four advanced European countries.

<sup>5</sup> Acemoglu et al. (2014) show that younger managers are more open to new ideas, so they are more likely to instigate disruptive, risky innovations.

As transition economies develop and move closer to the technological frontier, young firms producing world-class innovation will become more prominent. The economic environment will need to adapt to this change and become more supportive of innovative start-ups (as discussed in more detail in Chapter 5, which looks at policies that can help start-ups to succeed).

### Type of ownership

Another important characteristic affecting innovation is the type of firm ownership. In general, foreign ownership and the integration of local firms into global supply chains are expected to lead to increased innovation (see Box 3.2). On the other hand, concerns are sometimes raised that multinational companies may conduct all of their R&D activities in their home countries, outsourcing only lower-value-added activities to emerging markets, so foreign takeovers may actually result in reduced spending on R&D.<sup>6</sup>

Evidence from BEEPS V and MENA ES suggests that the first of these effects tends to dominate in the transition region and that foreign ownership is associated with an increased likelihood of innovation and higher levels of spending on in-house R&D. Foreign-owned firms are defined here as firms where foreign

investors hold a stake of 25 per cent or more – that is to say, at least a blocking minority. The percentage of such firms that have introduced new products is significantly higher than the percentage of locally owned firms that have done so. The same is true of process innovations, as well as marketing and organisational innovations (see Chart 3.4).

Indeed, in the case of marketing and organisational innovation, the impact of foreign ownership is pronounced even when foreign investors own a small stake that falls short of a blocking minority (in other words, between 0 and 25 per cent), while foreign ownership does not have a clear impact on product and process innovations until that stake reaches the 25 per cent mark. This suggests that foreign owners may be an important source of information about new organisational arrangements and marketing methods. At the same time, sharing technological know-how requires stronger incentives and assurances, which come with a stake of a certain size in a company.

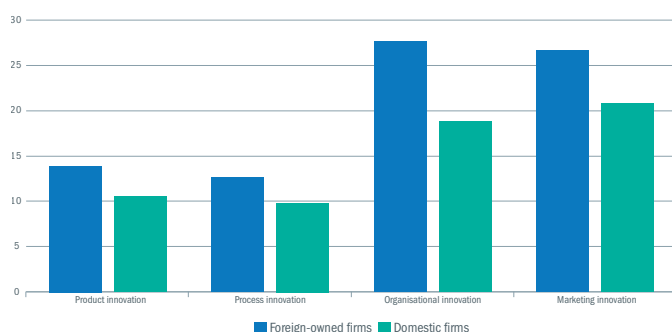
The results also suggest that increased innovation by foreign-owned firms is a result of a mixture of “make” and “buy” strategies when it comes to acquiring external knowledge. The percentage of foreign-owned firms that invest in R&D (thereby pursuing a “make” strategy) tends to be higher than the percentage of domestic firms that follow this strategy (see Chart 3.5). This is the case in virtually every country in the transition region. Foreign-owned firms also tend to spend more on R&D (see Case study 3.1 for details of a joint venture in the Turkish automotive sector with an active domestic R&D programme). Overall, these findings run counter to the view that foreign takeovers undermine domestic R&D.

Not only do foreign firms “make” more knowledge, they are also more likely to engage in the acquisition of external knowledge (through the purchasing or licensing of patents and non-patented inventions and know-how) than locally owned firms (see Chart 3.5).

The formal regression results in Table 3.1 confirm that the relationship between foreign ownership and innovation holds when other firm-level characteristics are also taken into account. Everything else being equal, a majority foreign-owned firm is, on average, 2.3 percentage points more likely to introduce new products or processes (see column 2) and 4.3 percentage points more likely to introduce organisational or marketing innovations (see column 3).<sup>7</sup> This is a sizeable difference, given that the average probability of a majority domestic-owned firm introducing new or improved products or processes is 17.5 per cent, while the probability of it introducing organisational or marketing innovations is almost 27 per cent.

In contrast, majority state-owned firms are significantly less likely to introduce new products or processes than locally owned private firms or foreign firms, and this effect is even larger in the case of new processes. This may reflect the fact that managers of state-owned firms have weaker incentives to achieve efficiency savings and improve productivity. Their remuneration, for example, is not necessarily linked to their firm’s performance, and these firms can typically rely on the state to bail them out in the event of poor performance.

**CHART 3.4. Percentages of foreign-owned and domestic firms that are engaged in innovation**



Source: BEEPS V, MENA ES and authors’ calculations.

Note: Unweighted averages across transition countries. Cleaned data for product and process innovations; unadjusted data for organisational and marketing innovations. “Foreign-owned firms” are those where the foreign stake totals 25 per cent or more. “Domestic firms” include locally owned firms and firms with foreign ownership totalling less than 25 per cent.

<sup>6</sup> See, for example, Sample (2014).

<sup>7</sup> Crespi and Zuñiga (2012) find mixed results for South America, with foreign ownership having a significant positive impact on R&D in Argentina, Panama and Uruguay, but not in Chile, Colombia or Costa Rica.

### Competition in international markets

In addition to firm-level characteristics such as a firm's age, size and ownership structure, various decisions made by firms are related to their incentives and ability to innovate. One such decision is whether to compete in international markets.

Firms that export their goods are able to spread the fixed costs of innovation over a larger customer base, so exports can support innovation. By the same token, firms in larger economies with larger domestic markets may find it easier to innovate on account of higher levels of domestic demand for new products.

Exporting can also expose domestic producers to stronger competition from foreign products, thereby providing an incentive to innovate (see Box 3.3 for a discussion of the complex relationship between competition and innovation).<sup>8</sup> Furthermore, firms' participation in global value chains, which involves the exporting of either intermediate or final goods, facilitates the adoption of foreign technologies, particularly in emerging markets<sup>9</sup> (see Box 3.2).

BEEPS V and MENA ES data confirm the importance of export markets for innovation. Firms that export their products directly appear to be more likely to engage in R&D and introduce new products, processes, marketing methods and organisational innovations than firms that only serve their domestic markets (see Chart 3.6).

Similar differences can be observed in firm-level regressions. The estimates in Table 3.1 suggest that once various other firm-level characteristics are taken into account, exporters are around 3 percentage points more likely to innovate than non-exporters. This is a sizeable impact, as the probability of a non-exporter introducing a new or improved product or process is 15 per cent.

The differences between exporters and non-exporters are particularly large when it comes to in-house R&D and process innovation.<sup>10</sup> Regression results indicate that exporters are 6 percentage points more likely to engage in R&D. This may be explained by the fact that exporting and entering new markets can help firms to improve their knowledge of production processes, while R&D can help firms improve their ability to absorb new technologies.<sup>11</sup>

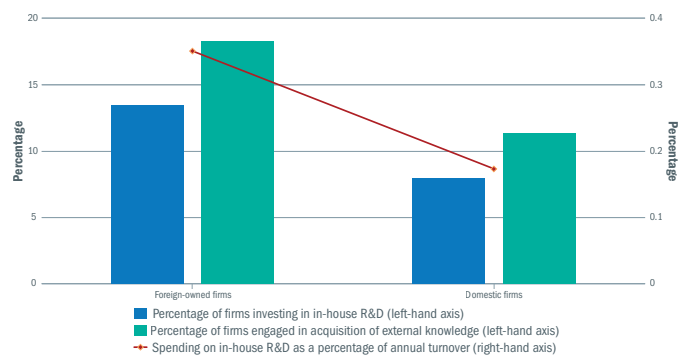
Of the firms that do not export, those that primarily sell in the national market are more likely to introduce new products, processes and marketing methods than firms that operate primarily in the local market. Similar forces may be at play here: a national market provides a broader customer base, making it easier to justify the fixed costs of developing new products and processes, while the higher levels of competition in the national market provide stronger incentives to seek productivity gains.

### R&D inputs and innovation outputs

Another important decision that a firm faces is whether to spend on R&D to support the development of new products. As discussed in Chapter 1, R&D is not a prerequisite for the introduction of new products or processes, as firms may decide to acquire existing knowledge from elsewhere.

At the same time, R&D significantly increases the likelihood of successful innovation. Firms that invest in R&D are an average

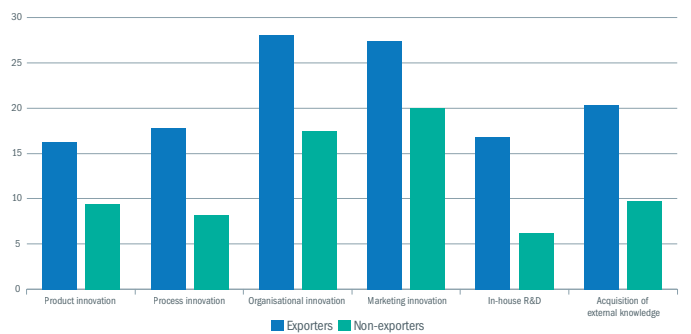
CHART 3.5. Foreign-owned firms spend more on obtaining knowledge



Source: BEEPS V, MENA ES and authors' calculations.

Note: Unweighted averages across transition countries. The acquisition of external knowledge includes the outsourcing of R&D and the purchasing or licensing of patents and non-patented inventions or know-how. "Foreign-owned firms" are those where the foreign stake totals 25 per cent or more. "Domestic firms" include locally owned firms and firms with foreign ownership totalling less than 25 per cent.

CHART 3.6. Percentages of exporters and non-exporters engaging in innovation and R&D



Source: BEEPS V, MENA ES and authors' calculations.

Note: Unweighted averages across transition countries. Cleaned data for product and process innovations; unadjusted data for organisational and marketing innovations. "Exporters" are firms that export directly; "non-exporters" are firms that do not export directly.

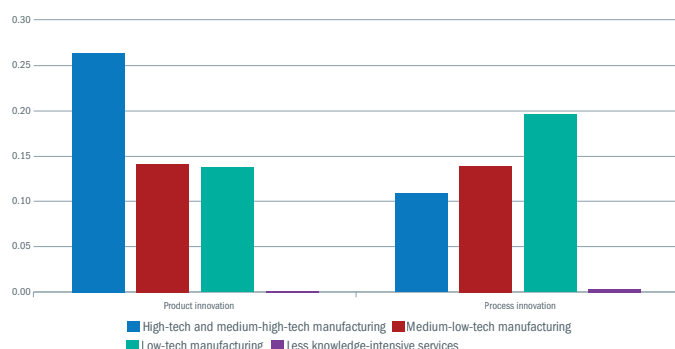
**FOREIGN-OWNED FIRMS  
ARE MORE LIKELY  
TO INNOVATE THAN  
DOMESTIC ONES**

<sup>8</sup> See also Aghion et al. (2005) and Bloom et al. (2011).

<sup>9</sup> See, for instance, Coe et al. (2009) and Baldwin and Gu (2004).

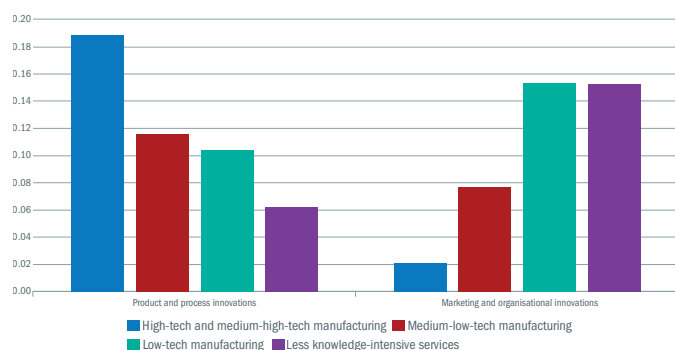
<sup>10</sup> These estimates are consistent with the results of studies looking at other regions. For instance, Crespi and Zuñiga (2012) estimate that exporters in Colombia and Argentina are, respectively, 7 and 15 percentage points more likely to invest in the development of new products (including R&D). Meanwhile, Baldwin and Gu (2004) find that exporters in Canada are 10 percentage points more likely to invest in R&D.

<sup>11</sup> Damijan et al. (2010) find evidence that, in Slovenia, exporting increases the probability of becoming a process innovator for medium-sized and large firms.

**CHART 3.7. The impact of R&D on product and process innovation, broken down by sector**


Source: BEEPS V, MENA ES and authors' calculations.

Note: This chart reports the average marginal effect of R&D on product and process innovation. Sectors are based on ISIC Rev. 3.1. High-tech and medium-high-tech manufacturing sectors include chemicals (24), machinery and equipment (29), electrical and optical equipment (30-33) and transport equipment (34-35, excluding 35.1). Low-tech manufacturing sectors include food products, beverages and tobacco (15-16), textiles (17-18), leather (19), wood (20), paper, publishing and printing (21-22) and other manufacturing (36-37). Knowledge-intensive services include water and air transport (61-62), telecommunications (64) and real estate, renting and business activities (70-74).

**CHART 3.8. The impact of ICT on innovation, broken down by sector**


Source: BEEPS V, MENA ES and authors' calculations.

Note: This chart reports the average marginal effect of the use of ICT on product and process innovation. The use of ICT is estimated using the question about the use of email to communicate with clients or suppliers. See the note accompanying Chart 3.7 for the list of industries in each sector.

of 22 percentage points more likely to introduce new products or processes.<sup>12</sup> They are also an average of 20 percentage points more likely to introduce marketing or organisational innovations (perhaps because these types of innovation often go hand in hand with technological innovation).

Investing in R&D has the largest impact on the probability of introducing a new product in high-tech manufacturing sectors such as electrical equipment or pharmaceuticals (see Chart 3.7). In these sectors R&D increases the probability of product innovation on average by 26 percentage points, while in less knowledge-intensive service sectors (such as catering or sales) R&D has virtually no impact on the probability of introducing a new product.

While R&D is closely linked to product innovation in high-tech manufacturing sectors, R&D in low-tech manufacturing has a large impact on process innovation, which involves the optimisation of the production of existing products (for instance, a clothing manufacturer that replaces the manual cutting of fabric with an automatic fabric-cutting machine). Conducting R&D in these sectors increases the probability of introducing a new process by an average of 20 percentage points (compared with an average of 11 percentage points in high-tech manufacturing sectors).

### Human capital

A suitably skilled workforce (including strong management skills) is one of the key prerequisites for successful innovation – both innovation at the technological frontier and the adoption of existing technology – as workers are required to develop and learn new production techniques.<sup>13</sup>

The results in Table 3.1 suggest that while the percentage of employees with a university degree affects the probability of introducing a new product or process and the likelihood of investing in R&D, this impact is fairly small relative to the effect of other firm-level characteristics discussed above. The regression analysis already accounts for the differences between the skill intensities of the various industries, so this finding suggests that differences in human capital across firms within a particular industry do not explain much of the remaining differences in innovation activity.

While a firm's human capital reflects its recruitment decisions, it is also, to a large extent, shaped by the availability of skills in the market. There is further cross-country analysis of this issue later in the chapter.

### Information and communication technology

Firms that use email to communicate with their clients or suppliers are, on average, 9 percentage points more likely to introduce new products or processes and 14 percentage points more likely to introduce organisational or marketing innovations (see Table 3.1, column 3). This attests to the importance of both modern organisational practices and supporting information and communication technology (ICT) infrastructure in facilitating innovation.

ICT's largest impact is on the probability of introducing product

<sup>12</sup> These estimates are comparable to those obtained by Crespi and Zúñiga (2012) for South American countries.

<sup>13</sup> See, for instance, Nelson and Phelps (1966).

and process innovations in high-tech and medium-high-tech manufacturing sectors (see Chart 3.8). At the same time, in low-tech manufacturing sectors (such as textiles or food and beverages) and less knowledge-intensive services (such as catering or sales), use of ICT has a large impact on the probability of implementing marketing and organisational innovations.

When it comes to innovation, firms may also benefit from the expert advice of external consultants (see Box 3.4). Lastly, the availability of finance also plays an important role, as firms may abandon the development of new products if the requisite funding cannot be obtained. Chapter 4 discusses these issues in more detail.

### The business environment as a driver of innovation

Firms' ability to innovate also depends on external factors. As Chapter 2 notes, a poor business environment – widespread corruption, weak rule of law, burdensome red tape, and so on – can substantially increase the cost of introducing new products and make returns to investment in new products and technologies more uncertain. These factors can undermine firms' incentives and ability to innovate.

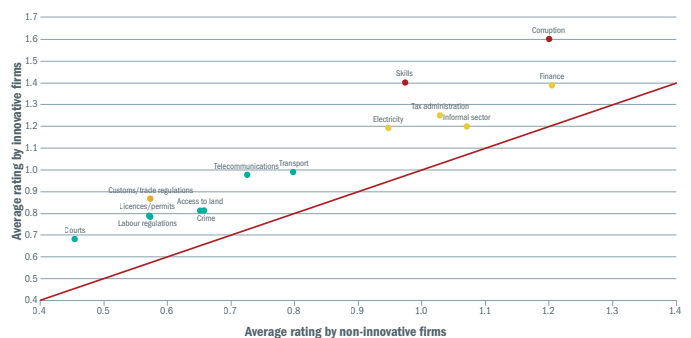
The results of BEEPS V and MENA ES confirm this. As part of these surveys, each firm was asked whether various factors, such as access to land or labour regulations, were obstacles to doing business. Firms responded using a scale of 0 to 4, where 0 meant "no obstacle" and 4 signified a "very severe obstacle".

On the basis of these answers, firms that have introduced a new product in the last three years regard all aspects of their business environment as a greater constraint on their operations than firms that have not engaged in product innovation.

This can be seen from the fact that all business environment constraints lie above the 45-degree line in Chart 3.9. The differences between the views of innovative and non-innovative firms are especially large when it comes to skills, corruption and customs and trade regulations (with these dots lying furthest away from the 45-degree line). Inadequate skills and corruption, in particular, are perceived to be among the main constraints for all firms, and they are even greater constraints for innovative firms. (These are located towards the top right of the chart and are marked in red.) In contrast, customs and trade regulations (in the bottom left of the chart, marked in orange) are not major concerns at the level of the economy as a whole, partly because only a relatively small number of firms import production inputs or export their products directly. However, customs and trade regulations specifically affect innovative firms, as the introduction of new products and technologies is often dependent on imported inputs and the ability to tap export markets.<sup>14</sup>

Innovative firms are also significantly affected by a number of other aspects of the business environment (located to the right of the chart, but close to the 45-degree line, and marked in yellow). However, these tend to constrain innovative and non-innovative firms alike, with only a slightly larger impact on

CHART 3.9. Differences between innovative and non-innovative firms' perception of the business environment



Source: BEEPS V, MENA ES and authors' calculations.

Note: Values on the vertical axis correspond to the views of firms that have introduced a new product in the last three years; values on the horizontal axis correspond to the views of other firms. Values are averages across firms on a scale of 0 to 4, where 0 means "no obstacle" and 4 signifies a "very severe obstacle". Obstacles marked in red and orange particularly affect firms that innovate; obstacles marked in red and yellow are the most binding constraints for all firms.

innovative firms. These include access to finance, the practices of competitors in the informal sector, tax administration and, to a lesser degree, electricity.

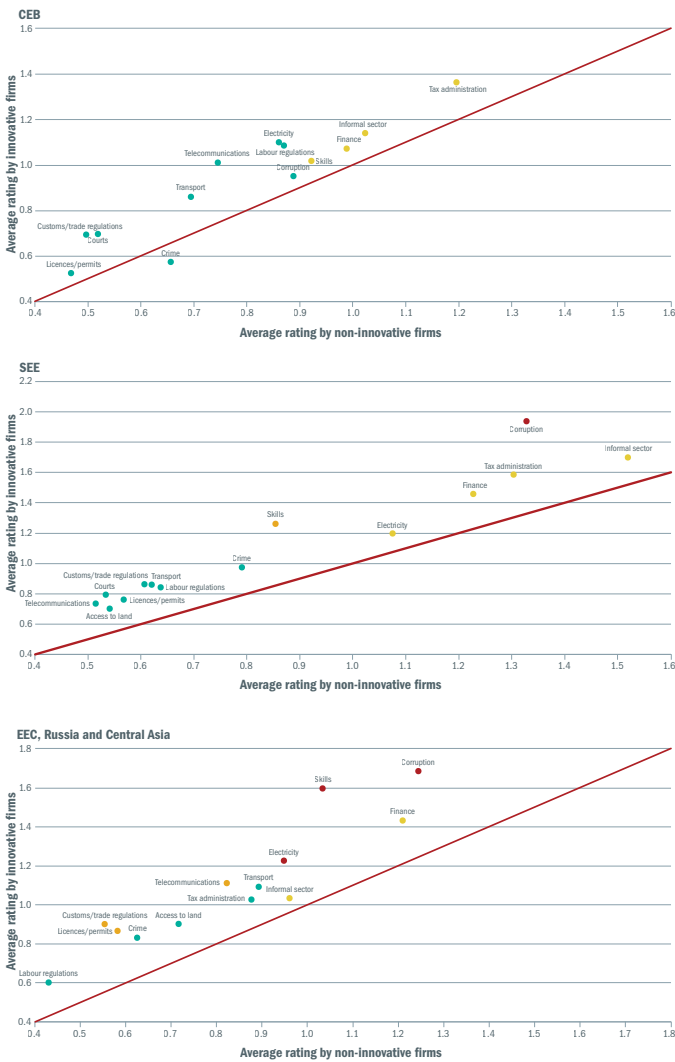
The extent to which the various features of the business environment affect all firms and innovative firms differs from region to region (see Chart 3.10). In central Europe and the Baltic states (CEB), for instance, the differences between the responses of innovative and non-innovative firms are relatively small (in other words, all dots lie close to the 45-degree line). This suggests that the business environment in the CEB region is less hostile towards innovation. However, a number of aspects of the business environment remain significant obstacles to the growth of innovative and non-innovative firms alike, including access to finance, tax administration and inadequate skills.

In south-eastern Europe (SEE) corruption stands out as an issue, constraining the growth of all firms, but particularly affecting those that innovate. Inadequate skills also particularly affect innovative firms, while both innovative and non-innovative firms frequently complain about the actions of competitors in the informal sector, access to finance and electricity.

The differences between the views of innovative and non-innovative firms are larger in eastern Europe and the Caucasus (EEC), Central Asia and Russia. While corruption and inadequate skills strongly affect all firms, this negative impact is felt most strongly by firms that innovate. In addition, innovative firms feel constrained by a number of aspects of the business environment that other firms regard as being less binding. These include customs and trade regulations, telecommunications and business licensing and permits, all of which are likely to be important inputs in the innovation process. ▶

<sup>14</sup> See Lileeva and Trefler (2010).

**CHART 3.10. Differences between innovative and non-innovative firms' perception of the business environment, broken down by region**



Source: BEEPS V and authors' calculations.  
Note: See the note accompanying Chart 3.9.

**TABLE 3.2. Main obstacles to firms' operations**

	Top constraints, affecting...		
	all firms, including innovators	all firms, but particularly innovators	specifically innovators
CEB	Tax administration Informal sector Access to finance Skills		
SEE	Informal sector Access to finance Electricity	Corruption Tax administration	Skills
EEC, Russia and Central Asia	Access to finance Informal sector	Corruption Skills Electricity	Telecommunications Customs and trade regulations Licences and permits

Source: BEEPS V and authors' calculations.  
Note: Excludes tax rates and political instability.

The BEEPS V and MENA ES results suggest that improvements in the provision of infrastructure, further deregulation in the area of licences and permits and improvements in the quality of government services can specifically help innovative firms. Table 3.2 summarises innovative firms' perception of the business environment in the various regions.

### Cross-country analysis


#### Economic institutions

The previous section shows that innovative firms tend to have a much more negative view of certain aspects of their business environment when compared with non-innovative firms. This raises the question of whether such perceived constraints negatively affect innovation outcomes. Do they inhibit innovation in practice? To answer this question, the impact of various aspects of the business environment is examined in more detail using cross-country regressions.

The business environment is, to a large extent, shaped by a country's deeper economic institutions, such as the rule of law, control of corruption, the effectiveness of the government and regulatory quality. This can be captured by the average of the relevant Worldwide Governance Indicators, as discussed in Chapter 2. Together with other country-level characteristics, such as income per capita, R&D inputs, financial development and the quality of human capital, the quality of institutions is used in this section to explain the number of patents granted per worker and the innovation intensity of exports in various countries. The results of these cross-country regressions are presented in Table 3.3.

These results indicate that better institutions are associated with increases in patenting and more innovation-intensive exports. The effect of improving institutions is stronger and has greater statistical significance in countries where institutions are relatively weak. This can be seen where the average of the

Worldwide Governance Indicators is interacted with (i) a dummy variable that takes the value of one when that average is above the mean for the sample (indicating strong economic institutions); or (ii) a dummy variable that takes the value of one when that average is below the mean for the sample (indicating weak economic institutions; see columns 3 to 8).

An improvement of around half a standard deviation in the quality of economic institutions in a country with below-average economic institutions (say, from the level of Ukraine to that of Albania) is associated with a 60 per cent increase in the innovation intensity of exports. An improvement of this magnitude is also associated with a 40 to 50 per cent increase in patent output. These effects are sizeable, considering that they only capture the direct impact of the quality of institutions, beyond the indirect effect that it may have through a higher level of income and of human capital in the country. 

**BETTER INSTITUTIONS  
ARE ASSOCIATED WITH  
INCREASES IN PATENTING  
AND MORE INNOVATION-  
INTENSIVE EXPORTS**

**TABLE 3.3. Determinants of patent output and the innovation intensity of exports**

Variables	(1) IIE	(2) Patent intensity	(3) IIE	(4) Patent intensity	(5) IIE	(6) Patent intensity	(7) IIE	(8) Patent intensity
Log of GDP per capita	-0.117 (0.169)	1.260*** (0.385)	-0.006 (0.166)	1.062*** (0.335)	-0.078 (0.168)	1.115** (0.430)	-0.229 (0.202)	0.876** (0.442)
Log of population	0.236*** (0.069)	-0.012 (0.108)	0.181** (0.069)	-0.152 (0.109)	0.135** (0.064)	-0.149 (0.111)	0.177*** (0.067)	-0.096 (0.126)
Institutions (WGIs)	0.733*** (0.230)	0.891* (0.459)	0.333 (0.225)	0.763* (0.450)				
WGIs * high WGI dummy					-0.165 (0.246)	0.795* (0.465)	-0.16 (0.262)	0.871* (0.487)
WGIs * low WGI dummy					1.083** (0.508)	0.535 (0.980)	1.309*** (0.491)	0.951 (0.952)
Average years of tertiary education	-0.132 (0.372)	1.311** (0.528)	-0.289 (0.420)	0.662 (0.467)	-0.002 (0.426)	0.614 (0.546)	0.144 (0.418)	0.757 (0.524)
Ratio of external trade to GDP	0.002 (0.002)	-0.001 (0.002)	0.003* (0.002)	-0.001 (0.002)	0.004** (0.002)	-0.001 (0.002)	0.005** (0.002)	0.000 (0.003)
Financial openness	-0.001 (0.071)	-0.086 (0.133)	0.054 (0.071)	-0.164 (0.115)	0.010 (0.070)	-0.156 (0.117)	0.033 (0.071)	-0.146 (0.132)
Private credit	0.002 (0.002)	0.008** (0.003)	0.003 (0.002)	0.011*** (0.003)	0.003 (0.002)	0.011*** (0.003)	0.004* (0.002)	0.011*** (0.003)
Natural resource rents	-0.029** (0.012)	-0.005 (0.020)	-0.032** (0.014)	0.009 (0.016)	-0.028* (0.014)	0.008 (0.016)	-0.014 (0.013)	0.021 (0.020)
Ratio of business R&D spending to GDP			0.338 (0.209)	0.834** (0.315)	0.360** (0.168)	0.826*** (0.309)	0.382** (0.167)	0.839*** (0.261)
Ratio of government R&D spending to GDP			-0.63 (0.989)	4.845*** (1.763)	-0.35 (0.944)	4.765** (1.915)	-0.221 (0.907)	5.053*** (1.657)
Ratio of university R&D spending to GDP			-0.191 (0.637)	-1.901 (1.272)	0.416 (0.681)	-1.949 (1.304)	0.550 (0.704)	-1.767 (1.280)
EBRD dummy	0.606*** (0.202)	1.325*** (0.372)	0.522** (0.244)	0.798* (0.420)	0.172 (0.291)	0.828* (0.481)	0.188 (0.292)	0.882** (0.423)
No. of observations	113	68	100	68	100	68	97	65
R <sup>2</sup>	0.53	0.80	0.54	0.86	0.57	0.86	0.55	0.86

**Source:** Authors' calculations using data from WIPO, World Bank, UNESCO, Penn World Table 8.0, Chinn and Ito (2006) and Barro and Lee (2013).

**Note:** The dependent variables are the log of total patents granted per 1,000 workers ("patent intensity") and the log of the innovation intensity of exports (IIE), both of which are averages over the period 2010-13. "WGIs" denotes the average of four Worldwide Governance Indicators (rule of law, control of corruption, effectiveness of government and regulatory quality). See [tr.ebrd.com](http://tr.ebrd.com) for details about other explanatory variables. Robust standard errors are indicated in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels respectively. Columns 1 to 6 are estimates using ordinary least squares; columns 7 and 8 are estimates using two-stage least squares, with lagged values for income per capita, openness to trade, and dependence on natural resources used as instruments for contemporaneous values.

### Economic openness

The analysis above shows that innovative firms feel far more constrained by customs and trade regulations than non-innovative firms. At the same time, firms that sell their products in export markets are more likely to innovate. The results of cross-country analysis confirm that both the size of the market (measured by population and GDP per capita) and economic openness (measured by the ratio of exports and imports to GDP) are important for the innovation intensity of exports. An increase in openness to trade totalling 30 percentage points of GDP (say, from the level of Ukraine to that of Latvia) is associated with a 9 to 15 per cent increase in the innovation intensity of exports. At the same time, no strong links are found between patent output and economic openness or the size of the economy.

In addition, there is also a positive (albeit weaker) relationship between the innovation intensity of exports and the financial openness of the economy (as measured by the Chinn-Ito index, where higher values correspond to free cross-border movement of capital and lower values correspond to more restrictive regimes).<sup>15</sup> All in all, these results suggest that a country's ability to commercialise innovations and adopt technologies benefits from openness to trade and a large market.

These results should be viewed as indicating a general correlation between innovation and country-level characteristics, rather than a causal relationship. For instance, the causality may also run from innovation to openness to trade. Indeed, innovation can support exports, as it can help firms to become more productive and improve their competitive positions in international markets, thereby increasing the ratio of exports to GDP. In order to take some account of such reverse causality, similar regressions have been estimated using values for income per capita, openness to trade and dependence on natural resources with a lag of ten years as proxies for their contemporaneous values. The results remain broadly unchanged (see columns 7 and 8).<sup>16</sup>

### Dependence on natural resources

Interestingly, an abundance of natural resources – measured by calculating natural resource rents (that is to say, revenues net of extraction costs) as a percentage of GDP – has the opposite effect to economic openness. Reliance on commodities does not appear to have an impact on the patent output of an economy, but the exports of countries that are dependent on natural resources tend to be significantly less innovation-intensive than those of other countries (see Table 3.3).

This is, of course, partially a reflection of the fact that commodity sectors inevitably account for a larger share of such countries' exports. However, this negative relationship may also arise because the economy's dependence on natural resources reduces the average firm's economic incentives to innovate, as a large percentage of the value added in the economy is derived from activities that are less reliant on continuous innovation.

For instance, while constant innovation and the adoption of cutting-edge technologies is a prerequisite for maintaining a competitive position in the automotive sector, a firm's competitive

edge in terms of natural resource exports is dependent primarily on natural resource endowments.<sup>17</sup> At the same time, the availability of natural resource rents may enable governments (as well as universities and firms) to finance research, which offsets any negative impact that natural resources may have on patent output, but does not necessarily strengthen incentives to commercialise innovations.

### Skills of the workforce

The third aspect of the business environment that constrains innovative firms particularly strongly is the availability of the right skills. In country-level regressions (such as those reported in Table 3.3) measures of human capital – including the percentage of the population that has completed secondary or tertiary education, the average number of years of schooling and the average number of years of tertiary education – are not consistently found to be significant determinants of innovation. However, a higher average number of years of university education is generally associated with a higher patent output. This weaker correlation may be due to the fact that enrolment ratio-type measures predominantly capture the quantity – rather than the quality – of education.<sup>18</sup>

A more nuanced measure of the quality of education and basic skills is available for a sample of 65 OECD and non-OECD economies, based on the Programme for International Student Assessment (PISA) conducted by the OECD. PISA is a standardised international assessment of 15-year-old students' abilities in the areas of reading, mathematics and science. It has been conducted every three years since 2000, with a sample of schools chosen at random in each country. Higher average scores across all students in all three subjects generally correspond to a higher quality of education in a given country.

For the sub-sample of countries participating in PISA, the average scores achieved by these 15-year-old students are positively and significantly correlated with innovation, in terms of both patent output and the innovation intensity of exports (see Chart 3.11). This relationship is particularly strong for patent output (with the correlation coefficient standing at around two-thirds), highlighting the role that the quality of education plays in facilitating innovation at the technological frontier.

The effect that R&D has on innovation outcomes, which was examined earlier at the level of individual firms, can also be observed in cross-country data (see Table 3.3). Furthermore, the results of cross-country analysis reveal that the distribution of R&D spending across firms, academic institutions and government also plays an important role. Both business R&D spending and government R&D spending are associated with increases in patent output, with the impact of an additional US\$ 1 of R&D spending estimated to be higher for government R&D than for business R&D. However, only business R&D appears to have a positive impact on the innovation intensity of exports. This could be because of the poor links between science and industry in transition countries (see Box 5.3).

This discussion of the links between innovation and R&D in the various sectors also highlights the complexity of the innovation

<sup>15</sup> See Chinn and Ito (2006).

<sup>16</sup> See EBRD (2010) for a more detailed discussion.

<sup>17</sup> See also Welsch (2008) for evidence of a negative correlation between dependence on natural resources and innovation.

<sup>18</sup> Arguably, if higher education is pursued by students in order to obtain a diploma, rather than skills, this could even waste resources that could have been used to support innovation.



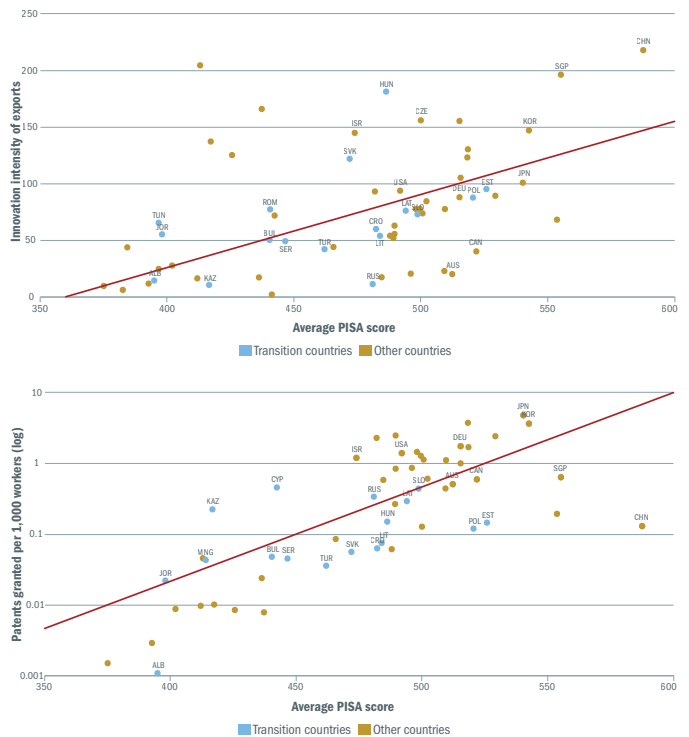
process, which requires a variety of general and specialist inputs. For this reason, countries that are at a more advanced stage in their development (measured, for instance, by GDP per capita at purchasing power parity) may be better placed to innovate. The cross-country results presented in Table 3.3 confirm that rich countries do tend to patent more.

However, there does not appear to be any correlation between income per capita and the innovation intensity of output. This may be due to the fact that firms in less developed countries have become increasingly successful at adopting existing technology over the last few decades.

Overall, the various factors discussed above explain between 60 and 90 per cent of variation in innovation outcomes across countries. The analysis also suggests that, given their income per capita, economic openness, human capital, economic institutions, R&D spending and other characteristics, transition economies innovate at around or slightly above the level that would be expected of them, in terms of both patent output and the innovation intensity of their exports.<sup>19</sup>

THE AVERAGE PERFORMANCES OF  
**15-YEAR-OLD**  
STUDENTS IN THE PISA ASSESSMENT  
ARE POSITIVELY CORRELATED WITH THE  
INNOVATION INTENSITY OF EXPORTS

CHART 3.11. Innovation and PISA scores



Source: OECD, USPTO, UN Comtrade, Feenstra et al. (2005) and authors' calculations.  
Note: PISA scores are averages across mathematics, science and analytical reading. Data are based on the 2012 survey (or the latest survey available).

**CASE STUDY 3.1. Ford Otosan**

The Turkish automotive sector has gradually evolved over the years. It used to focus purely on assembly, but it now conducts more higher-value-added activities, including local R&D. So far, however, R&D has focused mainly on the design and development of simple products (such as plastic and metal vehicle parts) and the optimisation of manufacturing techniques. Thus, significant challenges remain if its focus is to shift towards high-tech components (such as engine parts), which would require an accommodating innovation ecosystem with strong links between manufacturers, academia and local suppliers.

Ford Otosan has played a leading role in developing local R&D capabilities and establishing and nurturing links with local suppliers and academia, thereby helping the Turkish automotive industry to move towards higher-value-added activities.

The company is a joint venture bringing together a global automotive giant (the Ford Motor Company) and a local industrial conglomerate (Koç Holding). The firm was set up in 1959 to assemble Ford's

commercial vehicles. Ford's stake in the company has gradually increased, reaching 41 per cent in 1997. Koç Holding also owns 41 per cent, and the remaining 18 per cent is publicly traded. In 2007 the company opened the Gebze Engineering Centre, which develops new products and technology. The firm now has the largest private R&D centre in Turkey, employing around 1,300 engineers.

Ford Otosan is currently in the process of further increasing its local R&D activity and strengthening its links with local suppliers and academia. Specifically, the company has launched a project to develop a new heavy truck engine that will meet European standards and be an industry leader in terms of its energy performance, service life and maintenance costs. As part of the project, high-tech engine components are being designed and developed locally by Ford Otosan engineers, in cooperation with local universities and suppliers. Importantly, the project boasts more than a dozen specialist partnerships with local universities, using these institutions to verify new technologies and create an appropriate testing environment.

<sup>19</sup>The coefficient for the regional dummy variable is positive, but in most cases it is not significantly different from zero.

## Conclusion

Successful innovation relies on a supportive business environment. A poor business environment can substantially increase the cost of developing new products and make returns to innovation much more uncertain, undermining firms' incentives to innovate. In some cases it may prompt start-ups and other innovative firms to move their activities elsewhere, resulting in an "innovation drain".

Strikingly, firms that have recently introduced a new product tend to regard all aspects of the business environment as a greater constraint on their operations and growth than firms that do not innovate. These differences between the views of innovative and non-innovative firms are particularly large when it comes to corruption, the skills of the workforce and customs and trade regulations.

From a geographical perspective, they tend to be larger in Central Asia, the EEC region and Russia. In the CEB region, by contrast, these differences are less pronounced, suggesting that the overall environment there may be more supportive of innovation.

Firm-level and cross-country analysis has identified a number of factors that play an important role in shaping firms' incentives and ability to innovate, as well as innovation outcomes at country level. In the case of the latter, the factors that determine a country's patent output are not necessarily the same as those that determine the innovation intensity of a country's exports. For example, countries that are rich in natural resources tend to have less innovation-intensive exports, despite patenting levels that are comparable to those of other countries.

Overall, the analysis in this chapter suggests that efforts to further improve the innovation potential of firms and economies in the transition region should primarily target reductions in corruption, greater openness to international trade and cross-border investment (including effective customs and trade regulations) and improvements in the skills of the workforce. Other factors, such as improved access to finance and the upgrading of ICT infrastructure, also play an important role.

This analysis also reveals the relative scarcity of innovative start-ups in the transition region. While larger firms that have been around for a longer period of time tend to innovate more – particularly in high-tech manufacturing sectors, where innovation is more dependent on R&D – smaller and younger firms are often the ones developing products that are new to the global market.

In Israel, young, small firms are more likely to introduce world-class innovations than larger, established firms, but in the transition region this is not the case. On the contrary, innovations introduced by young, small firms in the EBRD region are less likely to target the global technological frontier than those of larger firms.

The analysis in this chapter supports the view that R&D activities increase the likelihood of successful innovation, but are by no means a prerequisite for innovation. The impact that R&D activities have on the likelihood of a new product being introduced is particularly large in high-tech manufacturing sectors. Meanwhile, R&D in low-tech sectors can help to optimise production processes. Lastly, while both business R&D and government R&D increase a country's patent output, only business R&D has a significant positive impact on the innovation intensity of a country's exports.

## INSUFFICIENT SKILLS

ARE REGARDED AS A MAJOR  
CONSTRAINT BY ALL FIRMS –  
PARTICULARLY INNOVATIVE FIRMS

**BOX 3.1. Innovation drain**

The transition region's most successful innovative entrepreneurs and small firms often move to London, Berlin, Silicon Valley, Boston, New York and other innovation hubs at the earliest available opportunity in order to take advantage of the resources available there. The investors, mentors, advisers and clients located in these places help them to develop products faster and more efficiently (thanks to the benefits of agglomeration and clustering), while at the same time increasing the value of their businesses.<sup>20</sup> The legacy of socialism means that entrepreneurship does not have a long tradition in the transition region, so marketing and business development still lag behind advanced economies.

Since a country's development prospects are partly dependent on its capacity for innovation – which, in turn, depends on human capital – such “innovation drain” may be damaging. Indeed, research suggests that the emigration of highly skilled individuals weakens local knowledge networks.<sup>21</sup>

However, a highly skilled diaspora can contribute to economic development through a variety of channels (such as remittances, trade, foreign direct investment and knowledge transfers), helping innovators back home to access knowledge accumulated abroad.<sup>22</sup> Most successful start-ups from the transition region are now developing their businesses in the United States or the United Kingdom, but have development centres somewhere in eastern Europe.<sup>23</sup>

The net effect ultimately depends on the country's economic development, the degree of transparency within government and public administration, the business environment, and employers' business practices in terms of recruitment and selection.<sup>24</sup> It also depends on how good the country is at establishing links with its citizens abroad.<sup>25</sup> One option here would be to put expats in contact with one another through social media and networking events and help them to return home if they so wish.

There are numerous examples of companies from the transition region that have moved abroad at an early stage.

Toshl Inc., the creator of a personal financial assistant app, was established in Slovenia in 2012, but moved its headquarters to Silicon Valley after joining the 500 Startups accelerator programme later that year. Another example is Double Recall, which helps publishers to increase the profitability and efficiency of paywalls by monetising social media, search and email traffic using simple advertisements that connect and engage with users. The company was established in Slovenia in 2010, but then graduated from Y Combinator (an American seed accelerator) in 2011 and now has its headquarters in New York.

Likewise, Croatian-Slovenian start-up Bellabeat (previously BabyWatch), the creator of pregnancy tracking system Bellabeat, participated at Startupbootcamp Berlin and raised funds via angel investors and an Indiegogo campaign in 2013. It graduated from the Y Combinator accelerator in March 2014 and relaunched its product in the US market after successfully completing the seed round. Its headquarters are in Silicon Valley.

Croatian start-up Replsly, a field management software company that was founded in 2010, moved its headquarters to Boston in 2014 after

securing funding from Launchpad Venture Group, First Beverage Group and K5 Ventures.

GrabCAD, a company established in 2009 that has created a collaborative product development tool that helps engineering teams to manage, view and share CAD files in the cloud, moved its headquarters from Tallinn to Boston in 2011 in order to benefit from the start-up scene there.


Codility, which produces software used for testing candidates for developer positions and was founded in London by a group of Poles in 2009 after winning the Seedcamp competition, is an example of movement in the opposite direction. Most of the team is now based in Warsaw, where they have an R&D centre, although they still have an office in London.

RealtimeBoard, which has developed a cloud-based whiteboard that facilitates collaboration, was founded in Perm, in Russia, in 2011, but it now has its headquarters in Las Vegas. Similarly, Jelastick, a cloud computing service that provides networks, servers and storage solutions to software development clients, enterprise businesses, original equipment manufacturers and web hosting providers, was founded in Zhitomir, in Ukraine, in 2010. It received funding from several Russian venture funds, but moved its headquarters to Silicon Valley in 2012.

It is interesting to note that several of these start-ups were given an initial (financial) push by seed financing or boot camp accelerator programmes in Berlin or London, but nevertheless moved across the Atlantic to the United States. The pull of the US innovation hubs and the large US market remains too strong for Europe to compete with, particularly as there are still many barriers to the free movement of online services and entertainment across national borders in the EU.

**BOX 3.2. Global value chains: drivers of innovation?**

Over the past two decades, the increased prominence of global value chains (GVCs) has transformed the world economy. The declining cost of communication and international shipping has caused production processes to be broken down into ever smaller parts and spread across vast geographical areas. As a result, international commerce is now dominated by trade in intermediate – rather than final – goods and services. This box looks at how GVCs stimulate innovation among manufacturing firms in the transition region.<sup>26</sup>

There are several reasons why participation in GVCs can help firms in emerging economies to learn and innovate. First, being part of a GVC means that a firm has to satisfy the chain's requirements in terms of the quality of products and the efficiency of processes.<sup>27</sup> To do so, managers may need to adapt their production methods or acquire technology via licensing arrangements. Second, serving foreign clients may require improved logistical solutions or delivery methods, as delivery at the appropriate time is essential for a smooth supply chain. Third, importing intermediate goods can itself be a channel for the diffusion of technology where firms import state-of-the-art technology that has not previously been available in the domestic market. Importing new technologies can also enhance the technical skills of the 

<sup>20</sup> See Szabo (2013).

<sup>21</sup> See Agrawal et al. (2011).

<sup>22</sup> See Agrawal et al. (2011) and Stankovic et al. (2013).

<sup>23</sup> EPAM, a global provider of software development services, was one of the first firms to adopt this model (see Case study 1.1 for more details). See also Khrennikov (2013).

<sup>24</sup> See, for example, OECD (2010).

<sup>25</sup> See The Economist (2014).

<sup>26</sup> See Franssen (2014) for more details.

<sup>27</sup> See Pietrobello and Raballotti (2011).

workforce if this necessitates further training. These increases in human capital may, in turn, enable companies to introduce innovative products of their own.

However, in certain circumstances GVCs can also hamper innovation within participating firms. This is most likely to occur where firms in developing countries are involved solely in the assembly of foreign intermediate goods. As this is the least skill-intensive stage of the value chain, the potential for technological spillovers is minimal and it is unlikely that participation in the GVC will encourage these firms to introduce new products of their own.

Chart 3.2.1 shows the percentage of innovative BEEPS V firms that are part of a GVC. GVC firms are defined as those that both import at least 10 per cent of their intermediate goods and export at least 10 per cent of their output.<sup>28</sup>

We can see that GVC firms tend to be more innovative than other firms across all five measures of innovation. In particular, 44 per cent of GVC firms responding to BEEPS V have introduced a new product in the last three years, compared with only 31 per cent of firms that do not participate in an international supply network. Equally striking is the fact that there is a 15 percentage point difference between the two when it comes to the percentage of firms that spend money on R&D or use technology via a licensing arrangement.

In order to check that these substantial differences are not driven by other factors, such as firms' ownership structures or their access to finance, Table 3.2.1 presents the results of a multivariate regression analysis. It shows that these differences in R&D, the licensing of technology, product innovation and process innovation continue to be observed when other firm-level characteristics are controlled for.

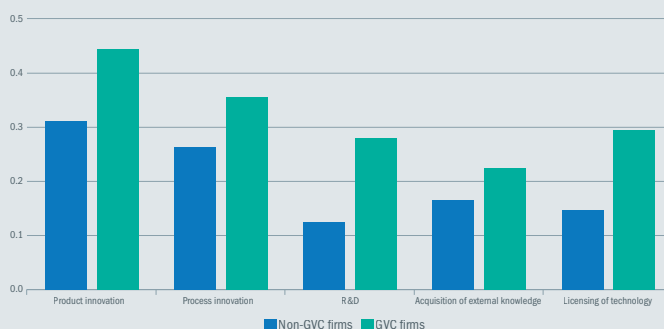
This analysis also determines the precise source of the positive impact that GVCs have on innovation. All measures of innovation – with the exception of the acquisition of external knowledge – are positively and significantly correlated with the importing of at least 10 per cent of total intermediate goods. However, only product innovation is positively and significantly associated with the exporting of at least 10 per cent of total output.

These results suggest that GVCs help firms to expand their product ranges and upgrade technology primarily by giving them access to better quality inputs, rather than by expanding the size of their markets.

The detailed innovation module in BEEPS V can help to shed more light on the mechanisms that are at work here. Firms that reported the introduction of a product or process innovation or the acquisition of external knowledge were asked whether they were able to do so as a result of working with domestic or foreign partners (such as clients or suppliers). Chart 3.2.2 shows that 22 per cent of GVC firms reported working with foreign partners on innovation, compared with only 10 per cent of non-GVC firms. This suggests that the higher levels of innovative activity among GVC firms can indeed be attributed to their easier access to foreign technology and knowledge. An important policy implication is that firms in emerging markets cannot hope to become more innovative simply by importing physical inputs. Instead, they need to invest in longer-term relationships with foreign suppliers and clients in order to allow a continuous flow of knowledge and know-how.

Chart 3.2.3 shows the impact that participation in GVCs has on the probability of firms innovating. Here, firms are grouped together on

**CHART 3.2.1. Global value chains and innovation**



Source: BEEPS V and authors' calculations.

Note: GVC firms are those participating in global value chains.

the basis of the relative skill endowments of the countries where they operate (measured as the percentage of the workforce that has completed secondary education). This chart suggests that the marginal probability of innovating on account of participation in a GVC increases with the quality of the workforce that is at the firm's disposal. Firms in countries with higher skill levels are given – via GVCs – more skill-intensive tasks with greater scope and need for technological spillovers.

However, caution is warranted when it comes to the type of involvement that firms have in GVCs. As mentioned above, participation in GVCs may hinder innovative activity and prevent positive spillovers if it only involves the assembly of components.

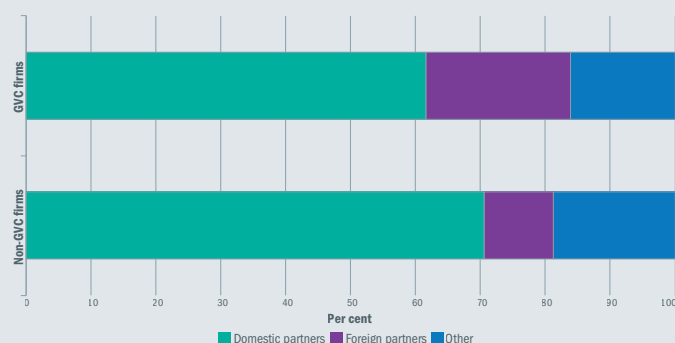
All in all, the analysis in this box shows that where participation in GVCs goes beyond simple assembly, it may allow firms to reap substantial productivity benefits through international spillovers of technology and know-how. A good example of this is the automotive industry in central and eastern Europe.<sup>29</sup> In CEE countries where this sector has seen high levels of foreign direct investment and local car producers are well integrated into GVCs – such as Hungary and the Slovak Republic – labour productivity in the automotive sector is substantially higher than the average for the manufacturing industry as a whole. By contrast, in countries where foreign investors play no meaningful role in the car industry (such as Bulgaria), the opposite is true.

The challenge, then, remains unchanged: not only replicating, but also improving on this paradigm across a variety of industries in the region, in order to help countries move up the value chain.

<sup>28</sup> Early methods of measuring GVCs focused on vertical specialisation and the flow of intermediate goods across borders (see, for instance, Hummels et al., 2001), while more recent methodologies focus on the value-added content of final goods. Identifying two-way trade at the firm level is important in order to correctly determine whether firms are likely to be part of a GVC.

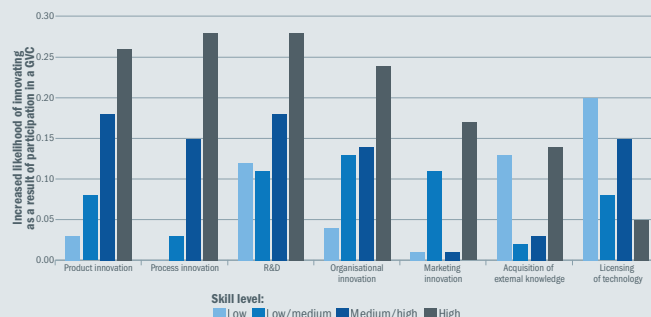
<sup>29</sup> See Pavlínek et al. (2009) and Fortwengel (2011).

CHART 3.2.2. Sources of innovation



Source: BEEPS V and authors' calculations.  
Note: GVC firms are those participating in global value chains.

CHART 3.2.3. The marginal impact that participation in a GVC has on the probability of innovating, broken down on the basis of countries' skill endowment levels



Source: BEEPS V and authors' calculations.

TABLE 3.2.1. Global value chains and innovation

	(1) Product innovation	(2) Process innovation	(3) R&D	(4) Acquisition of external knowledge	(5) Licensing of technology
Import at least 10% of intermediate goods	0.513*** (0.063)	0.367*** (0.067)	0.487*** (0.089)	0.107 (0.097)	0.437*** (0.074)
Export at least 10% of output	0.256** (0.089)	0.191* (0.095)	0.089 (0.120)	0.188 (0.125)	0.210* (0.098)
Both import and export 10%	0.421*** (0.075)	0.359*** (0.079)	0.531*** (0.096)	0.218* (0.106)	0.551*** (0.084)
Foreign-owned firm	0.038 (0.079)	-0.007 (0.083)	0.048 (0.093)	-0.007 (0.102)	0.435*** (0.081)
Staff training	0.371*** (0.052)	0.434*** (0.054)	0.480*** (0.065)	0.451*** (0.070)	0.156** (0.059)
Quality certificate	0.184*** (0.056)	0.189** (0.059)	0.263*** (0.069)	0.220** (0.077)	0.455*** (0.061)
External audit	0.108* (0.055)	0.109 (0.057)	0.066 (0.069)	0.268*** (0.076)	0.102 (0.060)
Managerial experience	0.005* (0.002)	0.004 (0.003)	0.006* (0.003)	0.002 (0.003)	-0.002 (0.003)
Age of firm	0.002 (0.002)	0.003 (0.002)	0.001 (0.002)	0.004 (0.002)	-0.002 (0.002)
OECD country	0.269 (0.203)	-0.403 (0.238)	0.575* (0.238)	0.071 (0.283)	-0.096 (0.269)
Size of firm, where baseline case is small firm (fewer than 20 employees)					
Medium size	-0.022 (0.056)	0.075 (0.059)	0.041 (0.072)	-0.209* (0.085)	0.128* (0.063)
Large size	0.071 (0.077)	0.182* (0.081)	0.269** (0.094)	-0.170 (0.107)	0.260** (0.083)
Whether access to credit is an obstacle to current operations, where baseline case is no obstacle					
Small obstacle	0.081 (0.054)	0.022 (0.057)	-0.048 (0.069)	0.118 (0.076)	-0.023 (0.061)
Large obstacle	0.171** (0.065)	0.192** (0.069)	-0.021 (0.083)	-0.052 (0.094)	0.115 (0.073)
Constant	-1.067*** (0.163)	-1.501*** (0.177)	-2.093*** (0.215)	-1.843*** (0.241)	-1.956*** (0.213)
N	3628	3617	3511	2277	3601

Source: BEEPS V and authors' calculations.  
Note: Standard errors are reported in parentheses below the coefficients. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels respectively.

### BOX 3.3. Competition and innovation: a complex relationship

Does stronger competition in product markets boost or hamper technological advances? The relationship between competition and innovation is complex, as multiple countervailing forces are at work.

On the one hand, concentrated markets with less competition may be more conducive to innovation. Large firms with substantial market power may be more willing to carry out innovation-oriented R&D activities because the scarcity of competitors will allow them to reap higher rents from newly introduced products if those innovations turn out to be successful. Market power may also help firms to finance R&D activities using retained earnings.

On the other hand, a lack of competition, while enabling firms to enjoy higher rents from new products, may also lead to complacency. In other words, firms may have more incentives to innovate in a competitive environment, in order to get ahead of their rivals and increase their market share.<sup>30</sup>

The combination of these two effects may lead to a non-linear relationship between competition and innovation (such as an inverted U-shape).<sup>31</sup> This shape may reflect the existence of two broad types of industry: “neck-and-neck” industries, in which companies operate with similar levels of technology, and “unlevelled” industries, in which a technological leader competes with a group of followers.

In neck-and-neck industries, competition encourages firms to innovate, because it allows them to move ahead of their competitors and increase their market share. In contrast, tougher competition discourages laggard firms in unlevelled industries from innovating, as the laggard’s reward for catching up with the technological leader declines. An inverted U-shape may emerge where neck-and-neck industries are more prevalent at low levels of competition, but then, as competition intensifies, more industries become unlevelled and further competition starts to put a break on innovation.

BEEPS V and MENA ES data broadly confirm the existence of an inverted U-shape in transition economies (see Chart 3.3.1). This chart plots innovative output in the SEE and CEB regions against the distribution of the number of competitors, showing that the average percentage of firms introducing a new or improved product or process initially increases with the number of competitors, before then declining in the third and fourth quartiles of the distribution. The chart also shows that the inverted U-shaped relationship between competition and innovation translates into a similar relationship between competition and firms’ growth.

Empirical evidence suggests that the positive impact that competition has on innovation is stronger for older firms. This is consistent with the view that older firms are inherently less likely to innovate unless they are spurred on by competition.<sup>32</sup> Overall, the literature seems to conclude that some degree of market power appears necessary for stimulating innovation activity, coupled with competitive pressure (especially pressure from foreign competitors).

#### Competition policy

There is a broad consensus that well-designed and properly enforced competition policies are beneficial to innovation. Competition-enhancing

policies can be broadly divided into two groups. First, product market deregulation aims to remove barriers to entry, trade and economic activity, as well as limiting the state’s direct interference in economic activity. Second, competition laws provide a legal framework for the prosecution of anti-competitive conduct, cartels and the abuse of dominant positions, as well as reducing the anti-competitive effect of mergers.

Product market deregulation has consistently been found to increase the adoption of state-of-the-art production techniques, as well as the introduction of new technologies. As a result, deregulation may ultimately translate into stronger total factor productivity growth.<sup>33</sup>

Conversely, restrictive product market regulations limit the productivity of the industries concerned. This is particularly true of industries that are a long way from the technological frontier. In these industries, restrictive regulations tend to halt the catching-up process.

Recent analysis also shows that anti-competitive product market regulations in upstream sectors curb productivity growth even in very competitive downstream sectors. In other words, a lack of competition in upstream sectors can generate barriers to entry that curb competition in downstream sectors as well, reducing pressures to improve efficiency in those sectors. For example, tight licensing requirements in retail or transport sectors can restrict access to distribution channels, while overly restrictive regulation in banking and financial sectors can reduce sources of financing, affecting all firms in the economy.<sup>34</sup>

When it comes to the enforcement of competition law, the existence of a complex relationship between competition and innovation has sometimes been interpreted as meaning that more lenient standards should be adopted when it comes to innovative industries. The complicated relationship between competition and innovation does call for a more comprehensive assessment of the impact that specific actions have on market participants’ ability to innovate and the incentives they have. However, it does not justify the blanket dismissal of all concerns about anti-competitive behaviour in industries that are deemed to be innovative.

A proper assessment of innovative industries requires well-designed competition laws and competent competition authorities. The enforcement of competition law can play an important role in supporting innovation by allowing actions that promote innovation (such as mergers) and prohibiting actions that hamper it. Recent evidence from OECD countries points in this direction, showing that sound competition policies lead to stronger total factor productivity growth (which may be seen as a proxy for innovation).<sup>35</sup>

Data for the transition region show the positive effect that competition-enhancing policies have on innovation. Chart 3.3.2 shows that there is a positive relationship between the quality of competition-enhancing policies (as measured by the EBRD’s competition indicator, which assesses the quality of competition law, the institutional environment and enforcement activities)<sup>36</sup> and innovation. While the chart does no more than indicate a correlation between the two, this nevertheless points to a link between the quality of competition policy and the strength of innovation.

All in all, while the relationship between competition and innovation is a complex one, well-designed competition policies can help to provide the right business environment, allowing companies to fulfil their competitive potential and having a positive impact on innovation.

<sup>30</sup> See Arrow (1962) for an early discussion of this effect.

<sup>31</sup> See Aghion et al. (2005).

<sup>32</sup> See Carlin et al. (2004).

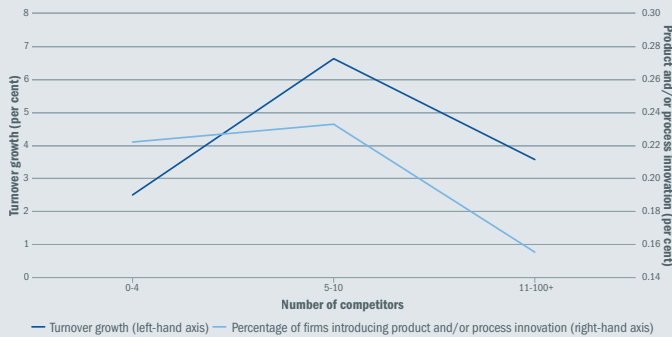
<sup>33</sup> See Nicoletti and Scarpetta (2005) and Conway et al. (2006).

<sup>34</sup> In addition, if there is market power in upstream sectors and firms in downstream industries have to negotiate the terms and conditions of their contracts with suppliers, some of the rents that are expected downstream as a result of the adoption of state-of-the-art technology will be taken by providers of intermediate inputs. This, in turn, will reduce incentives to improve efficiency and curb productivity in downstream sectors, even if competition in these sectors is strong.

<sup>35</sup> See Buccirosi et al. (2013).

<sup>36</sup> See Annex 5.1 of this *Transition Report* for a description of the EBRD’s competition indicator.

**CHART 3.3.1. Competition, innovation and growth in transition countries**



Source: BEEPS V, MENA ES and authors' calculations.

**BOX 3.4. Consultants as conduits for firm-level innovation**

Consultancy firms can play a vital role in facilitating innovation by acting as conduits for external know-how and providing information about customers' preferences.<sup>37</sup> They can help a firm adapt its organisational structure and management practices to changing industry needs, help it refine its design and packaging in order to appeal more effectively to its target groups, or provide market research underpinning the development of new products that better satisfy customers' needs. For instance, consultants have helped a Swedish bank to introduce internet banking.<sup>38</sup> Consultants can also help firms' managers to analyse the pros and cons of developing new products and processes.<sup>39</sup>

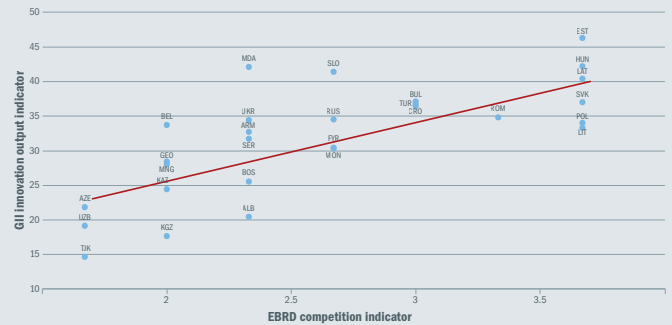
While the percentage of firms using consultants varies greatly across the countries of the transition region – ranging from just 4 per cent in Azerbaijan to 54 per cent in Ukraine – consultants are more likely to be used by innovative firms in almost all countries (see Chart 3.4.1).

Across the region as a whole, 61 per cent of firms that have introduced a new product in the last three years also hired a consultant during that period, compared with 20 per cent of firms that did not innovate. Consultants also assisted 63 per cent of firms that introduced new or improved organisational management practices.

These relationships do not appear to be driven by particular industries or specific types of firm. Even when firm-level characteristics are taken into account, there remains a positive and highly significant correlation between the use of consultants and all types of innovation – product, process, organisational and marketing innovations. This is consistent with evidence that external consultants can help small and medium-sized firms to improve their productivity.<sup>40</sup>

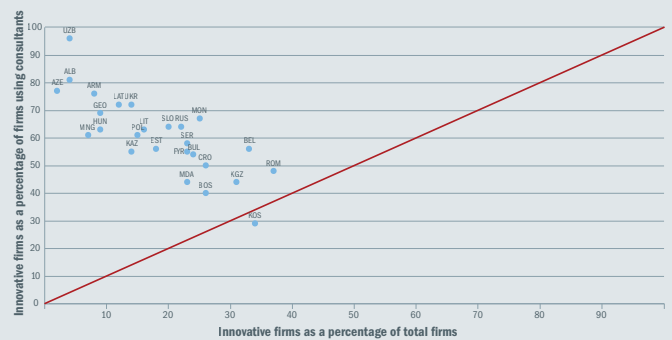
Despite these apparent advantages, many firms choose not to use consultants when developing new products or processes. One reason for this is that every consultancy contract involves transaction costs, which may take resources away from the innovation itself. Firms may also be concerned about leaking information regarding new products and processes, particularly in countries where intellectual property rights are poorly enforced.<sup>41</sup>

**CHART 3.3.2. Competition policy and innovation output**



Source: EBRD (2013), Cornell University et al. (2014) and authors' calculations.

**CHART 3.4.1. Firms that use consultants are more likely to innovate**



Source: BEEPS V and authors' calculations.

Note: The percentage of innovative firms is calculated using cleaned data for product and process innovation.

However, the main reason why firms in the transition region do not hire consultants is that they simply see no need for them. Interestingly, exposure to consultancy services seems to change this belief: once firms have employed consultants once, they typically do so again. Indeed, BEEPS firms that use external consultants have done so an average of four times in the last three years. Moreover, where clients of the EBRD's Small Business Support team have never worked with a local consultant before, nearly half of these clients then undertake a second consultancy project independently within a year. Since firms that hire consultants also tend to be more innovative, their exposure to external know-how seems to be an important channel in the fulfilment of their innovation potential.

<sup>37</sup> See Thrift (2005).

<sup>38</sup> See Back et al. (2014).

<sup>39</sup> See Back et al. (2014).

<sup>40</sup> See Bruhn et al. (2012) for evidence from Mexico.

<sup>41</sup> See Hoecht and Trott (2006).

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# FINANCE FOR INNOVATION



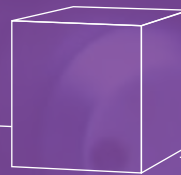
FIRMS WITH ACCESS TO CREDIT ARE AROUND

## 30%

MORE LIKELY TO INTRODUCE A PRODUCT THAT IS NOT ONLY NEW TO THE COMPANY BUT ALSO NEW TO THE FIRM'S LOCAL OR NATIONAL MARKET



AT A GLANCE



## 52%

OF ALL SURVEYED FIRMS IN THE EBRD REGION NEEDED A LOAN IN THE PERIOD 2012-13; ONLY HALF OF THEM MANAGED TO BORROW THE MONEY THEY REQUIRED FROM A BANK

**Financial systems across the transition region continue to be dominated by banks, with little public or private equity available. To what extent can financing by these banks help firms to innovate? This chapter shows that where banks ease credit constraints, firms tend to innovate more by introducing products and processes that have not previously been available in their local or national markets. However, there is little evidence that bank credit also stimulates in-house research and development. This suggests that while banks can facilitate the spread of technology within emerging markets, their role in pushing back the technological frontier remains limited.**



## Introduction


Innovation by firms is an important driver of factor productivity and long-term economic growth around the world.<sup>1</sup> As Chapter 1 explains, innovation in technologically developed countries typically entails research and development (R&D) and the invention and subsequent patenting of new products and technologies. In less advanced economies, innovation often involves imitation, with firms adopting existing products and processes and adapting them to local circumstances.<sup>2</sup> Such innovation tends to be about catching up with the technological frontier, rather than pushing that frontier back.

As firms adopt products and processes that have been developed elsewhere, technologies gradually spread across and within countries. The speed of this process varies greatly from country to country, which can explain up to a quarter of total variation in national income levels.<sup>3</sup> Despite the central role that such technological diffusion plays in determining growth outcomes, the mechanisms that underpin the spread of new products and processes remain poorly understood. This chapter focuses on one such mechanism: the impact that funding constraints have on firms' adoption of technology.

Funding constraints may limit the adoption of technology, as external inventions (which are typically context-specific and involve tacit know-how) are costly to integrate into a firm's production structure. Firms therefore need sufficient financial resources to properly adapt external technologies, products and processes to their local circumstances. If insufficient funding is available, businesses in emerging markets may be unable to fully exploit the easy option of R&D that has been carried out elsewhere. Such firms remain stuck in low-productivity activities, and this may, at country level, contribute to the persistence of divergent growth patterns around the world.

Exactly how – and how much – external finance helps firms to innovate, be it through R&D or the adoption of existing products and processes, remains a matter of debate. One key problem hampering this discussion is the dearth of firm-level information on these two forms of innovation. The EBRD and World Bank's fifth Business Environment and Enterprise Performance Survey (BEEPS V) goes some way towards remedying this problem.

The empirical analysis contained in this chapter comprises two closely related assessments. First, detailed data about banking structures in towns and cities across the transition region are used to explain the severity of the credit constraints experienced by individual firms in these areas. Second, information on these credit constraints is then used to explain why certain firms innovate more than others.<sup>4</sup>

The transition region is an interesting place to explore the relationship between access to finance and firm-level innovation, given that – as in other large emerging markets, such as India and China – firms there continue to be plagued by credit constraints.<sup>5</sup> At the same time, these firms also perform poorly when it comes to adopting technology. For instance, in the World Economic Forum's *Global Competitiveness Report 2013-2014*, 

<sup>1</sup> See Aghion and Howitt (1992).

<sup>2</sup> See Acemoglu et al. (2006).

<sup>3</sup> See Comin and Hobijn (2010).

<sup>4</sup> In econometric terms, the analysis is based on a two-stage least squares framework, with local banking variables being used as instruments in the first stage of the analysis.

<sup>5</sup> The analysis in this chapter is based on data for Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic\*, Estonia, FYR Macedonia, Georgia, Hungary, Latvia, Lithuania, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia and Ukraine. \*Since 2008, the EBRD has not made new investments in the Czech Republic.

Russia is ranked 126th out of 148 countries in terms of firm-level absorption of technology.<sup>6</sup>

### Banks and innovation: opposing views

Much of the transition region continues to be characterised by bank-based financial systems, with only shallow public and private equity markets (see Box 4.1). This raises the question of whether access to bank credit can help firms to innovate in the absence of a meaningful supply of risk capital. Broadly speaking, there are two schools of thought on this issue.<sup>7</sup>

One group of scholars and practitioners takes a rather pessimistic view and stresses the uncertain nature of innovation – particularly R&D. This makes banks less suitable as financiers for four reasons. First, the assets associated with innovation are often intangible, firm-specific and linked to human capital. They are therefore hard to redeploy elsewhere, which makes them difficult for banks to collateralise. Second, innovative firms typically generate volatile cash flows, at least initially. This does not fit well with the inflexible repayment schedules of most loans. Third, banks may simply lack the skills needed to assess early-stage technologies. Lastly, banks may fear that funding new technologies will erode the value of collateral underlying existing loans (which will mostly represent old technologies). For all of these reasons, banks may be either unwilling or unable to fund innovative firms.

A second school of thought takes a much more optimistic view of the situation. According to this view, one of the core functions of banks is the establishment of long-term relationships with firms, during which loan officers gain a deeper understanding of borrowers. Thus, banks may be well placed to fund innovative firms, as such enduring relationships will allow them to understand the business plans and technology involved.

Moreover, as earlier chapters of this *Transition Report* stress, firm-level innovation entails more than just R&D. It also involves the adoption of existing products and processes that are new to a particular firm, but not to the wider world. Such imitative innovation is arguably less risky and more in line with the risk appetites of most banks. This is particularly true of banks that have funded specific technologies in the past in partnership with other borrowers. In this case, banks may even act as conduits, facilitating the spread of technology across their borrower base.

Lastly, even without financing innovative projects directly or explicitly, banks can still stimulate firm-level innovation. When banks provide firms with straightforward working capital or short-term loans, this can free up internal resources, which firms can then use to finance innovation. Evidence from a broad range of developed countries suggests that firms generally prefer internal funds to any form of external finance when funding innovation.

### The evidence so far

The limited evidence that is currently available suggests that access to bank credit may indeed help firms to innovate. Findings from the United States show that the deregulation of inter-state banking, which increased bank competition during the 1970s and the 1980s, boosted firm-level innovation (as measured by the number of patents that were subsequently filed in the states concerned).<sup>8</sup>

Meanwhile, evidence from Italy (a more bank-based economy) suggests that increases in the density of local bank branches are associated with growth in firm-level innovation. This effect is stronger for smaller firms in sectors that are more dependent on external finance.<sup>9</sup> Firms that have longer-term borrowing relationships with their banks are also more likely to innovate. Lastly, earlier evidence from the transition region indicates that self-reported credit constraints can partly explain cross-firm variation in innovative activity.<sup>10</sup>

This chapter extends that body of evidence in two main ways. First, the latest round of the BEEPS survey, which includes a separate innovation module (see Chapter 1), allows much deeper analysis of the channels through which access to credit may (or may not) affect firm-level innovation. Second, by combining such firm-level data with information on the exact geographical location of bank branches across the transition region, it is possible to see how local variation in the presence of banks affects firms' ability to innovate.

The analysis in this chapter comprises two stages. First, new data on the geography of banking in the transition region are used to improve our understanding of why certain firms are more credit-constrained than others. Second, this chapter then looks at the extent to which such credit constraints affect a wide variety of innovation outcomes. Before that, though, it is useful to look in more detail at how we assess whether a particular firm is credit-constrained or not.

### Which firms lack bank credit?

An assessment of the impact that bank credit has on firm-level innovation calls for a clear and unambiguous measure of whether firms are credit-constrained or not. The measure used here is created by combining firms' answers to various BEEPS questions.

First, we need to distinguish between firms that need credit and those that do not, as only the former can be credit-constrained. Firms that need credit can then be divided into those that have applied for a loan and those that have decided not to apply because they expect to be turned down by the bank. Finally, firms that have applied can be divided into those that have been granted a loan and those that have been rejected by the bank. Thus, credit-constrained firms can be defined as those that need credit but have either decided not to apply for a loan or were rejected when they applied.

Applying this methodology to the BEEPS V dataset, 52 per cent of all firms surveyed reported needing a bank loan. Just over half of those – 54 per cent – turned out to be credit-constrained:

<sup>6</sup> The countries of central Europe and the Baltic states (CEB) are ranked 68th on average, compared with 109th for the countries of south-eastern Europe (SEE), 100th for those of eastern Europe and the Caucasus (EEC), 99th for the countries of Central Asia and 76th for those of the southern and eastern Mediterranean (SEMED). Turkey is ranked 37th. When compared with Latin American and Asian countries with similar levels of wealth and development (measured by GDP per capita), the CEB and SEMED regions do about as well as their peers in terms of adopting technology, whereas the SEE and EEC regions perform worse.

<sup>7</sup> For a more detailed literature review, including references, see Bircan and De Haas (2014).

<sup>8</sup> See, for instance, Amore et al. (2013) and Chava et al. (2013).

<sup>9</sup> See, for instance, Benfratello et al. (2008) and Herrera and Minetti (2007).

<sup>10</sup> See Gorodnichenko and Schnitzer (2013).

they either did not apply for credit (although they needed a loan) or were rejected by the bank when they did. There is, however, substantial variation both across and within countries in terms of the percentage of credit-constrained firms (see Chart 4.1). This ranges from just 26 per cent in Slovenia to 76 per cent in Ukraine. In some Russian regions (such as Rostov and St Petersburg) this percentage is higher still.

Chart 4.2 provides an even more detailed picture of the regional presence of credit constraints. In this heat map, each dot indicates a town or city where firms were interviewed as part of the BEEPS survey. Red dots indicate areas where a large percentage of firms indicated that they were credit-constrained, whereas blue dots denote areas where only a few firms had problems accessing credit. It is noticeable that there is considerable variation within countries and regions in terms of firms' ability to successfully attract bank loans. If access to credit affects firms' ability to innovate, one would expect firms in red areas to have more trouble innovating than firms in blue areas, everything else being equal.

## Empirical analysis

### Bank credit and firm-level innovation: a first look

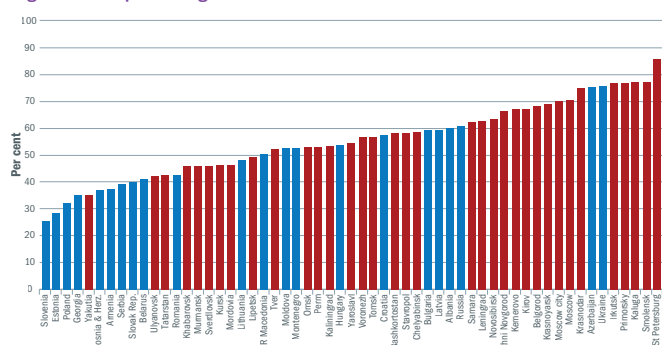
Table 4.1 and Chart 4.3 (see p68) take a first look at the relationship between credit constraints and innovation. Firms are grouped into three categories: firms with loans (3,840 firms); firms without loans, but without any need for them (4,723 firms); and firms with no loans and an unfulfilled need for credit (2,762 firms). The third group contains all credit-constrained firms.

Looking at the likelihood of innovative activity, there is a striking difference between the firms with loans and the firms that are credit-constrained. Of the firms with an unmet need for credit, 11.0 per cent, 11.2 per cent and 8.8 per cent have engaged in product innovation, process innovation and R&D respectively over the past three years. When we look at the firms that have been granted loans, these percentages are significantly higher at 15.3, 16.6 and 14.2 per cent respectively. In other words, firms with loans are around 40 per cent more likely to innovate than those without access to credit.

A clear picture – albeit only a preliminary one – is beginning to emerge as regards the relationship between access to credit and innovative activity: firms that innovate tend to be those that apply for a loan and are granted one. Firms that do not demand a loan in the first place are the least likely to innovate, probably because their lack of interest in borrowing coincides with a lack of innovative capacity.

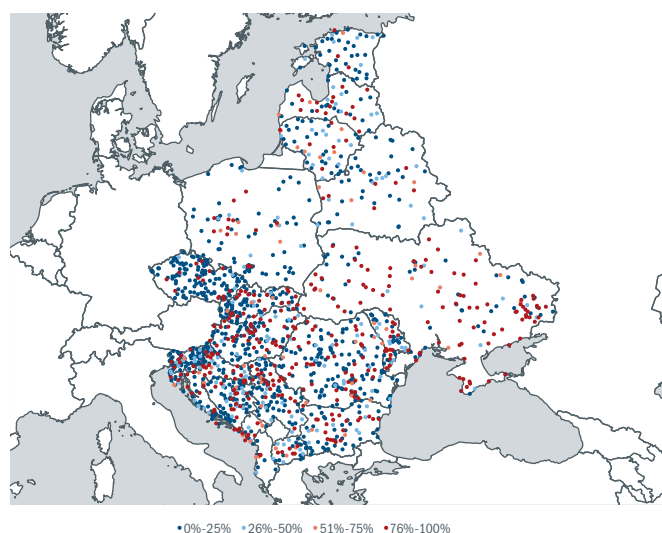
For those firms that have managed to obtain a bank loan – a third of all firms interviewed – Table 4.1 also contains information on the type of bank that lent to them. Only 17 per cent of firms borrowed from a state bank, 29 per cent from a private domestic bank and 54 per cent from a foreign bank. Is innovative activity affected by the type of bank that a firm borrows from? ◀

**CHART 4.1.** There is considerable variation across countries and across Russian regions in the percentage of firms that are credit-constrained



**Source:** BEEPS V.  
**Note:** Bars indicate the percentage of firms that reported needing a bank loan, but either decided not to apply for one or were rejected when they applied. Blue bars indicate countries, while red bars denote Russian regions.

**CHART 4.2.** A heat map showing regional variation in firms' access to bank credit



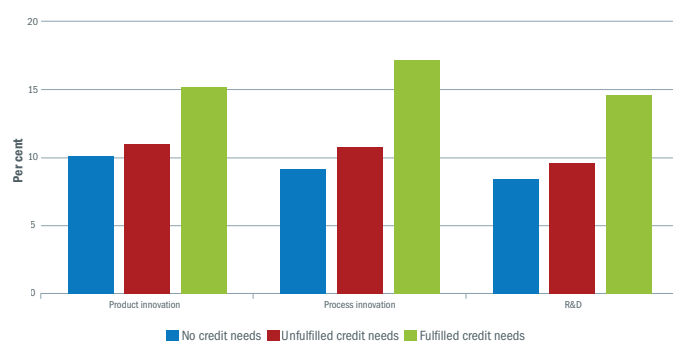
**Source:** BEEPS V.  
**Note:** Each dot represents a town or city where firms were interviewed as part of the BEEPS survey. Red colours indicate a higher percentage of credit-constrained firms in that area, while blue colours indicate a lower percentage.

**TABLE 4.1. Access to bank credit is associated with increases in firm-level innovation**

	Percentage of firms engaged in			Observations
	Product innovation (1)	Process innovation (2)	R&D (3)	
<b>Firms with loans</b>	15.29%***	16.62%***	14.20%***	3,840
Private domestic bank	14.20%	16.65%	13.48%	1,120
State bank	17.28%	19.13%	15.66%	664
Foreign bank	16.09%	15.68%	14.79%	2,056
<b>Firms without loans</b>	9.94%	9.48%	7.82%	7,485
No demand	9.27%	8.36%	7.26%	4,723
Credit-constrained	10.99%	11.24%	8.76%	2,762
<b>Total</b>	11.82%	11.99%	10.11%	11,325

Source: BEEPS V.

Note: This table reports univariate results on the relationship between access to bank credit and firm-level innovation. \*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively for a two-sample t-test for a difference in means with unequal variances. The t-tests compare all firms with loans (top row) with all credit-constrained firms (penultimate row).

**CHART 4.3. Access to credit and firm-level innovation**


Source: BEEPS V.

Note: "No credit needs" denotes firms with no need for bank credit. "Unfulfilled credit needs" denotes firms with a need for bank credit that have either decided not to apply or were rejected when they applied. "Fulfilled credit needs" denotes firms with a need for credit that have received a loan from a bank.

Table 4.1 suggests not (as does unreported additional analysis). There is some evidence that the clients of state and foreign banks innovate more, but these differences are fairly small and statistically weak, and they disappear when controlling for other firm-level characteristics.

Chart 4.4 shows product and process innovation among credit-constrained and unconstrained firms in selected transition countries. In almost all countries unconstrained firms innovate more than credit-constrained firms.

Chart 4.5 plots data for the same set of countries. Here, the horizontal axis measures the percentage of firms that are credit-constrained, while the vertical axis indicates the difference between the innovative activities of unconstrained and constrained firms. That difference is a rough indicator of the aggregate sensitivity of innovation to firms' credit constraints in any given country. It indicates the extent to which reducing credit constraints could boost firm-level innovation, given the current economic, political and institutional framework in the country.

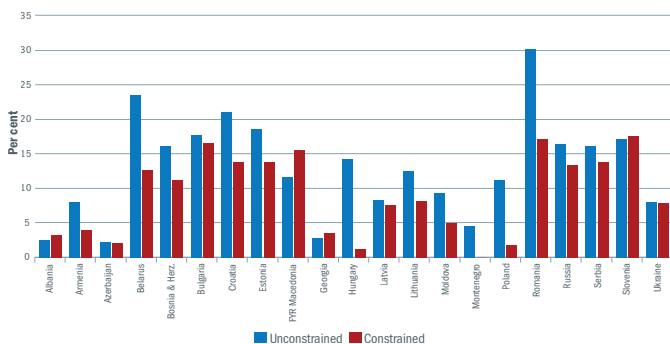
The chart shows that in some countries (such as Azerbaijan and Ukraine) credit constraints remain rife among firms. However, in these countries there is also little difference between credit-constrained and unconstrained firms in terms of their innovative behaviour. Consequently, it may be that access to credit has little impact on innovation in these countries, with other constraints – such as an inadequately educated workforce or corruption (see Chapter 3) – having more effect. In contrast, in countries such as Belarus, Lithuania, Romania and Russia, not only are there large numbers of credit-constrained firms but access to bank loans seems to have a relatively large impact in terms of unleashing innovation.

Chart 4.6 indicates that even within countries, at town or city level, there is a strong negative correlation between firms' credit constraints and innovative activity. The remainder of this chapter looks at this relationship in more detail.

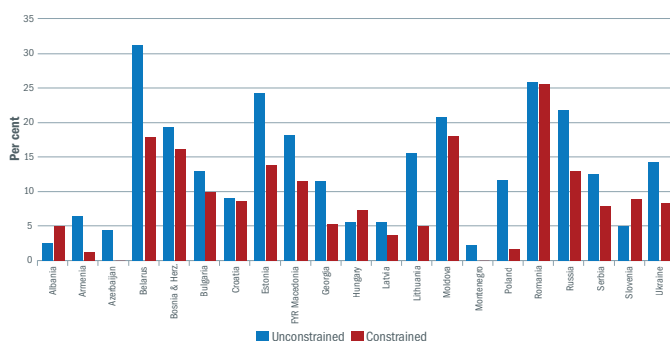
There are two main reasons for conducting this additional analysis. First, a more rigorous investigation is needed to control for other firm-level characteristics, so that the "everything else being equal" condition holds as much as possible. Second, the strong negative correlation between credit constraints and innovation does not necessarily indicate that credit constraints cause a decline in innovation. It could be that causation runs the other way – that is to say, it may be that when firms innovate successfully, banks are more amenable to financing them, thereby reducing credit constraints. One way to address this concern is to consider only credit constraints that are driven by external non-firm-specific factors. To this end, the remainder of this chapter focuses on the impact of credit constraints stemming from exogenous variation in the local banking landscape that surrounds each BEEPS firm.

**CHART 4.4. Credit constraints and firm-level innovation across the transition region**

**(a) Product innovation**



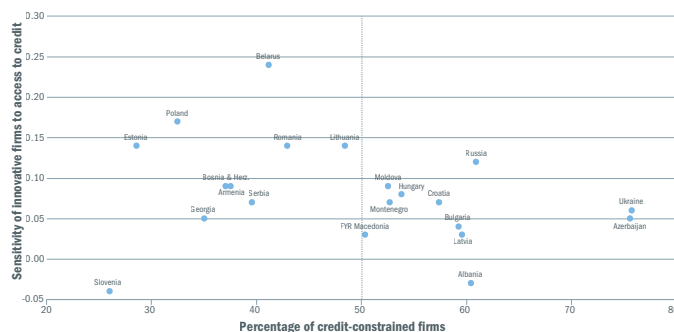
**(b) Process innovation**



Source: BEEPS V.

Note: Unconstrained firms need loans and are able to borrow from banks. Constrained firms need loans, but either decide not to apply for one or are rejected by the bank when they apply.

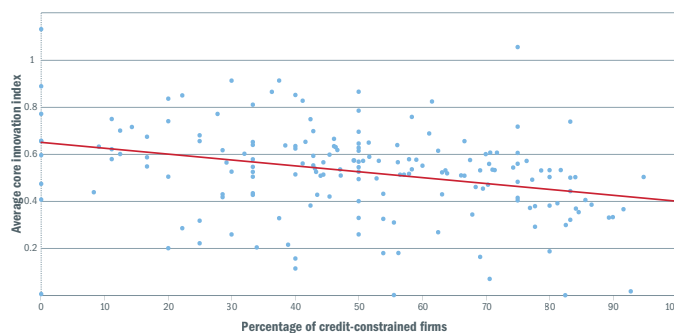
**CHART 4.5. Sensitivity of firm-level innovation to credit constraints across the transition region**



Source: BEEPS V.

Note: The vertical axis measures the difference between the average core innovation indices (calculated as the sum of product and process innovation) for unconstrained and constrained firms.

**CHART 4.6. Credit constraints and firm-level innovation across towns and cities**



Source: BEEPS V.

Note: Each dot represents a town or city that contains more than 10 BEEPS firms. The x-axis measures the percentage of credit-constrained firms, while the y-axis measures the average core innovation index, which is constructed by regressing the average core innovation observed in the relevant area on the percentage of credit-constrained firms and country fixed effects. The predicted values are then plotted on the y-axis.

**The local geography of banking**

Despite rapid technological progress and financial innovation, small business banking remains by and large a local affair. Indeed, according to the Italian Banking Association, “the banker’s rule of thumb is to never lend to a client located more than three miles from his office”.<sup>11</sup> Many banks comply with this informal “church tower principle” – the idea that they should lend only to firms that can be seen from the local church tower.

If such geographical credit rationing is widely practised, all but the largest firms will depend on the ability and willingness of local banks to lend to them. This also means that local variation in the number and type of bank branches may explain why firms in certain areas are more credit-constrained than similar firms elsewhere. ▶

OF ALL BORROWING FIRMS,  
17% BORROWED FROM  
A STATE BANK, 29%  
FROM A PRIVATE  
DOMESTIC BANK AND  
**54%**  
FROM A FOREIGN BANK

<sup>11</sup> Quoted in Guiso et al. (2004).

**CHART 4.7.** Geographical distribution of bank branches across emerging Europe and Russia  
 (a) Emerging Europe



(b) Russia



Source: BEPS II.  
 Note: Each dot denotes an individual bank branch.

Chart 4.7 depicts the geographical distribution of banking activity across both emerging Europe (see 4.7a) and Russia (see 4.7b). These maps are based on information collected by the EBRD on the geographic coordinates of over 137,786 bank branches. These branches span 1,737 different locations and are owned by over 600 different banks.<sup>12</sup> Bank branches are fairly evenly distributed across much of emerging Europe, with greater concentration in capital cities and other urban areas. Russia's bank branches are concentrated in the south-west of the country, particularly in and around Moscow, as this is where Russia's economic activity is concentrated.

These detailed branch data are used to construct two indicators for each town or city where BEEPS firms were interviewed. First, the Herfindahl-Hirschman index (HHI) – a measure of market concentration – is calculated for the local area. This HHI index is the sum of the squares of the market shares of the banks in the area, where these market shares are expressed as the share of total branches that is owned by each bank. The index ranges from 0 to 1, with higher values indicating a decrease in competition and an increase in banks' local market power. The HHI index for emerging Europe as a whole is 0.15, indicating that most local banking markets are only moderately concentrated. Variation across towns and cities is considerable, however.

On the one hand, a concentrated banking market (with a high HHI index) can facilitate long-term lending relationships and thus reduce credit constraints, particularly for more opaque firms. On the other hand, it can also be argued that such concentration may stifle inter-bank competition and thus reduce the supply of credit to firms. While scholars have found evidence for both of these opposing ideas, recent research has tried to reconcile them.

Italian data show, for instance, that while market power (that is to say, higher levels of concentration) can boost firm creation, particularly in opaque industries, at some point the banks' excessive market power starts to have a negative impact on firm creation. Similarly, cross-country evidence shows that while bank concentration promotes growth in sectors that are dependent on external finance, the overall relationship between bank concentration and economic growth is a negative one.<sup>13</sup>

The second town/city-level banking indicator that is used in this chapter is the percentage of bank branches that are owned by foreign banks. On average, 39 per cent of the bank branches in a given town or city are foreign-owned. A higher percentage of foreign ownership may reduce small firms' access to credit if domestic banks possess a comparative advantage in terms of reduced information asymmetries in relation to local firms. This may be because they share a common language and culture or have a better knowledge of local legal and accounting institutions. Such factors may make it easier for domestic banks to base lending decisions on soft data when it comes to smaller local firms, as they have developed long-term relationships with these companies. On the other hand, however, foreign banks may be better at applying transaction technologies that use hard data (such as credit scoring) or collateral-based methods when lending to small businesses. In this case, the presence of foreign banks may actually benefit such firms.

<sup>12</sup> These data were collected as part of the second Banking Environment and Performance Survey (BEPS II). For more details, see [www.ebrd.com/pages/research/economics/data/beps.shtml](http://www.ebrd.com/pages/research/economics/data/beps.shtml) and Beck et al. (2014).

<sup>13</sup> See Bonaccorsi di Patti and Dell'Ariccia (2004) and Cetorelli and Gambera (2001). See also Guriev and Kvasov (2009) for a theoretical insight into the relationship between bank concentration and firms' capital structures.



TABLE 4.2. Local credit markets and firms' credit constraints

Dependent variable: Credit constrained	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Highly concentrated (0/1)	0.2346*** (0.0757)	0.2190*** (0.0759)	0.2286*** (0.0757)	0.2378*** (0.0758)	0.2329*** (0.0758)	0.2315*** (0.0757)	0.2352*** (0.0757)
HHI of town/city	-0.2385** (0.0937)	-0.4624*** (0.1257)	-0.5990*** (0.1593)	-0.2961*** (0.0982)	-0.3063*** (0.0986)		
Share of foreign banks	-0.1984*** (0.0601)	-0.2145*** (0.0605)	-0.2061*** (0.0604)	-0.1934*** (0.0601)	-0.2052*** (0.0601)	-0.2046*** (0.0602)	-0.2001*** (0.0602)
HHI of town/city * Log of firm size		0.0784*** (0.0284)					
HHI of town/city * Log of firm age			0.1383*** (0.0453)				
HHI of town/city * Quality certification (0/1)				0.1855** (0.0788)			
HHI of town/city * External audit (0/1)					0.1752** (0.0703)		
HHI of town/city * Low-tech industry (0/1)						-0.2150** (0.0949)	
HHI of town/city * High-tech industry (0/1)						-0.3795*** (0.1229)	
HHI of town/city * Low dependence on external finance (0/1)							-0.1720* (0.1013)
HHI of town/city * High dependence on external finance (0/1)							-0.2634*** (0.0969)
Inverse Mills ratio	0.6307*** (0.0909)	0.6327*** (0.0910)	0.6157*** (0.0906)	0.6274*** (0.0907)	0.6312*** (0.0910)	0.6362*** (0.0912)	0.6317*** (0.0908)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Town/city-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,289	4,289	4,289	4,289	4,289	4,289	4,289
F-statistic on instrumental variables	8.50	8.22	8.26	7.47	7.51	6.92	7.18
Hansen J-statistic (p-value)	0.88	0.21	0.64	0.59	0.04	0.21	0.91

Source: BEEPS V, BEPS II and BankScope.

Note: This table reports the results of regressions estimating the impact that the composition of local banking markets has on firms' credit constraints – the first stage of an instrumental variable (IV) estimation. The dependent variable is a dummy which is equal to 1 if the firm is credit-constrained and 0 if not. The inverse Mills ratio in column 1 is derived from an unreported Heckman selection probit model. All regressions include a set of firm-level control variables, industry and country fixed effects, town/city-level controls, firm-level controls and a constant. Firm-level controls include log of firm size, log of firm age, external audit, training, quality certification, national sales, expectations of higher sales, log of manager's experience and previous state ownership. Town/city-level controls include dummies that control for town/city size, main business centre, and firms' responses to questions on high-speed internet use, power outages, security, business licensing, political instability, courts and education (all averaged at town/city level). Robust standard errors are shown in parentheses; \*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively. The F-statistic on IVs is for the F-test that the instruments are jointly insignificant, while the p-value of the Hansen J-statistic is for the overidentification test that the instruments are valid.

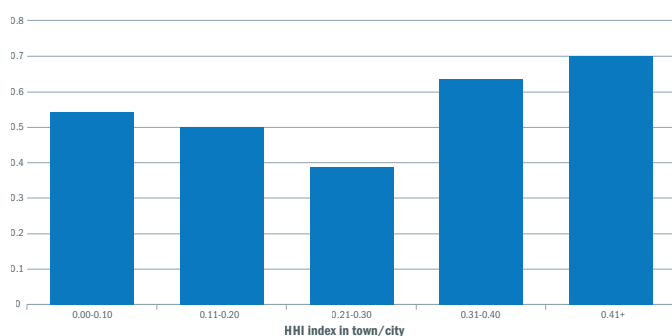
### Step 1: Local banking and credit constraints

Table 4.2 reports the results of statistical analysis explaining the probability of a particular firm being credit-constrained (that is to say, either deciding not to apply for bank credit or being rejected when it applies). Secondary analysis will then use the predictions in this model to determine whether credit-constrained firms innovate less or in a different manner. The first three rows in the table show the main explanatory variables at town/city level: a measure that singles out the most highly concentrated banking markets (those where the HHI index exceeds 0.5); the HHI index in all other towns and cities; and a bank composition indicator that measures the percentage of bank branches in the town/city that are foreign-owned.

An important assumption in this analysis is that these three

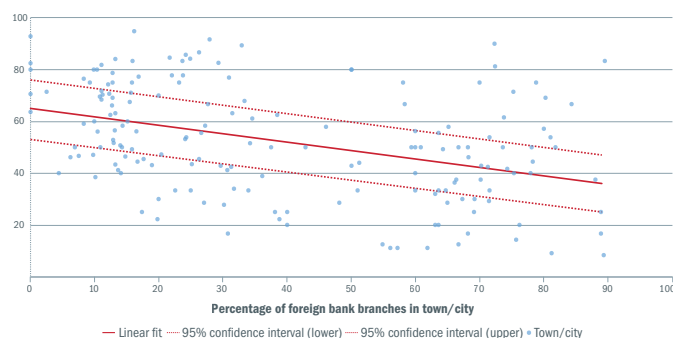
local banking variables (or “instruments”) are exogenous in the sense that they only affect firm-level innovation through their impact on the probability of firms being credit-constrained. While plausible, this exclusion restriction could be violated if the location of bank branches is related to local factors that are also correlated with firm-level innovation. While the validity of this assumption cannot be tested directly, there is some evidence to suggest that the concentration and composition of the local banking markets in this dataset are largely exogenous.

First, there is very little correlation between changes in the number of bank branches in a given region between 2002 and 2011 and innovative activity in that region in 2012. Second, the three instruments are not related to firms' credit demand. Thus, the structure of local credit markets does not appear to have

**CHART 4.8. Local bank concentration and firms' credit constraints**


Source: BEEPS V and BEPS II.

Note: This bar chart is based on data for all towns and cities with more than 10 BEEPS firms. The y-axis shows the average percentage of constrained firms in the relevant towns and cities. The bars group together towns and cities in increasing order of bank concentration. Concentration is measured by an HHI index where local market shares are expressed as the number of branches belonging to each bank.

**CHART 4.9. Presence of foreign banks and average credit constraints**


Source: BEEPS V, BEPS II and BankScope.

Note: This chart contains data for all towns and cities with more than 10 BEEPS firms.

responded in a systematic manner to local demand for external finance on the part of innovative firms. Third, in order to further mitigate endogeneity concerns, (unreported) town/city-level regressions were run where the dependent variable was either “HHI of town/city” or “share of foreign banks”.

This allows us to see the extent to which a battery of town/city-level firm characteristics (and industry fixed effects) can explain local banking structures. If the local banking structure is driven by the composition of the local business sector, we should find significant relationships between firm characteristics (averaged at town/city level) and that banking structure. In this case, there is no significant relationship between, on the one hand, the percentage of small firms, the percentage of large firms, the percentage of sole proprietorships, the percentage of privatised firms, the percentage of exporters or the percentage of audited firms and, on the other hand, bank concentration or the presence of foreign banks. Thus, it appears that the concentration and composition of these banking markets are unrelated to a large set of observable characteristics of the local business sector.

In addition to the three instrumental variables, various other firm and town/city-level characteristics are also included (but not shown for reasons of brevity). This ensures that the analysis carefully controls for other possible determinants of credit constraints. At firm level, these are: the firm's age and size; whether the firm's accounts are audited; whether the firm regularly trains its staff; whether it is quality-certified; whether it operates at national level; whether it expects sales to increase; whether it was previously state-owned; and the experience (in years) of the main manager.

At town/city level, these control variables include the size of the relevant town or city and whether that area is the main business centre in the country. They also include the BEEPS V firms' average responses to questions on: their use of high-speed internet; the frequency of power outages; their assessment of local security, business licensing policies and political instability; and the quality of local courts and the education of the workforce. In addition, they include country and industry fixed effects, so that the analysis effectively compares firms within the same geographical area and within the same industrial sector. This controls for unobservable characteristics common to firms in the same industry or country.

Column 1 shows that a higher HHI index (reflecting a more concentrated local banking market) is associated with a lower probability of a firm being credit-constrained, everything else being equal. In terms of economic magnitude, the coefficient implies that a 1-standard-deviation increase in local bank concentration reduces the probability of a firm being credit-constrained by 5.4 percentage points.

At the same time, however, credit constraints are higher in areas with very concentrated banking markets. This non-linear effect is in line with the literature cited above and shows that while banks' local market power can help firms to access credit, this only holds up to a certain point. When inter-bank competition declines too much, access to credit starts to suffer.

The U-shaped relationship between local bank concentration

and firms' credit constraints is depicted in Chart 4.8. On the horizontal axis all towns and cities have been allocated to one of five categories with increasing levels of bank concentration. The vertical axis indicates the average percentage of credit-constrained firms in each of those categories. The chart shows that while firms are initially less credit-constrained in more concentrated credit markets (that is to say, those with a higher HHI index), this effect is then reversed once a critical concentration threshold is crossed.

The negative coefficient for the variable "share of foreign banks" in Table 4.2 shows that a higher percentage of foreign-owned bank branches in a firm's town/city is also associated with less binding credit constraints. Foreign banks may be better placed than domestic banks when it comes to overcoming agency problems and lending to firms. This effect is fairly substantial. A 1-standard-deviation increase in this variable reduces the probability of a firm being credit-constrained by 5.6 percentage points. This reflects the fact that foreign banks are not disadvantaged relative to domestic banks when lending to small and medium-sized businesses. If anything, their presence in the area has had a positive impact on the ability of firms to access external funding. The negative relationship between the percentage of foreign banks and the intensity of credit constraints is also shown graphically in Chart 4.9.

If the positive impact that local bank concentration has on credit constraints reflects the increased ability of banks to build relationships with firms (as economic theory would suggest), this impact should be stronger for relatively opaque firms, for whom such lending relationships are most important.

Columns 2 to 7 in Table 4.2 provide evidence to support this assertion. These columns show interaction terms between the HHI index and various firm-level characteristics. They show that bank concentration reduces credit constraints particularly strongly for smaller firms (column 2), younger firms (column 3), firms without any quality certification (column 4) and unaudited firms (column 5). Together, these findings suggest that, across the transition region, moderately concentrated credit markets may, to some extent, alleviate credit constraints for opaque businesses.

For instance, column 2 shows that a 1-standard-deviation increase in bank concentration reduces the probability of being credit-constrained by 9.4 percentage points for the smallest firms in the sample. For the average firm the reduction is only 5.4 percentage points. That impact becomes progressively smaller for larger and older firms. When a firm reaches 245 employees or 23 years of age, bank concentration starts to have a negative impact on access to credit, indicating that larger and older firms benefit from inter-bank competition.

Columns 6 and 7 of Table 4.2 explore this idea further. In each column the firm sample is split into two groups. The impact that credit market concentration has on credit constraints is then estimated for each of these groups separately. Column 6 distinguishes between firms in high-tech and low-tech industries. High-tech industries are characterised by larger information asymmetries and more severe agency problems between borrowers and lenders. This reflects both the inherent riskiness

TABLE 4.3. Credit constraints and firm-level innovation

Dependent variable	Product innovation (1)	Process innovation (2)	Soft innovation (3)	At least two types of innovation (4)	At least three types of innovation (5)
Credit-constrained (0/1)	-0.4665** (0.2046)	-0.5730*** (0.2028)	-0.4006 (0.3029)	-0.4252** (0.2027)	-0.2711 (0.1703)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Area-level controls	Yes	Yes	Yes	Yes	Yes
Observations	4,278	4,281	4,260	4,289	4,289

Source: BEEPS V, BEPS II and BankScope.


Note: This table reports the results of regressions estimating the impact that credit constraints have on firm-level innovation. This is the second stage of our instrumental variable estimation. "Credit-constrained" is the endogenous variable, instrumented as in column 1 of Table 4.2. The inverse Mills ratio is derived from the probit model in column 1 of Table 4.2 and analogous probit models for the other columns. All regressions include industry and country fixed effects, town/city-level controls and a constant. Robust standard errors are given in parentheses; \*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively.

of high-tech investments and the fact that in high-tech industries collateral is typically intangible. It is therefore easier for firms in low-tech industries to obtain financing via arm's-length lending techniques, and this type of lending tends to perform better in less concentrated lending markets. The data support this theory, revealing that the impact that local bank concentration has on credit constraints in high-tech industries is almost twice the size of that seen for low-tech industries.

Next, column 7 distinguishes between industries with high (above median) and low (below median) dependence on external finance. Dependence on external finance is calculated by averaging, for each industry, the percentage of working capital that firms in that industry derive from sources other than internal funds and retained earnings (as reported by firms in the BEEPS V survey). As expected, the data show that the impact of bank concentration is more pronounced in industries that are heavily reliant on external funding.

### Step 2: Credit constraints and firm innovation

Table 4.3 provides estimates of the impact that credit constraints have on firm-level innovation. The main explanatory variable is "credit-constrained", a binary indicator derived from the initial analysis reported in Table 4.2. The analysis in Table 4.3 also takes account of various non-financial determinants of innovation, as well as industry and country fixed effects. Industry fixed effects are particularly important here, as certain industries may present firms with more innovation opportunities via intra-industry spillovers of knowledge and technology.

The first control variable is firm size, which is measured as the number of full-time employees. Firm size is included because larger companies may benefit more from innovative activities owing to economies of scale. The analysis also includes a binary variable indicating whether the firm has its annual financial statements certified by an external auditor. On average, 

31 per cent of all firms in the sample have such audited statements. A third firm-level characteristic is the firm's age, measured as the number of years since its incorporation. Young firms tend to be less transparent than older ones on account of their limited track record. They often also lack the knowledge and experience that is necessary to innovate.

It is also important to take account of a firm's intrinsic ability to innovate. Hence, a binary variable is included indicating whether the relevant firm has a formal training programme for its permanent employees. 37 per cent of all firms in the sample have such a programme. Moreover, in order to account for firms' efficiency, a binary variable is included that indicates whether the firm has an internationally recognised quality certification such as ISO 9000. Around 21 per cent of all firms have such a certification.

While economic literature emphasises the role played by competition in driving the returns derived from new technologies, the sign of that effect remains unclear.<sup>14</sup> On the one hand, innovation may decline with competition, as firms derive lower returns from the introduction of new technology. On the other hand, though, competition may also drive down mark-ups, encouraging firms to adopt new products and technologies. This analysis contains a measure of competition – a binary variable (“national sales”) that indicates whether the market for a firm's product is national, as opposed to local. Almost 35 per cent of all BEEPS firms report that their market is national.

Firms undertaking innovation presumably do so with an eye to expanding production and/or increasing efficiency. Thus, innovation may be a response to the investment opportunities available to a firm. While part of this effect is already captured by industry fixed effects, two additional variables are used to control for investment opportunities at the level of individual firms. First, a binary variable is included that indicates whether the firm expects its sales to increase over the next year. A total of 46 per cent of BEEPS firms have a positive growth outlook.

When this battery of firm and industry-level non-financial determinants of innovation are controlled for, we can see that credit-constrained firms are significantly less likely to innovate (see columns 1 and 2 of Table 4.3). The impact of credit constraints is also considerable. These estimates suggest that a credit-constrained firm is 30 percentage points less likely to carry out product innovation and 33 percentage points less likely to conduct process innovation, relative to an equivalent firm with no credit constraints.

Credit constraints have no discernible impact on “soft” innovation such as marketing or organisational innovation. This probably reflects the fact that the implementation of these types of innovation requires less funding and is therefore less dependent on the local availability of bank credit.

The (unreported) coefficients for the control variables are in line with expectations regarding the non-financial drivers of firm-level innovation. The statistically strongest results indicate that innovative activity is higher among firms that expect sales to increase, have recently invested in fixed assets, operate at national level, have a quality certification, use technology that is

licensed by a foreign-owned company and provide regular training for employees.

Another interesting question is whether innovation outcomes vary depending on the type of bank from which a firm borrows.

State-owned banks may act as conduits for government-funded programmes boosting firm-level innovation. They may, to some extent, also act like venture capitalists, as they are able to take on more risk (and longer-term risk) than private banks. In this case, borrowing from a state bank could be associated with higher levels of innovation relative to borrowing from a private domestic bank.

Foreign banks, on the other hand, may facilitate the transfer of know-how from foreign to domestic borrowers, thereby boosting the local adoption of foreign products and processes. However, despite all of this, further (unreported) analysis of the sample of borrowing firms suggests that clients of state and foreign banks do not innovate any more or less than firms borrowing from private domestic banks.

### Credit constraints and the nature of firm-level innovation

The preceding sections show that access to credit is associated with substantial increases in firm-level innovation, in the form of both new products and new production processes. This strong correlation continues to hold when controlling for an extensive set of firm and town/city-level characteristics and when correcting for the fact that part of this correlation may, to some extent, reflect “reverse causality”. Thus, the evidence suggests that having better access to bank credit does indeed cause firms to introduce new products and processes.

But how exactly does the ability to borrow from a bank help firms to become more innovative? Chart 4.10 provides some initial information on this subject, showing that firms change the way they innovate once credit constraints are loosened. The red bars show the breakdown of innovation strategies for credit-constrained firms, whereas the green bars show the breakdown for firms without financial constraints. Overall, the main strategies that firms use to introduce new technologies involve: (i) the exploitation and implementation of their own ideas; (ii) the licensing (or informal imitation) of products and processes developed by other firms (typically competitors); and (iii) the development of new products and the upgrading of production processes in cooperation with suppliers, clients and academic institutions.

When comparing the red and green bars, one key difference is the fact that unconstrained firms appear to find it easier to use (and pay for) external ideas. The percentage of firms that are reliant on their own ideas declines from 55 to 49 per cent in the case of product innovation and from 55 to 46 per cent in the case of process innovation. This decline is mirrored by increases in cooperation with suppliers and – more frequently – the licensing of products and processes developed by other firms. This suggests that access to credit may allow firms to access and implement external know-how more quickly and more easily. It also indicates that bank credit can help to facilitate the spread of technology across firms.

<sup>14</sup> See also Box 3.3 in Chapter 3.

Table 4.4 looks at these issues in more detail, applying a similar statistical framework to Table 4.3. More specifically, the table takes a set of innovation outcomes and looks at whether they are affected by firms' access to credit.

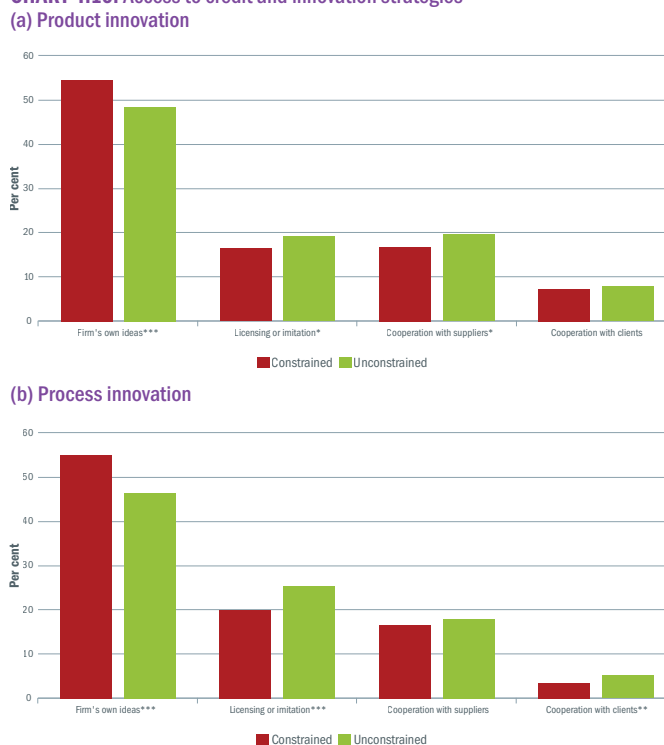
One striking result is that access to credit allows firms not only to introduce products and processes that are new to the firms themselves, but also to adopt products and processes that are new to the main markets where the firms sell their goods or services. This is particularly true of firms that serve a local market, but somewhat less clear-cut for firms that operate at national level. Access to credit helps firms to introduce technologies that are already available elsewhere in the country (or abroad) but are not yet available in their own local markets.

In line with some of the findings of Chart 4.10, this suggests that easier access to credit may help technologies to spread within countries and across local markets. Thus, policies that reduce credit constraints may have collateral benefits in the form of greater intranational diffusion of technology and a gradual reduction in regional growth disparities.<sup>15</sup>

Importantly, Table 4.4 also indicates a notable limitation of bank credit. In keeping with some of the arguments that were set out at the start of this chapter, data for the transition region show that there is no correlation between easier access to bank credit and in-house innovation in the form of R&D.

This suggests that while bank credit may help firms to adopt existing products and processes that have been developed elsewhere – technologies that are new to those firms and, in many cases, new to local and even national markets – it does little to boost original R&D by firms. ▶

CHART 4.10. Access to credit and innovation strategies



Source: BEEPS V.  
Note: These bar charts show the differences between the innovation strategies of firms that are credit-constrained and firms that are not. \*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively.

TABLE 4.4. Credit constraints and the nature of firm-level innovation

Dependent variable:	Product innovation			Process innovation			R&D and acquisition of external knowledge	
	New to firm's market (1)	New to local market (2)	New to national market (3)	New to firm's market (4)	New to local market (5)	New to national market (3)	Spent on external knowledge (4)	R&D (5)
Credit-constrained (0/1)	-0.3807** (0.1801)	-0.3190* (0.1793)	-0.2606* (0.1354)	-0.3529** (0.1535)	-0.2956** (0.1465)	-0.1587 (0.1005)	-0.0649 (0.1275)	-0.0310 (0.1458)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Town/city-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,289	4,289	4,289	4,289	4,289	4,289	4,289	4,289

Source: BEEPS V and BEPS II.

Note: This table reports the results of regressions estimating the impact that credit constraints have on various forms of firm-level innovation. This is the second stage of our instrumental variable estimation; the results of the first stage are reported in column 1 of Table 4.2. "Credit-constrained" is the endogenous variable. The inverse Mills ratio is derived from the probit model in column 1 of Table 4.3 and analogous probit models for the other columns. All regressions include industry and country fixed effects, town/city-level controls and a constant. Robust standard errors are given in parentheses; \*, \*\* and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively.

<sup>15</sup> Intranational technology spillovers tend to be considerably stronger than international spillovers. Eaton and Kortum (1999) look at a number of advanced countries and estimate that the rate of intranational diffusion within those countries is around 200 times the rate of international diffusion.

## Conclusion

The process of firms' adoption of technology is neither inevitable nor automatic.<sup>16</sup> Firms can remain stuck in a pattern of low productivity and weak growth for a long time, even after other businesses in the country have managed to upgrade their operations and move closer to the international technological frontier. Chapter 3 of this *Transition Report* outlined the main country-level barriers that are currently preventing firms across the EBRD region from benefiting from the world's technological advances.

This chapter has focused on one key determinant of technological progress at firm level: the ability of entrepreneurs to successfully tap into external funding sources. This analysis shows that while access to bank credit does not matter much for firms' capacity to conduct in-house R&D – for which access to private or public equity may be necessary (see Box 4.1) – it does determine the pace at which firms can upgrade their production processes, as well as the products and services they offer.

Thus, improving access to bank credit may allow firms in emerging markets to more effectively exploit the global pool of available technologies, increasing the productivity of these firms and helping these countries to catch up with more advanced economies.

Against this background, it is worrying that roughly a quarter of all firms that were interviewed for the BEEPS V survey indicated that they needed bank credit but were unable to access it. These firms either decided not to apply for a loan for fear of rejection or were refused one when they actually approached a bank.

Of course, not all the businesses will have been creditworthy, and banks may have been right not to lend to them. However, the findings presented in this chapter also indicate that factors external to firms (and thus external to their creditworthiness) are equally important for access to credit. In particular, the probability of a firm managing to access bank credit continues to be strongly influenced by the number and type of banks that happen to be in its immediate vicinity.

This raises the question of what policy-makers in the EBRD region can do to improve access to credit for small businesses. This question has become even more acute in the wake of the global financial crisis, which has had a particularly strong impact on smaller firms,<sup>17</sup> thus potentially delaying the economic recovery in many parts of the world.

Moreover, this chapter shows that, in addition to negative cyclical effects, the inability of firms to access bank credit may also have longer-term implications for growth, as credit-constrained firms will find it difficult to upgrade their products and production processes.

While short-term policy responses, such as special funding schemes for small firms, may have a role to play in alleviating such firms' funding constraints, they are unlikely to solve all problems in the long run. Instead, some banks – at least, those that target smaller businesses – may also need to adjust their lending models at the margins.

Recent research suggests that banks which engage in relationship lending – whereby banks develop long-term lending relationships with small and medium-sized firms, accumulating inside information about these companies – may be better able to lend to relatively opaque borrowers.<sup>18</sup> This is particularly true during cyclical downturns, when loan officers tend to be less able to rely on collateral and hard information and need, instead, to conduct an in-depth assessment of a firm's prospects. This requires more subtle judgements and better information about the abilities and determination of firms' owners and management. Relationship lenders tend to be better equipped to arrive at such judgements during an economic downturn.

Banks may also need to refine their business models in other ways. For example, financial innovation may contribute to gradual improvements in small firms' access to financing (see Box 4.2). Lastly, policy-makers can also help banks lend to smaller businesses by establishing credit bureaus and registries, which facilitate the sharing of borrower information among lenders.

<sup>16</sup> See Keller (2004).

<sup>17</sup> See Chodorow-Reich (2014).

<sup>18</sup> See Beck et al. (2014) for evidence relating to the transition region and Bolton et al. (2013) for evidence on Italy.

### BOX 4.1. Private equity and venture capital

Most innovative technologies and products have two things in common. First, they take many years to develop and have unpredictable returns, making them risky investments. Second, they are often introduced by start-ups and younger companies.<sup>19</sup> These characteristics mean that bank credit – and debt more generally – is not an ideal funding instrument for R&D, as this chapter demonstrates.

Instead, advanced economies have traditionally used equity to finance innovative companies. Private equity (PE) and venture capital (VC) funds provide equity to a diverse portfolio of companies, as well as offering know-how and incentives to help them realise their potential.

There is now growing evidence from both Europe and the United States that companies backed by PE or VC carry out more patented innovations and have their patents cited more often (an indication of the quality of these innovations).<sup>20</sup> This is not simply because PE/VC funds are good at picking the most promising companies and sectors. It also reflects the fact that these funds add economic value to companies in their portfolios through improvements in corporate governance, better monitoring of managers and superior access to human capital.<sup>21</sup>

While smaller and younger companies stand to gain the most from such professional expertise, equity financing can also benefit more established businesses. Without adequate modernisation or R&D, older and larger companies may find it hard to maintain brand names or introduce new products or processes. As a result, their growth may stagnate.

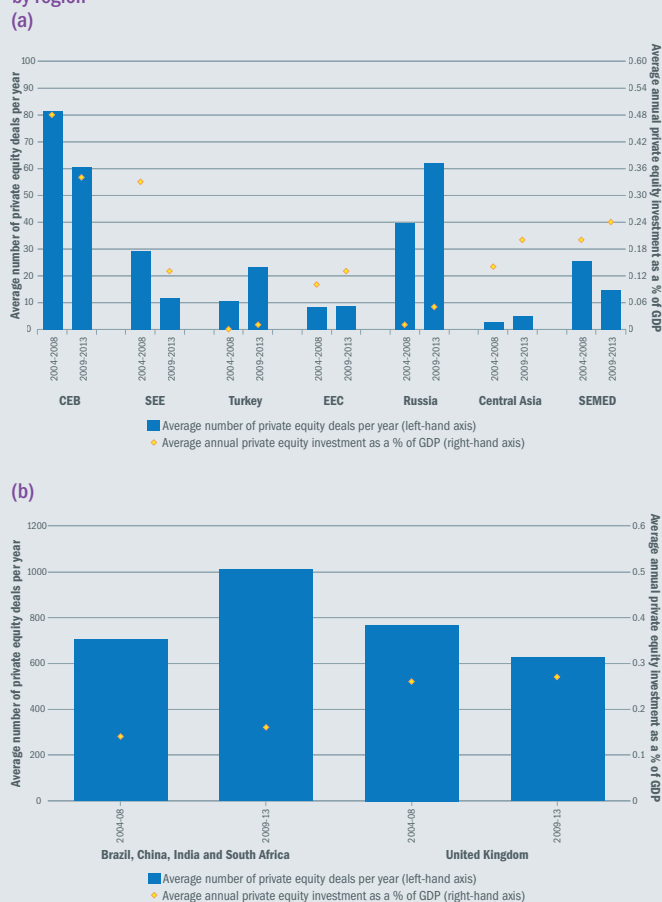
This is especially relevant for larger and older firms in the transition region that need to catch up with the technological frontier in terms of corporate governance and the sophistication of products. For these more established companies, equity financing may not only boost R&D, but also help them to catch up by adopting products and processes from elsewhere.

Unfortunately, over the past decade the transition region has seen only modest levels of PE/VC financing, which has tended to remain focused on the United States and western Europe. While equity funding is increasingly being directed towards emerging markets, the region has also lagged behind Brazil, China, India and South Africa when it comes to securing such funding.

Chart 4.1.1 shows, on the left-hand axis, the average number of private equity deals in each EBRD subregion (4.1.1a), comparing those figures with other emerging economies and the United Kingdom (4.1.1b). The CEB region and Russia stand out as having the highest number of deals in the transition region, which secures investment in a total of around 190 companies a year on average. However, this figure pales in comparison with Brazil, China, India and South Africa. The transition region also lags far behind the United Kingdom, where upwards of 600 companies typically attract equity investment in any given year.

Emerging markets have become more attractive for private equity investors over the past decade, but the impact of the global recession of 2009 has varied from country to country. The average number of private equity deals has risen considerably in Russia and Turkey, while the CEB, SEMED and SEE regions have all seen declines in the post-crisis period. This partly reflects the impact of bank deleveraging in Europe, with the United Kingdom also seeing fewer deals in this

CHART 4.1.1. Number of private equity deals and private equity penetration by region



Source: Thomson Reuters VentureXpert, July 2014.

Note: The left-hand axis measures the average number of portfolio companies receiving private equity financing per year. The right-hand axis measures the average private equity penetration rate – that is to say, average annual private equity investment as a percentage of current GDP.

<sup>19</sup> See Schneider and Veugelers (2010).

<sup>20</sup> See Lerner et al. (2011), Popov and Roosenboom (2009) and Cornelli et al. (2013).

<sup>21</sup> See Acharya et al. (2013) and Bernstein et al. (2014).

period. However, Brazil, China, India and South Africa are continuing to see strong growth in such deals.

Chart 4.1.1 also shows, on the right-hand axis, the penetration ratio for private-equity investment in the various EBRD regions (4.1.1a) and the same group of comparator countries (4.1.1b). The chart shows that in some of the largest transition countries, such as Russia and Turkey, PE/VC flows barely constitute 0.05 per cent of GDP, while that penetration ratio is typically upwards of 0.25 per cent in more mature markets. PE/VC penetration in the CEB region compares favourably with mature markets, despite a sizeable decline since 2008. The SEE region has also suffered a particularly strong decline in PE/VC penetration. Overall, then, the contribution that PE/VC investment makes to innovative activity may well remain limited in most of the EBRD region.

Why has private equity financing been so lacklustre in the region? Table 4.1.1 offers a few clues using an index that measures countries' attractiveness for venture capital and private equity.<sup>22</sup> The table contains details of six different indicators measuring how far each country is from the United States in terms of its attractiveness for equity financing.

Panel A shows the transition region and Panel B shows a set of comparator countries. The table shows that the development of capital markets is a significant area in this regard – one in which the transition region is a long way from catching up with the major emerging economies and more developed economies. The lack of developed stock markets, the paucity of opportunities for initial public offerings and mergers and acquisitions, and the immature credit markets all serve to discourage PE/VC funds, for which viable exit strategies are crucial in order to realise financial returns. The region also scores less favourably in terms of its human and social environment, indicating that it does not have sufficient human capital to attract PE/VC investors. In addition, there is room for improvement both in terms of the ease of doing business and corporate R&D spending (in order to boost entrepreneurial opportunities) and in terms of investor protection and corporate governance rules. On a more positive note, the region's taxation system compares favourably with developed economies.

ON AVERAGE, ABOUT  
**190**  
 COMPANIES ACROSS  
 THE TRANSITION REGION  
 ATTRACT PRIVATE  
 EQUITY INVESTMENT  
 IN A GIVEN YEAR

IN RUSSIA AND TURKEY,  
 TOTAL FLOWS OF PRIVATE EQUITY  
 AND VENTURE CAPITAL  
 (AS A PERCENTAGE OF GDP)  
 ARE LESS THAN  
**20%**  
 OF THE FLOWS OBSERVED  
 IN MORE MATURE MARKETS

<sup>22</sup> See the 2014 Venture Capital and Private Equity Country Attractiveness Index produced by the IESE and EMLYON business schools (<http://blog.iese.edu/vcpeindex>).



**TABLE 4.1.1. Distance to developed venture capital and private equity markets**  
Panel A

Country	Ranking	Index	Economic activity	Capital markets	Taxation	Investor protection and corporate governance	Human and social environment	Entrepreneurial opportunities
Poland	29	69.9	81.2	70.0	101.3	69.5	61.5	64.0
Turkey	30	69.7	90.2	75.2	109.4	67.4	51.0	60.5
Russia	41	63.0	91.7	72.1	100.7	46.5	33.6	66.5
Lithuania	43	61.0	68.9	47.1	103.2	74.5	65.2	62.7
Hungary	45	58.8	72.8	45.6	96.5	63.6	64.3	60.5
Slovak Rep.	48	56.8	66.6	48.7	94.2	59.3	54.2	57.7
Morocco	49	55.2	81.1	51.3	108.2	60.3	38.5	50.1
Slovenia	50	54.5	59.5	33.3	112.1	68.0	70.4	66.8
Estonia	51	54.2	62.1	31.4	109.2	85.2	61.6	65.9
Romania	52	53.9	83.2	42.4	83.1	58.7	42.4	58.6
Jordan	53	53.5	66.4	45.9	95.4	47.9	58.6	52.4
Latvia	55	53.2	68.3	32.0	107.2	77.7	58.7	61.1
Bulgaria	56	53.2	63.5	40.6	89.1	55.4	62.1	55.9
Tunisia	60	50.3	64.1	44.1	109.2	63.7	50.9	38.6
Ukraine	63	48.0	72.8	49.2	82.7	43.3	27.0	48.7
Croatia	64	47.6	60.3	34.1	108.1	53.6	41.3	56.8
Egypt	69	46.4	76.6	49.3	83.0	46.6	19.8	46.7
Kazakhstan	70	45.9	90.4	23.9	98.2	64.5	42.1	56.5
Georgia	71	45.9	57.5	27.3	104.7	61.7	58.8	50.7
Bosnia and Herz.	75	43.6	42.5	31.0	74.5	52.6	53.0	50.7
FYR Macedonia	78	42.9	36.6	25.3	93.8	67.0	59.9	53.2
Serbia	79	42.8	55.9	26.7	44.8	47.7	57.8	55.0
Montenegro	84	38.8	35.1	20.5	86.6	71.0	74.9	40.2
Armenia	86	38.6	52.0	16.8	94.4	66.8	46.0	55.8
Mongolia	87	38.3	72.3	18.7	73.6	55.8	40.6	48.5
Belarus	92	33.1	78.5	12.0	93.8	35.2	44.2	53.6
Moldova	96	29.0	56.1	11.4	93.2	54.1	26.2	41.4
Kyrgyz Rep.	101	25.4	58.2	10.5	66.5	45.0	23.2	33.1
Albania	106	23.4	54.5	5.0	74.9	57.7	37.6	42.7

Panel B

Country	Ranking	Index	Economic activity	Capital markets	Taxation	Investor protection and corporate governance	Human and social environment	Entrepreneurial opportunities
United States	1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
United Kingdom	4	95.3	92.2	87.2	122.6	107.9	103.4	92.4
China	22	78.4	116.5	86.0	109.6	62.6	53.1	73.4
India	28	70.7	94.5	81.4	84.7	66.0	49.2	60.8
South Africa	32	69.4	62.3	76.8	111.3	87.1	43.6	67.4
Brazil	40	64.0	94.7	77.3	23.0	58.0	55.1	55.5

Source: 2014 Venture Capital and Private Equity Country Attractiveness Index.

Note: The Venture Capital and Private Equity Country Attractiveness Index measures the attractiveness of a country for investors in limited partnerships on the basis of six key drivers: economic activity (size of the economy, GDP growth and unemployment); capital markets (size and liquidity of stock markets, IPO and M&A activity, credit markets and sophistication of financial markets); taxation (entrepreneurial tax incentives and administrative burdens); investor protection (quality of corporate governance, security of property rights and quality of legal enforcement); human and social environment (human capital, labour market policies and crime); and entrepreneurial opportunities (innovation capacity, ease of doing business and corporate R&D). The United States is used as a benchmark, with values equal to 100; lower values indicate lower levels of attractiveness. Azerbaijan, Kosovo, Tajikistan, Turkmenistan and Uzbekistan are not covered.

**BOX 4.2. Financial innovation**

Firm-level innovation – and private-sector dynamism more generally – may pose challenges to banks and other financial intermediaries that need to decide which entrepreneurs deserve funding and which do not. The more quickly technologies evolve, the more difficult it is for banks to distinguish between creditworthy loan applicants and firms that are too risky.

To some extent, this is simply because business plans that involve new and untested products or processes are more difficult to evaluate. It may also be complicated to value collateral that involves new technologies. Consequently, if they are to continue lending to innovative firms, banks will have to constantly update their screening processes. Thus, banks themselves will need to innovate if they are to continue facilitating firm-level innovation.<sup>23</sup>

Across the transition region, various forms of financial innovation are currently helping banks and other financial service providers to continue lending to a broad spectrum of clients.

**Factoring:** Factoring involves the sale of accounts receivable, at a discount, to a specialist lender. This is an important source of external financing for small and medium-sized enterprises (SMEs) around the world. Total global turnover from factoring stood at €2.2 trillion in 2013 and has been growing at an average annual rate of 15 per cent in the wake of the global financial crisis. This suggests that factoring has acted as a substitute for traditional bank lending in the tight credit environment currently faced by SMEs. An important innovation in the area of factoring has been the emergence of invoice-trading platforms. These platforms enable SMEs to auction off their receivables to a broader range of institutional investors with greater flexibility. This helps firms to gain access to more cost-efficient working capital. Following the success of the US-based Receivables Exchange, a number of similar start-ups have emerged in other countries. Slovenia's Borza Terjatev is the first online receivables exchange in the EBRD region.

**Credit scoring:** Banks use credit scoring to automatically process information on a small number of standard characteristics of borrowers in order to predict the credit risk associated with each borrower. This was originally used for consumer and mortgage lending, but in the 1990s it began to be used for small business loans as well, after Fair, Isaac and Company developed a credit-scoring model for SME lending in the United States. Today, over 90 per cent of US small business lenders use this technique. Across the transition region, more and more banks and microfinance institutions are introducing credit-scoring tools as part of broader improvements in screening and underwriting policies. One particularly interesting example is the recent introduction

by various Turkish banks of a credit-scoring tool aimed specifically at farmers and small-scale agricultural firms. This agricultural client assessment programme was developed by the Frankfurt School of Finance & Management to help financial institutions lend to agricultural firms. The innovative credit-scoring tool allows relationship managers and loan officers with limited knowledge of agriculture to process loan applications submitted by farmers and entrepreneurs working in the areas of crop production, dairy production, cattle fattening, apiculture and poultry.

**Online lenders:** Online financial service providers vary widely – from those that lend to businesses from their own balance sheets (such as the US-based OnDeck or Kabbage) to peer-to-peer (P2P) business lenders (such as the UK-based FundingCircle), which link institutional investors with borrowers and charge a fee for the origination and vetting. These organisations use proprietary credit algorithms to gain a better understanding of small businesses' financial health and make quick decisions on lending. In the transition region, the first online lenders are only just beginning to emerge. The Estonian company isePankur has gained traction in the area of P2P lending, although it focuses on consumer loans, rather than lending to businesses.

**"Big data" and alternative data sources:** The screening of SMEs is particularly challenging in emerging markets, where credit bureaus often have only patchy coverage, firms' financial histories are limited and collateral is often unavailable. A number of start-ups are trying to address this issue by leveraging alternative data sources (such as applicants' online transaction records, mobile phone usage and activity on social networks) to evaluate repayment risk. German company Kreditech, which has offices in Prague, Moscow, Warsaw and Ukraine, sells a credit-scoring tool that is based on "big data" (such as e-commerce transactions). It also underwrites its own consumer loans in a number of countries (including Russia and Poland). Meanwhile, Friendscore.com is a Polish start-up that sells lenders credit scorecards that are based on Facebook data.

**Psychometric testing:** A growing number of financial institutions are assessing business owners' creditworthiness using computer-based psychometric tests. By asking questions about applicants' characters, abilities and attitudes, they hope to identify high-potential, low-risk entrepreneurs (who may not have a credit history or collateral). A psychometric test developed by the Entrepreneurial Finance Lab – a spin-off from a Harvard University research project – is currently being applied by various financial institutions across Latin America, Asia and Africa.

<sup>23</sup> See Laeven et al. (2013).

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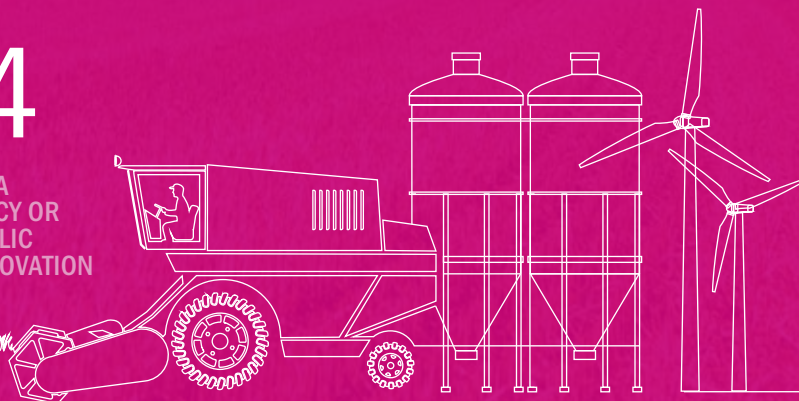
# POLICIES SUPPORTING INNOVATION

## AT A GLANCE

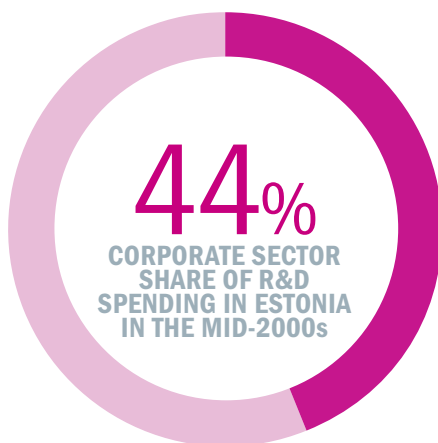
AS OF  
**2014**

ALL TRANSITION COUNTRIES HAVE A NATIONWIDE POLICY OR STRATEGY ON PUBLIC SUPPORT FOR INNOVATION

ICT, ENERGY AND BIOTECHNOLOGY ARE  
**PRIORITY AREAS**  
FOR INNOVATION SPENDING IN ALL TRANSITION COUNTRIES



**Countries at different stages of development vary in their capacity to create and use knowledge. This is shaped by various factors, which include the conditions that enable countries to access, absorb and create new technologies. Policies designed to support innovation need to take these individual circumstances into account. However, analysis reveals that innovation policies across the transition region are surprisingly similar, being characterised by an excessive focus on the creation of technology and insufficient attention to the absorption of technology. Analysis also suggests that strong governance, sophisticated public administrations and private-sector involvement are crucial for the success of innovation policies.**



## Introduction

Governments everywhere acknowledge the importance of innovation for long-term growth. This is most noticeable in countries where the easy options have been exhausted and future growth depends on more efficient ways of combining inputs or producing new or improved outputs.

Furthermore, the creation and spread of new knowledge are associated with significant market failures. For example, an individual firm deciding whether to invest in research and development (R&D) may fail to take account of the potential for positive spillovers to occur as the knowledge created becomes available to the wider economy. Such externalities call for government action.

Governments can support innovation directly, either by funding public research or by encouraging private investment in research and innovation (for example through support for the transfer and spread of technology, support for venture capital, seed capital and R&D, and innovation-related tax incentives or incentives fostering cooperation between industry and science). They can also foster innovation indirectly, by providing a suitable environment for firms that are willing to invest and innovate.

The policy mix should take account of potential externalities stemming from innovation by individual firms, as well as the degree of competition within the relevant sector. Most policy options will favour one sector over another, and some sectors may require specific interventions. This may force governments to make difficult choices, striking a balance between direct support for innovation and improvements in the general environment.

The combination of policy objectives and instruments should be tailored to a country's level of development and the strengths and weaknesses of its innovation system, so it should vary both across countries and over time. Although some countries in the EBRD region have made important technological breakthroughs in the past – such as Sputnik 1, the first artificial satellite to orbit the Earth, and Vostok 1, the world's first manned spacecraft – they are not currently operating at the technological frontier in most areas.

Instead, they are at various stages of the catching-up process. Furthermore, the legacy of centrally planned innovation systems still looms large over much of the EBRD region – particularly in the countries of the former Soviet Union, where most research work was conducted by special research institutes, rather than universities or private companies.<sup>1</sup> Although the pure science and innovation that resulted from these top-down systems was sometimes very advanced, it often failed to translate into commercially viable applications, as links with industry were weak. While there are examples of innovative companies subsequently emerging from these environments, the interface between research and the rest of the economy remains rudimentary at best.

With this in mind, this chapter provides an overview of science, technology and innovation policies (henceforth simply referred to as “innovation policies”) in transition countries and assesses their appropriateness given the level of development ▶

<sup>1</sup> In the Baltic states the centrally planned system that was previously used to manage and finance science was rapidly dismantled, thanks to the efforts of the scientific unions that launched R&D reform in 1990. See Kristapsons et al. (2003).

in these countries. It first analyses the potential for transition countries to follow a knowledge-based growth path, given their current position in terms of innovation. It then discusses the main characteristics of the innovation policies currently being pursued, before looking at whether such policies are in line with these countries' levels of development and their potential for knowledge-based growth. It concludes by providing guidelines for more differentiated and more appropriate innovation policies in individual countries in the region.

## Potential for knowledge-based growth

### Stages of innovation development

Transition countries differ significantly in terms of their rates of innovation and the ways in which firms acquire or create the know-how that they need. The analysis in Chapter 3 demonstrates that both firm-specific factors (such as a firm's age, size and ownership) and country-specific factors (such as the business environment) influence innovation. The importance of these factors varies depending on a country's position relative to the global technological frontier – in other words, whether a country is in a pre-catching-up phase, a catching-up phase or a post-catching-up phase.<sup>2</sup>

The way in which firms acquire the knowledge that underpins innovation tends to differ across these stages of development. As Chapter 1 shows, countries can be grouped together in four broad categories in terms of the main ways in which knowledge is obtained: (i) "low innovation" countries (where few companies spend money on buying or producing knowledge); (ii) "buy" countries (where firms predominantly buy technology, and relatively few firms engage in in-house R&D); (iii) "make and buy" countries (where firms are more active in terms of in-house R&D, relative to the purchasing or licensing of patents and know-how); and (iv) "make" countries (where firms are even more active in terms of in-house R&D).

In general, analysis suggests that in countries with very low levels of development (in other words, countries in the pre-catching-up phase) the take-up of new technology is often still slow (or absent entirely). This is partly because insufficient human capital severely constrains technological progress. As economies develop and move into the catching-up phase, the pace of such take-up starts to vary greatly, even across countries that are at similar levels of development.<sup>3</sup> One explanation for this heterogeneity in take-up rates is differences in countries' access to (typically foreign) technology, particularly information and communication technology (ICT).

The openness of a country's economy to foreign direct investment (FDI) and other forms of international cooperation are the key channels that determine the extent to which a country that is catching up with the technological frontier is able to tap the global pool of existing technologies.<sup>4</sup> In particular, attracting FDI helps countries to effectively absorb such technologies. For instance, the Spanish-based firm Grupo Industrial Roquet is investing, in cooperation with the EBRD, in the production of

standard hydraulic cylinders for agricultural and construction machinery in Romania. The use of modern technology – particularly as regards welding techniques and other modern production facilities – was essential to obtaining the approval of major international clients such as Kubota, Caterpillar and John Deere.

This absorptive capacity also depends on many other factors. Among these are: (i) the availability of technologically literate workers (reflecting both the quality of education and the effectiveness of on-the-job training programmes); (ii) good management skills; (iii) incentives for firms to use higher-technology processes; (iv) access to capital; and (v) the existence of adequate public-sector institutions which will support the take-up of critical technologies where market forces prove to be insufficient.<sup>5</sup>

As countries develop further and move closer to the technological frontier, another factor explaining the heterogeneity of the take-up of technology comes into play. This factor is the capacity of countries to create their own knowledge as they move from the "buy" group to the "make and buy" group.<sup>6</sup> The adoption of technology and its modification to suit local circumstances tend to be more effective when domestic firms have R&D programmes.

At higher levels of development (as countries move to the "make" group), a country's own R&D can increasingly start to generate new processes and products, particularly in areas where the country has developed advanced capabilities. In this post-catching-up phase, countries require cutting edge know-how, supported by both public and private R&D and good links between the two. Incentives for investment in R&D and innovation, which should already have been put in place, now become crucial. This requires access to markets where there is strong demand for new products, as well as effective intellectual property rights, tailored finance and access to specific skills.

### Conditions for knowledge-based growth

These prerequisites for knowledge-based growth can be grouped together under broader business environment conditions (or framework conditions). Such conditions affect the operations and decisions of all firms in the economy, particularly firms that innovate. Some conditions affect specific aspects of firms' capacity to innovate. Business environment conditions include the quality of institutions (in other words, the legal and administrative framework that underpins interaction between individuals, firms and governments), macroeconomic stability and the functioning of product, labour and financial markets. (The importance of these factors as drivers of innovation is discussed in Chapter 3.)

Taking into account differences in levels of development, the conditions influencing innovative capacity can be divided into those affecting access to foreign technology, those affecting firms' capacity to adopt and fully understand existing technologies, and those affecting the ability to create knowledge.<sup>7</sup>

For instance, access to technology depends on a country's economic openness, the availability and use of ICT infrastructure

<sup>2</sup> See Lall (1992) and Verspagen (1991).

<sup>3</sup> See World Bank (2008).

<sup>4</sup> That being said, trade protection has been used by several countries that were successful in catching up in the 19th and 20th centuries, including Germany, Japan and South Korea (see Mazzoleni and Nelson, 2007), and initial tariffs for skill-intensive industries have been found to be positively correlated with long-term growth in GDP per capita (see Nunn and Trefler, 2010).

<sup>5</sup> See World Bank (2008).

<sup>6</sup> See Acemoğlu et al. (2006).

<sup>7</sup> For a more detailed description and explanation of the various prerequisites and their measurement, see Veuglers (2011) and Annex 5.2 to this *Transition Report* (available in the online version only).

and the extent to which FDI facilitates the transfer of technology. Absorptive capacity is underpinned by the quality of secondary and undergraduate education, the effectiveness of on-the-job training and the extent of any “brain drain”. Creative capacity depends crucially on: (i) the quality of postgraduate education; (ii) the availability of highly qualified scientists and engineers; (iii) flexible product and labour markets; (iv) the quality of scientific research institutions; (v) effective cooperation between science and industry in the field of research; (vi) the protection of intellectual property; and (vii) the availability of venture capital.

### Conditions for innovation

Thus, as countries develop, the relevant conditions need to evolve in order to support knowledge-based growth. Having better access to technology without an educated workforce that is capable of effectively absorbing such technology will make it difficult for countries to progress to the “buy” stage of knowledge acquisition. Countries that become successful at absorbing technology and seek to create knowledge will need to improve the availability of specific skills. They will also need to strengthen links between public scientific institutions and the private sector.<sup>8</sup>

Policies that help to improve these conditions must evolve accordingly, depending on the extent to which conditions supporting knowledge-based growth are already in place. Where countries are still in the early stages of technological development, policies should focus on fulfilling the conditions for access to and absorption of technology.

In these circumstances, a policy mix that focuses solely on strengthening creative capacity (for instance, through increases in venture capital or grants fostering cooperation between industry and science) may yield only limited results. At the same time, these factors cannot be completely ignored, as elements such as cooperation between industry and science and the quality of scientific research institutions take a long time to improve.

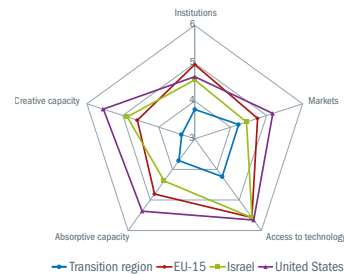
### Assessment of prerequisites

A simple framework comprising six sets of conditions for knowledge-based growth (the quality of institutions, the macroeconomic environment, the functioning of markets, access to technology, absorptive capacity and creative capacity) is used below to provide a brief assessment of the conditions for innovation in individual countries in the transition region.

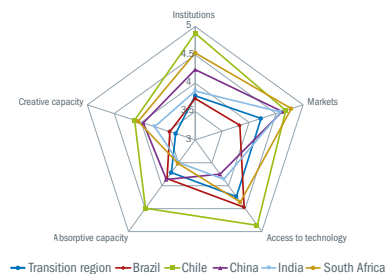
Assessment in these areas is based on the relevant global competitiveness indicators. Data on these indicators are provided not only for the transition countries, but also for a number of advanced economies (in other words, countries operating at the technological frontier) and emerging market comparators.<sup>9</sup> The scores reflect the establishment of various regulations (such as laws protecting intellectual property or requirements that need to be fulfilled in order to start a new company) and their implementation, as well as expert assessments of the quality of economic institutions and firms’ capacity to access and absorb technology.

The largest gap between the transition countries and the

**CHART 5.1. Assessment of framework conditions in transition countries and comparators**  
**(a) Advanced industrialised economies**



**(b) Emerging markets**



Source: World Economic Forum (2013) and authors’ calculations.

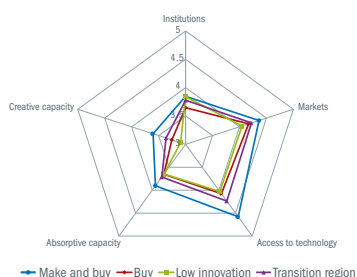
Note: The scores for each indicator range from 1 to 7, where 1 corresponds to the worst possible outcome and 7 corresponds to the best possible outcome. Scores for “macroeconomic stability” are not shown, given the extraordinary circumstances affecting this broad framework condition in the review period. Data are not available for Belarus, Kosovo, Tajikistan, Turkmenistan or Uzbekistan. Figures for the transition region are unweighted cross-country averages.

advanced economies relates to the capacity to create knowledge (see Chart 5.1a). While transition countries score relatively well on the availability of scientists and engineers (thanks to the emphasis placed on science and technology in the days of centrally planned economies), they lag behind when it comes to the quality of scientific research institutions and the availability of venture capital.

The gap between transition and advanced economies in terms of their absorptive capacity and access to technology is smaller, but still substantial, driven primarily by the lower availability and use of ICT in transition countries. This is also the area where differences within the transition region are the largest. This suggests that countries in the region tend not to fully exploit the potential of ICT when fostering innovation-based growth. ◀

<sup>8</sup> See Aghion et al. (2009b) for a discussion of specific aspects of human resources, which influence a country’s absorptive and creative capacity.

<sup>9</sup> See World Economic Forum (2013); macroeconomic stability scores are not reported. The World Bank knowledge economy indicators provide a similar assessment, but a less detailed one for the purposes of analysis in this chapter.

**CHART 5.2. Framework conditions in transition countries**


**Source:** World Economic Forum (2013) and authors' calculations.

**Note:** Transition countries are grouped together on the basis of the methodology presented in Chapter 1. (See Chapter 1 for a list of the countries in each category.) The scores for each indicator range from 1 to 7, where 1 corresponds to the worst possible outcome and 7 corresponds to the best possible outcome. Scores for "macroeconomic stability" are not shown, given the extraordinary circumstances affecting this broad framework condition in the review period. Data are not available for Belarus, Kosovo, Tajikistan, Turkmenistan or Uzbekistan. Figures are unweighted cross-country averages.

☉ A lower use of ICT often reflects insufficiently dynamic product and labour markets, as well as inadequate university systems.<sup>10</sup>

Transition countries perform somewhat better when it comes to broad business environment conditions such as the functioning of markets, although the gap in terms of the quality of institutions is sizeable.

Differences relative to other emerging markets (such as Brazil, Chile, China, India and South Africa) are smaller (see Chart 5.1b). However, the transition region is not in the lead on any aspect. Indeed, it trails all of those comparators when it comes to the capacity to create knowledge (where Chile scores highest).

Within the transition region, countries differ substantially in terms of the conditions for innovation. As expected, countries in the "make and buy" group tend to score higher than the "buy" and "low innovation" countries on all aspects (see Chart 5.2). In turn, the "buy" countries score higher than the "low innovation" countries on all aspects (with the exception of the quality of institutions, where differences are generally smaller).

These broad trends mask substantial heterogeneity within each group. For instance, Hungary, Poland and Turkey score highest among the countries in the "buy" group, signalling greater potential for knowledge-based growth. However, all of these countries have areas where they underperform. Hungary scores relatively poorly on the quality of institutions. Poland does badly on education and Turkey underperforms when it comes to labour market efficiency and the use of ICT.

Countries in the "low innovation" category have made substantial improvements since 2007, particularly in terms of the quality of institutions, access to technology and absorptive capacity. In these areas they have closed all or most of the gap

relative to countries in the "buy" category. However, they continue to be held back by insufficient competition in their product markets, as well as their relatively inefficient labour and financial markets.

Regardless of these differences, the fact that countries that are more highly developed score better on all conditions for innovation suggests that they need to be looked at as a whole. Estonia, the transition country with the highest score in terms of the conditions for innovation, illustrates the importance of such a systemic approach to innovation (see Box 5.1).

## Innovation policies: one size fits all?

Innovation policies can play a crucial role in improving the conditions for innovation, identifying and addressing bottlenecks that impair the ability of countries to innovate and improve productivity.

In fact, as of 2014 all countries in the EBRD region have drafted a nationwide policy or strategy with a view to providing public support for innovation activities. Most countries established the bulk of their policy frameworks during the 2000s. Some countries (such as Tajikistan and Turkmenistan) did not start outlining their priorities until more recently. This section examines these policies, looking at the extent to which they reflect countries' potential for knowledge-based growth as assessed in the previous section.

In order to obtain detailed information about innovation policies in transition countries, the government bodies in charge of innovation policy in all countries where the EBRD works were asked to complete a questionnaire in summer 2014.

A total of 19 countries responded in time to be included in this analysis. The response rate was relatively high among countries at the "make and buy" stage (with Bulgaria, Croatia, Kosovo, Latvia, Lithuania, Romania, Slovak Republic and Slovenia all replying). A similarly high response rate was seen among those at the "buy" stage (with Bosnia and Herzegovina, Cyprus, Hungary, the Kyrgyz Republic, Moldova, Poland, Serbia, Tunisia and Ukraine responding as well). Meanwhile, in the "low innovation" category only two countries responded (Albania and Armenia).<sup>11</sup> The survey evidence was supplemented with information from publicly available sources.

## Policy objectives

The survey results suggest that there is remarkably little variation across transition countries in terms of the objectives of innovation policy (see Chart 5.3). Virtually all countries regarded the objectives of enhancing the contribution that public research organisations make to the country's innovation performance and improving the business environment for innovative firms as either "important" or "highly important". All of them also placed considerable emphasis on better links between science and industry. Such links included improved commercialisation of academic research.

In contrast, while the objective of producing educated and trained personnel – a critical factor underpinning a country's

<sup>10</sup> See Aghion et al. (2009a).

<sup>11</sup> Caution is warranted in view of this small and biased sample. Respondents are also likely to be subjective, with a bias towards favourable assessments.



capacity to efficiently adapt and use new technologies – was considered important, it tended to score less than the top priorities referred to above. Furthermore, some countries at the “buy” stage ranked it lower than countries in the “make and buy” category. This was surprising, given that “buy” countries would be expected to place greater emphasis on factors facilitating the absorption of technology.<sup>12</sup>

### Economic and financial instruments

The consensus among the transition countries extends to the preferred policy instruments for supporting innovation. The three instruments most frequently regarded as “important” or “highly important” are (i) competitive funding of R&D, (ii) support for the transfer of technology and (iii) incentives for cooperation between industry and science (see Chart 5.4).

At first glance, this support for the transfer of technology appears to be well suited to the needs of emerging market economies, where the adoption of existing technology plays a prominent role. On closer inspection, however, we can see that policies primarily target the transfer of technology from science to industry. Virtually all countries (with the exception of Bulgaria) report that they have government initiatives in place aimed at helping to translate research in universities and public research organisations into innovation, together with initiatives strengthening research in these institutes.

At the same time, initiatives supporting firms’ absorption of technology (the spread of technology and technology matching services<sup>13</sup>) are, on average, deemed only “somewhat important”. What is more, the actual initiatives often focus on the transfer of technology from science to industry (see Box 5.2). While public research institutes are encouraged to develop applied technologies, incentives for firms to take on and commercialise these technologies often remain weak. This potentially undermines the effectiveness of technology transfer policies. (See Box 5.3 for a more detailed assessment of the links between industry and science in transition countries.)

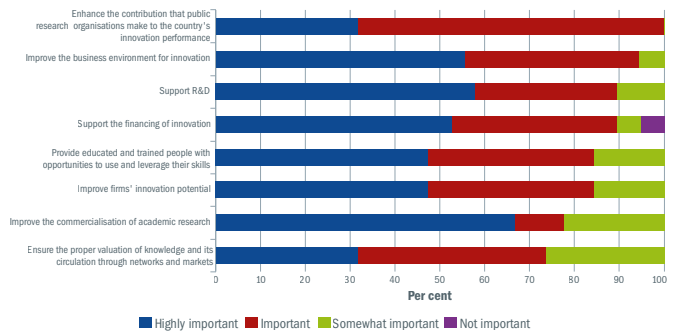
Almost all countries also report support for small and medium-sized enterprises (SMEs) and start-ups – mostly in the form of project-based financial support, incubators, and science and technology parks. Such location-based innovation policies – specific measures directed at well-defined geographical areas – are in place in virtually all transition countries. These policies provide for the direct financing of economic activities or establish special regulations governing targeted areas. They also aim to promote a culture of competitiveness and innovation among the firms located there and seek to stimulate technological spillovers. (See Box 5.4 for further discussion of location-based policies.)

Support for venture and seed capital is more prominent in the more advanced transition economies (although even there it remains relatively modest, as discussed in Box 4.1).

### One size fits all?

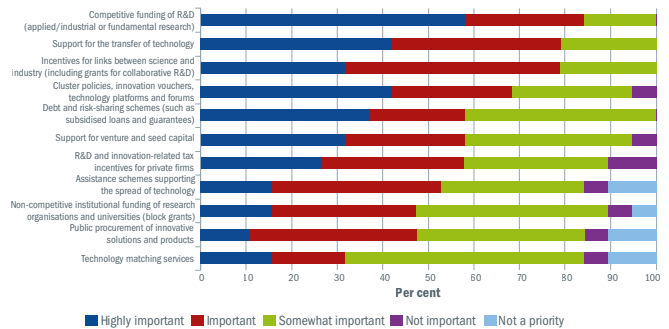
Overall, policy priorities and instruments look remarkably similar across the entire transition region, despite fairly large differences in terms of the level of development and the potential for

CHART 5.3. Relative importance of objectives of innovation policy in transition countries



Source: EBRD innovation policy questionnaire and authors' calculations.  
Note: This chart ranks the strategic objectives of innovation policy in descending order according to the percentage of countries that regard them as “highly important” or “important”.

CHART 5.4. Economic and financial instruments of innovation policy



Source: EBRD innovation policy questionnaire and authors' calculations.  
Note: This chart ranks economic and financial instruments of innovation policy in descending order according to the percentage of countries that regard them as “highly important” or “important”.

<sup>12</sup> Among countries in the “make and buy” category, the most frequent response for this objective was “highly important”; among countries in the “buy” category, it was “important”.

<sup>13</sup> Technology matching services are web-based platforms that connect organisations offering technology with those seeking technology and technological solutions.

◉ **knowledge-based growth.** This suggests that the stated policy targets and instrument mixes are, in most cases, insufficiently tailored to the specific circumstances of countries, with policy choices seemingly following the fashion of the day.

Analysis suggests that, with some exceptions, transition economies tend to follow the type of innovation policy that is typically used by advanced economies. They do not necessarily identify priority areas on the basis of careful analysis of their current strengths and comparative advantages.<sup>14</sup>

The overarching focus on the development of high-tech industries and the omnipresent objective of improving the contribution that public research organisations make to the country's innovation performance are perhaps the clearest illustration of this.

This kind of “one size fits all” approach may not suit many of the transition countries. Given the current prerequisites for knowledge-based growth in these countries, governments need to focus more on supporting the absorption and adaptation of existing cutting-edge technology, which features far less prominently as a priority. Similarly, greater attention needs to be paid to improving the formation of human capital in universities, which may often focus excessively on academic patenting. In extreme cases, simply taking innovation policies that are designed for advanced economies and transposing them to transition countries may be more of a deterrent, rather than acting as a catalyst for knowledge-based growth.

### Design and governance

One area where innovation systems could usefully imitate advanced economies is policy design and governance.

Effective innovation policies rely on the careful identification of key bottlenecks preventing innovation. This is important, because policies need to evolve as a country's innovation develops. Continued monitoring of a country's performance in terms of framework conditions can guide the design, evaluation and adaptation of its innovation policy mix.

Identifying bottlenecks requires close communication with the intended recipients of innovation support. It also calls for regular evaluation of the outcomes of policies and an ability to learn from past mistakes.<sup>15</sup> The use and effectiveness of programmes targeting innovation should not only be monitored, but also benchmarked and evaluated. Future policy design phases should use the results of such evaluation exercises.<sup>16</sup> Most countries that responded to the EBRD's innovation policy questionnaire indicated that they assess the effectiveness of spending on innovation support. However, closer inspection of published evaluation exercises suggests that such appraisals are rarely rigorous – even in advanced economies.

Furthermore, three-quarters of respondents reported that they always or usually use the continuation of existing schemes as a selection criterion when choosing instruments. There may be good reasons for this. Continuity of innovation policies increases the private sector's willingness to undertake risky investments with a long payback period. In addition, the results of innovation policies that depend on such investments may take a long time

to materialise. At the same time, continuity needs to be weighed against the need to evaluate policies, learn from past mistakes and redesign policies as the economy evolves.

Finland's centres of excellence (CoEs) in the field of research are a good example of best practice in terms of governance. This government programme was launched in 1994 for a fixed term of six years and has since been repeated a number of times. CoEs consist of a number of cutting-edge research teams working closely together. The Academy of Finland, which allocates funding to CoEs, establishes priorities in terms of the subject areas to be covered and sets quantifiable targets to be reached by the end of the six-year term, as well as specific short-term objectives. CoEs receive funding in two instalments – one at the beginning of the six-year term and one at the mid-point. The programme is managed by sub-regional councils, which act as an interface with the private sector and various levels of government. A CoE can apply to participate in a new programme at the end of its term, but whether or not its application is successful is determined by the quality of its scientific research plan.<sup>17</sup>

The effectiveness of innovation policies also depends on the overall quality of governance in the countries that implement them. In this regard, only five survey respondents reported that they never use ad hoc selection criteria or take account of the lobbying activities of particular groups. Weak governance may be particularly damaging when it comes to identifying priority sectors and the allocation of related subsidies and concessions. In general, governments tend not to be particularly good at picking winners, and identifying losers has proven politically difficult. Authorities in countries with weak governance are likely to have particularly poor track records in these areas.

### Use of vertical targeting and smart specialisation

Vertical innovation policies require high standards of governance to be effective, so they may not suit many of the transition economies. Broader sectoral coverage may be particularly advantageous for countries in the early stages of development. Their existing innovation capacity in any specific field is typically too weak to warrant a clear focus based on indigenous strengths. In contrast, broader support for multiple sectors may help to strengthen the general innovation capacity of countries, with strong competitive positions in specific areas being developed over time.

At the same time, the economies in the region have a long history of attempting policies aimed at specific sectors or technologies. While most of these countries do not focus their public support on a single sector, they do tend to identify a few priority areas. As with other features of innovation policy in the region, countries tend to focus on similar priority areas (see Chart 5.5). They show little variation based on their individual circumstances, the existing structure of production or their skills mix.

All transition countries regard ICT, energy, biosciences and biotechnology as “highly important” or “important” priority areas for public innovation spending. Other sectors that are at least “somewhat important” in all countries are the environment, food,

<sup>14</sup>Tötting and Trippl (2005) and European Commission (2013) both come to a similar conclusion regarding EU member states. European Commission exercises such as the National Reform Programmes, the European Semester and smart specialisation programmes tend to heavily influence the innovation policies of transition countries in the EU.

<sup>15</sup>See Rodrik (2008) for a discussion of “embeddedness” as a key feature of policy design.

<sup>16</sup>See Rodrik (2008).

<sup>17</sup>See Pietrobelli (2009) and [www.aka.fi/en-GB/A/Programmes-and-cooperation/Centres-of-Excellence/](http://www.aka.fi/en-GB/A/Programmes-and-cooperation/Centres-of-Excellence/) (last accessed on 30 September 2014).

digital services and healthcare. There are also a few country-specific priorities. For instance, Kazakhstan, Turkmenistan and Ukraine pay special attention to the energy sector. Belarus and Kazakhstan place emphasis on heavy industries, building on their legacy from the Soviet era. The ICT sector, which is prioritised virtually across the board, is a particularly strong focus for at least three countries – Armenia, Azerbaijan and Egypt – with several dedicated initiatives and programmes (see Box 5.5).

Where countries decide to make active use of vertical policies providing benefits and subsidies to specific sectors or firms, a number of safeguards could help to minimise the risks associated with such policies and increase their effectiveness.

First, in order to minimise rent-seeking behaviour by firms and officials, vertical targeting of particular sectors or firms needs to be based on strict eligibility criteria.<sup>18</sup> These criteria include the potential benefits for the broader economy and the degree of competition within the sector.

In this respect, reporting details of activities and spending carried out under innovation support programmes (as well as the beneficiaries of such initiatives) may help to strengthen the governance of these programmes. In EU member states, support for innovation generally constitutes state aid and falls under the corresponding rules governing monitoring and reporting.

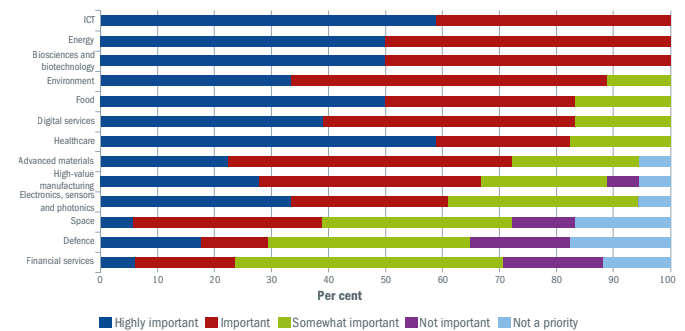
Second, vertical policies need to be complemented by horizontal measures. Such measures will create better conditions for productivity growth across all sectors, for instance by improving the business environment, increasing the efficiency of product and labour markets and investing in education and professional training. Effective horizontal policies which address bottlenecks affecting innovation (such as corruption, inadequate skills among the workforce, and customs and trade regulations) help firms in all sectors, including those identified as priorities. In addition, effective horizontal policies are often a prerequisite if vertical policies are to yield positive results.

In this regard, improving access to ICT can in fact be seen as an important horizontal policy aimed at improving the productivity of firms in all sectors that actively use ICT services. At the same time, not all countries can or should aspire to becoming a major hub for the development of cutting-edge ICT, given their comparative advantages.

A country's strengths may lie in the application of cutting-edge technology in medium or low-tech sectors, such as food or textiles. These sectors are often overlooked by innovation policies (which tend to target cutting-edge innovation in high-tech sectors), but they may deliver sizeable returns to innovation.

Third, vertical policies should make effective use of private-sector participation and co-financing. Private-sector involvement provides an independent assessment of the commercial viability of projects which are selected to receive preferential treatment and reduces risks associated with governments picking winners. Private-sector involvement can also strengthen publicly funded education and training programmes. For example, the Estonian Association of Information Technology and Telecommunications (EAITT), an industry association, plays a leading role in the development of clusters and the design of vocational and university education programmes.<sup>19</sup>

CHART 5.5. Priority areas for innovation spending



Source: EBRD innovation policy questionnaire and authors' calculations.

Note: This chart ranks priority areas for innovation spending in descending order according to the percentage of countries that regard them as "highly important" or "important".

## VERTICAL INNOVATION POLICIES

REQUIRE HIGH STANDARDS OF GOVERNANCE IN ORDER TO BE EFFECTIVE, SO THEY MAY NOT SUIT MANY TRANSITION COUNTRIES

<sup>18</sup> See Rodrik (2008), Aghion et al. (2012) and Aghion et al. (2014).

<sup>19</sup> See OECD (2013). The EAITT is responsible for several initiatives, including the Ustus Agur Scholarship (which is awarded to a doctoral student working in the field of ICT at a public university) and the Idea of the Year (which celebrates ideas or projects that have had a particularly strong impact on the field of ICT). This year, the Idea of the Year was the Tallinn University of Technology's new undergraduate programme "Integrated Engineering" – Estonia's first English-language undergraduate programme in the field of engineering.

Private-sector involvement can also help countries and regions to pursue “smart specialisation”. Rather than targeting entire sectors, such as ICT or biotechnology, this approach focuses on promoting investment in particular activities that can strengthen comparative advantages in existing or new areas, rather than targets.<sup>20</sup> One such example is precision farming – the management of farming practices using computers, satellite positioning systems and remote sensors. These determine whether crops are growing with maximum efficiency given the specific local environmental conditions and form the basis for decisions on seed rates and the application of fertilisers and agrochemicals. In food processing, ICT can be used to record a product’s every movement and the various stages of the production process using barcodes or radio-frequency identification (RFID) tags and other tracking media. Such traceability is a key risk management tool, allowing food businesses and authorities to withdraw or recall products which have been identified as unsafe. In the EU, traceability has been compulsory for all food and feed businesses since 2002.

Such smart specialisation relies on entrepreneurs identifying market opportunities and promising areas in which to specialise. The role of the government is to provide an environment that allows this process to happen and remove obstacles to the development of promising new activities.

## Conclusion and guidelines

The analysis in this chapter shows that countries at different stages of development vary in terms of their ability to use and create knowledge. This ability is shaped by the quality of institutions, macroeconomic stability, and the functioning of product, labour and financial markets. It is also determined by specific conditions underpinning a country’s ability to effectively access and absorb existing technology and create new technology.

Transition countries perform reasonably well in terms of access to technology, but they lag behind advanced economies and many other emerging markets when it comes to absorptive and creative capacity. Analysis reveals that transition countries have surprisingly similar innovation policies, despite the underlying differences in these countries’ potential for knowledge-based growth and the ways in which their firms tend to acquire knowledge. This indicates that the stated policy targets and instrument mixes are, in most cases, insufficiently tailored to the specific circumstances of these countries.

In particular, innovation policies in the region tend to follow trends set by advanced economies, focusing on the creation of new technology. There is an overarching focus on developing high-tech industries and improving the contribution that public research organisations make to innovation performance, seemingly with the aim of creating the next Silicon Valley.

However, this kind of “one size fits all” approach may not suit many transition countries. Given that these countries are not yet operating at the technological frontier, policies need to prioritise improvements in absorptive capacity. Such improvements can be

achieved through greater economic openness, better secondary education and professional training, better management practices, and policies that alleviate credit constraints.

As countries develop and approach the technological frontier, innovation policies need to evolve. They should place greater emphasis on helping firms to improve their capacity to create knowledge by facilitating the supply of specialist skills and specialist finance, strengthening competition and facilitating the entry and exit of firms.

While policy instruments and priority areas need to be tailored to the specific circumstances of countries, innovation systems could usefully imitate the governance and general policy design seen in advanced economies. They should also ensure maximum transparency when allocating innovation support and striking an appropriate balance between horizontal and vertical policy elements.

To be effective, vertical innovation policies focusing on support for particular sectors require high standards of governance and high-quality economic institutions. Given the weak economic institutions in many transition countries, such policies may not suit many of them. The high risk of manipulation by interest groups may outweigh the potential benefits of more targeted support. Instead, policies should initially prioritise improvements in institutional quality and address common bottlenecks affecting innovation in all sectors (such as poor skills among the workforce or burdensome customs and trade regulations).

If direct government support is provided to particular sectors or firms, such vertical policies should make effective use of private-sector participation. This would provide an independent assessment of the commercial viability of projects receiving preferential treatment and encourage smart specialisation. Policy instruments need to include clear conditionalities linked to addressing the bottlenecks identified. They should also specify exit strategies to mitigate the risk of firms becoming addicted to support.

Policies should be subject to regular evaluations, with reviews linked to these evaluations. Thus, the design and implementation of effective innovation policies requires a sophisticated public administration with the capacity to regularly evaluate a country’s strengths and weaknesses and collect the data necessary to conduct such assessments. This calls for the quality of public administration to be improved in the area of innovation policy, for instance by providing universities with the resources and incentives needed to properly train future civil servants. That may, in itself, be an important aspect of a country’s innovation policy mix.

<sup>20</sup> See Foray et al. (2009), Foray and Goenaga (2013) and OECD (2013).

### BOX 5.1. Knowledge-based Estonia

Back in the early 1990s Estonia had similar conditions to Latvia and Lithuania in terms of innovation and the development of ICT. These countries have since followed separate development paths, and they now differ significantly in these areas. Estonia is currently the highest scoring transition country in terms of innovation potential, while Latvia and Lithuania lag some way behind (see Chart 5.1.1).

Estonia began to develop its ICT infrastructure at an early stage. When it gained independence, only half of the population had a phone line. By 1997, however, 97 per cent of Estonian schools had internet access. The first public Wi-Fi area was created in 2001, and most public locations now have wireless internet access. Indeed, by May 2013, 4G services covered over 95 per cent of the country. Estonian citizens can now use the internet to vote, transfer money and access information that the state holds on them – all using the identity card introduced in 2002.

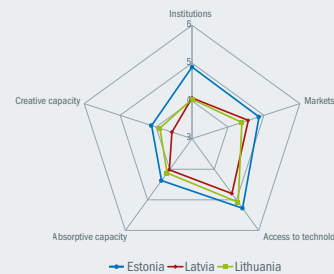
Estonia's innovation policy formally began in 2000 with discussions regarding the first Knowledge-Based Estonia (KBE) strategy, which covered the period 2002-06. This strategy drew on the experiences of Finland and Sweden,<sup>21</sup> taking account of specific development opportunities, the existing research potential and the country's economic structure, as well as other Estonian development strategies.<sup>22</sup> The two main objectives were updating Estonia's knowledge pool and increasing the competitiveness of its companies. The three key areas for Estonian research, development and innovation (RDI) were (i) user-friendly information technology and the development of an information society; (ii) biomedicine; and (iii) material technology.<sup>23</sup>

In order to achieve these objectives, the KBE strategy established a set of measures spanning four key areas (see Table 5.1.1). These measures sought to increase gross domestic expenditure on R&D (GERD) to 1.5 per cent of GDP by 2006. They also aimed to rebalance expenditure on research and development, seeking to shift the breakdown between the two from 90:10 to 60:40 by 2006. To increase the effectiveness of its RDI system, Estonia adopted location-based policies, creating science parks and regional business incubators. Lastly, Estonia used international cooperation not only as a means of attracting foreign knowledge and technology, but also as a way of building research teams with critical mass and avoiding "brain drain".

The 2002-06 programme produced mixed results. In terms of R&D financing, GERD accounted for 1.13 per cent of GDP in 2006, below the target level. As a result of this shortfall in financing, national R&D programmes in selected key areas were not launched and financial support for graduate and postgraduate studies did not increase substantially. However, growth in corporate R&D outpaced growth in public-sector R&D. By 2006 the corporate sector accounted for 44 per cent of GERD, exceeding the target by some distance. Estonia was also successful in attracting foreign R&D investment, which grew from 13 to 16 per cent of GERD, higher than the EU average of 7 to 8 per cent. This was evidence of stronger links between Estonian RDI and the rest of the world.<sup>24</sup>

The KBE strategy for the period 2002-06 has been followed by similar strategies for the periods 2007-13 and 2014-20. A number of governmental and independent bodies have conducted assessments looking at the progress made under the first two strategies. ▶

CHART 5.1.1. Framework conditions in Estonia, Latvia and Lithuania



Source: World Economic Forum (2013) and authors' calculations.

Note: The scores for each indicator range from 1 to 7, where 1 corresponds to the worst possible outcome and 7 corresponds to the best possible outcome. Scores for "macroeconomic stability" are not shown, given the extraordinary circumstances affecting this broad framework condition in the review period.

TABLE 5.1.1. Major tools of the KBE strategy for the period 2002-06

Key areas	Types of programme/initiative
Financing of R&D	Targeted financing R&D grants and loans for firms and research institutes Infrastructure of R&D institutions Risk capital scheme
Development of human capital	In-service training scheme for engineers and specialists Funding for masters and doctoral studies (including studies abroad) Funding for university infrastructure Scheme to involve PhD graduates and post-doctoral students in RDI Multifaceted courses allowing students and researchers to acquire management and business skills
Increasing the effectiveness of RDI systems	Regular collation, storage and dissemination of scientific information Innovation awareness programme Training programme focusing on the management of RDI Science and technology parks in Tallinn and Tartu and incubators in the regions Liaison between research and industry, and research-intensive spin-offs
International cooperation	Stronger Estonian participation in international RDI networks Network of Estonian technological attachés

Source: Reid and Walendowski (2006).

<sup>21</sup> See OECD (2010) and Polt et al. (2007).

<sup>22</sup> Such as the country's educational strategy (entitled "Learning Estonia").

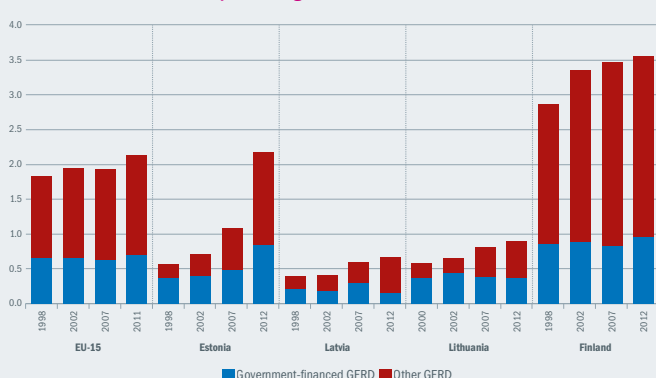
<sup>23</sup> See "Knowledge-Based Estonia: Estonian Strategy for Research and Development 2002-06", Estonian Ministry of Education and Research.

<sup>24</sup> See "Knowledge-Based Estonia: Estonian Research and Development and Innovation Strategy 2007-13", Estonian Ministry of Education and Research.

**TABLE 5.1.2. Objectives of KBE strategies**

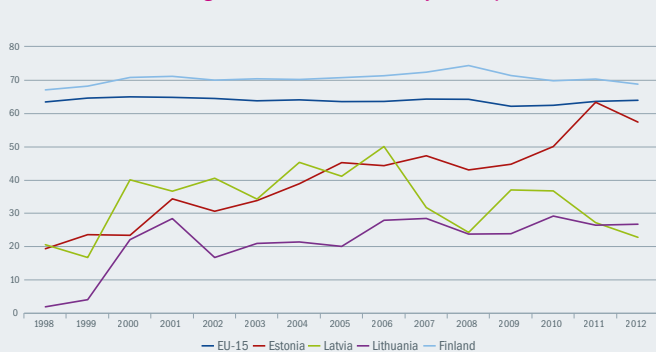
Period	Objectives
2002-06	An updated knowledge pool An increase in the competitiveness of Estonian companies
2007-13	Competitive and more intensive R&D Innovative entrepreneurship, creating new value in the global economy An innovation-friendly society targeting long-term development
2014-20	A diverse range of high-quality research in Estonia R&D that acts in the interests of Estonia's society and economy R&D that makes the structure of the economy more knowledge-intensive An active and visible role for Estonia in international RDI cooperation

Source: KBE 2002-06, KBE 2007-13 and KBE 2014-20.

**CHART 5.1.2. GERD as a percentage of GDP**


Source: Eurostat and authors' calculations.

Note: Other GERD includes business enterprise, higher education and private non-profit GERD.

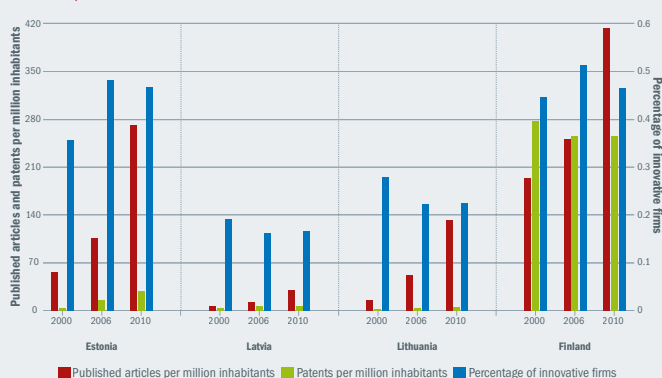
**CHART 5.1.3. Percentage of GERD accounted for by the corporate sector**


Source: Eurostat and authors' calculations.

Each strategy has taken account of the experience and expert recommendations resulting from the preceding period and set more ambitious objectives, with targets increasing in number and scope (see Table 5.1.2). The key areas have been adjusted over time, but the overall priorities have not. The focus continues to be on ICT, health technology and services, and more efficient use of resources.<sup>25</sup>

This "systemic" approach to innovation policy has produced results. In 2012 Estonia's GERD stood at 2.2 per cent of GDP (higher than the average across the EU-15). Meanwhile, the percentage of GERD accounted for by the corporate sector had risen further to stand at 57 per cent, approaching the EU-15 average (see Charts 5.1.2 and 5.1.3). Estonia was also one of the few EU countries that broadly maintained the same level of spending on public R&D during the crisis. In both Latvia and Lithuania, on the other hand, government-financed GERD declined as a percentage of GDP during this period.

Improvements can also be seen in terms of scientific and innovation output (see Chart 5.1.4). Estonia still lags some way behind Finland when it comes to patent applications, but it is catching up in terms of published articles. Moreover, in 2010 similar percentages of Estonian and Finnish firms introduced product or process innovations. Meanwhile, Latvia and Lithuania both trail behind Estonia for all indicators of R&D spending and output.

**CHART 5.1.4. Indicators of innovation output for Estonia, Latvia, Lithuania and Finland, 2000-10**


Source: Eurostat, Web of Science and authors' calculations.

Note: Patents per million inhabitants are calculated as patent applications to the European Patent Office by priority year per million inhabitants. The percentage of innovative firms is taken from the Community Innovation Survey and includes product and process innovation, but not organisational or marketing innovation.

<sup>25</sup> According to KBE 2014-20, this last priority may include material science, which was one of the areas targeted by the 2002-06 strategy.

### BOX 5.2. Public support for the transfer and spread of technology

While 80 per cent of the transition countries that participated in the EBRD's survey on innovation policy in summer 2014 regarded support for the transfer of technology from science to industry as important or highly important, only half of them regarded support for firms' adoption of existing technology as equally important.

On closer inspection, even in those countries where the adoption of existing technology is an explicit priority, policies typically focus on fostering links between industry and science, rather than helping firms to absorb and adapt foreign technology.

Public support for the transfer of technology comes in different forms. It includes: R&D cooperation centres; technology transfer offices; grants promoting cooperation between industry and science; innovation vouchers (which can be used for specific purposes); exchange programmes for people working in academia and industry; and information dissemination services.

For instance, in the early 2000s Hungary established a network of 19 cooperative research centres (CRCs) and 19 regional knowledge centres (RKC)s<sup>26</sup> with the aim of strengthening links between industry and science and promoting the spread of technology.<sup>27</sup> Between 2007 and 2009 public support provided to firms by those CRCs and RKC)s totalled €34 million. This support helped them to purchase equipment, acquire external expertise and protect intellectual property rights. In addition, 15 technology transfer offices help researchers in major universities with their patenting, licensing and fundraising activities.<sup>28</sup>

Many countries finance joint R&D projects that bring together representatives of the scientific community and industry. In Armenia, for instance, the State Committee of Science, which was established in 2007, supports cooperation between industry and science in areas chosen by public agencies where there is the potential for research to be commercialised. In 2011, for example, 11 projects received funding totalling €2.4 million.<sup>29</sup> In Moldova, the Agency for Innovation and Technology Transfer provides grants to small consortiums of researchers and businesses conducting innovation and technology transfer projects (with a total of 17 projects being supported in 2014). Projects are selected annually on the basis of a competitive evaluation of funding proposals. At least 50 per cent of a project's funding must come from private sources and can be in-kind.<sup>30</sup> The programme's overall budget for the period 2005-12 totalled €5.3 million.<sup>31</sup>

Some countries use innovation voucher schemes to foster the transfer of knowledge from academic and public research organisations to SMEs. In 2008, for example, Bulgaria launched a scheme which covers the cost of consultancy services provided by external experts. Two options are available under the scheme: vouchers for up to €2,500 and vouchers for up to €7,500. The latter requires co-financing totalling at least 20 per cent. This programme's budget for the period 2008-10 was €2.3 million.<sup>32</sup>

Staff exchanges are another important channel supporting the transfer of knowledge between different parts of a national innovation system. Between 2007 and 2009 Romania provided funding to PhD students undertaking three months of cross-sector training in a public or private research laboratory as part of a human resources programme

under the 2007-13 National RDI Plan.<sup>33</sup> The maximum financial support provided was RON 8,500, covering mobility expenses and up to 30 per cent of charges for access to research infrastructure.<sup>34</sup>

Some countries also use information dissemination services to promote awareness of new technologies and inventions among the business community. In 2012 the Kyrgyz Republic launched a three-year programme aimed at innovative SMEs with a budget of €17,000. An initial survey was conducted in order to analyse the use of new technologies and the level of innovation in the country. Nine public centres providing patent search services have now been established, and training for SMEs focusing on the transfer of technology is scheduled for 2014.<sup>35</sup>

Significant amounts are being spent on the transfer and spread of technology, but it is not entirely clear whether these initiatives are proving successful in terms of creating better links between science and industry. Box 5.3 looks at the results in more detail.

<sup>26</sup> See the section on the development and strengthening of research and development centres on the Hungarian pages of the ERAWATCH website: [http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country\\_pages/hu/country](http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country_pages/hu/country).

<sup>27</sup> See OECD (2008).

<sup>28</sup> See the section on knowledge transfer on the Hungarian pages of the ERAWATCH website: [http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country\\_pages/hu/country](http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country_pages/hu/country).

<sup>29</sup> See UNECE (2014).

<sup>30</sup> See the section on innovation and technology transfer projects on the Moldovan pages of the ERAWATCH website: [http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country\\_pages/md/country](http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country_pages/md/country).

<sup>31</sup> Agency for Innovation and Technology Transfer, Moldova.

<sup>32</sup> See the section on knowledge triangle policies on the Bulgarian pages of the ERAWATCH website: [http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country\\_pages/bg/country](http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country_pages/bg/country).

<sup>33</sup> See the section on knowledge triangle policies on the Romanian pages of the ERAWATCH website: [http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country\\_pages/ro/country](http://erawatch.jrc.ec.europa.eu/erawatch/openncms/information/country_pages/ro/country).

### BOX 5.3. Assessment of links between industry and science in transition countries

The previous box reviewed various schemes for fostering links between industry and science. To assess the effectiveness of such initiatives, we can look at various indicators of links between the two.

One such indicator is based on patent information. It is available for all countries over a long period of time, but it covers only a fraction of the links between industry and science. It looks only at the information contained in patents, so it is unlikely to capture the majority of the links between industry and science, particularly in countries that are in the process of catching up with the technological frontier.<sup>36</sup>

Chart 1.15 in Chapter 1 showed that, when compared with the United States or Germany, a remarkably large percentage of patents in transition countries are applied for by universities or public research organisations. This is particularly true of Russia, Poland and Ukraine, where more than a third of all patents are held by universities or research institutes. In countries such as Estonia, Slovenia and the Czech Republic, academic patenting is much closer to the levels observed in the United States and Germany. Meanwhile, Turkey has very low levels of academic patenting.

Furthermore, while co-patenting involving academia and industry is relatively rare everywhere, its incidence in the transition region is relatively high compared with the United States. Russia stands out in this regard, accounting for 62 per cent of all co-patenting in the transition region. This suggests that universities and research institutes have a high degree of involvement in the development of technology, especially in Russia. Consequently, links between industry and science in transition countries such as Russia mostly involve the scientific community supplying new technology to industry.

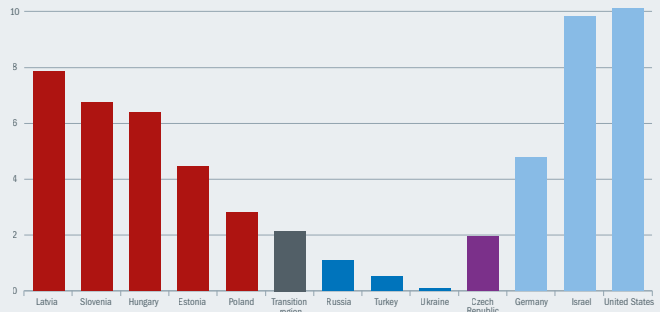
The picture is dramatically different when looking at such links from the perspective of corporate demand – in other words, when looking at how often corporate patents refer to scientific literature (scientific non-patent references) as prior art for patented inventions.

When assessed on the basis of this indicator, Russia and Ukraine score very poorly (see Chart 5.3.1). Latvia, Slovenia, Hungary and Estonia, on the other hand, score much better than other major patenting countries in the transition region, albeit they still lag behind the United States. Israel scores almost as highly as the United States on this indicator. With few patents being used as prior art for further patenting by firms, the impact of academic patenting in the transition region is likely to be limited in practice.

Thus, these data suggest that what is lacking in most transition countries – including those where the scientific community develops a lot of new technology – is a corporate sector that actively uses its links with science to innovate. There is a policy bias in this regard, with countries stimulating the supply of new technology – rather than demand for it – without much regard for the country's level of innovation.

Overall, this assessment raises the question of whether industry actually needs the results of scientific research conducted by local public institutions and whether it has sufficient capacity and incentives to take those findings on board. It also indicates that policies need to pay greater attention to industry demand in the area of innovation.

**CHART 5.3.1.** Corporate patents with scientific non-patent references as a percentage of total corporate patents, 2000-10



**Source:** PATSTAT and authors' calculations.

**Note:** Data cover all patent applications reported in PATSTAT that originate in the relevant country. The figure for the transition region is an unweighted average, including only countries with at least 1,000 patent applications. This leads to the exclusion of Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Egypt, FYR Macedonia, Georgia, Jordan, Kazakhstan, the Kyrgyz Republic, Mongolia, Montenegro, Tajikistan, Tunisia and Uzbekistan. Croatia is not included because its sectoral allocation is not reliable.

<sup>34</sup> National Council of Scientific Research in Higher Education, Romania.

<sup>35</sup> State Service of Intellectual Property and Innovation, part of the government of the Kyrgyz Republic. See Government Decree No. 593 of 2011.

<sup>36</sup> For more detailed discussion and analysis of patent-based indicators of links between industry and science, see Veugelers et al. (2012).



### BOX 5.4. Location-based policies

Location-based innovation policies can be found in almost all transition countries, typically in the form of science, technology and research parks, technology centres, and designated science cities (see Chart 5.4.1).

Location-based policies are fairly popular in central Europe and the Baltic states – particularly in Hungary, where more than 200 industrial parks can be found. They are even more popular in Russia. The former Soviet Union pioneered innovation-oriented location-based policies, which were underpinned by public investment in science and fundamental research. The innovation model followed by the Soviet authorities as of the early 1930s involved the creation of “special-regime enclaves intended to promote innovation”.<sup>37</sup> These enclaves initially took the form of secret research and development laboratories (referred to as Experimental Design Bureaus or, more commonly, *sharashkas*) in the Soviet Gulag system. They were later followed by science cities, closed cities and academic cities.

Today, 14 locations are officially designated as *naukograds* (science cities). In addition, the country has almost 30 national research universities (NRUs) and numerous business incubators, technology parks and technology transfer centres, as well as five special economic zones (SEZs) focused on innovation, and the Skolkovo innovation centre.<sup>38</sup> In some of these locations, a pilot programme for innovation-oriented hubs was launched in 2012.

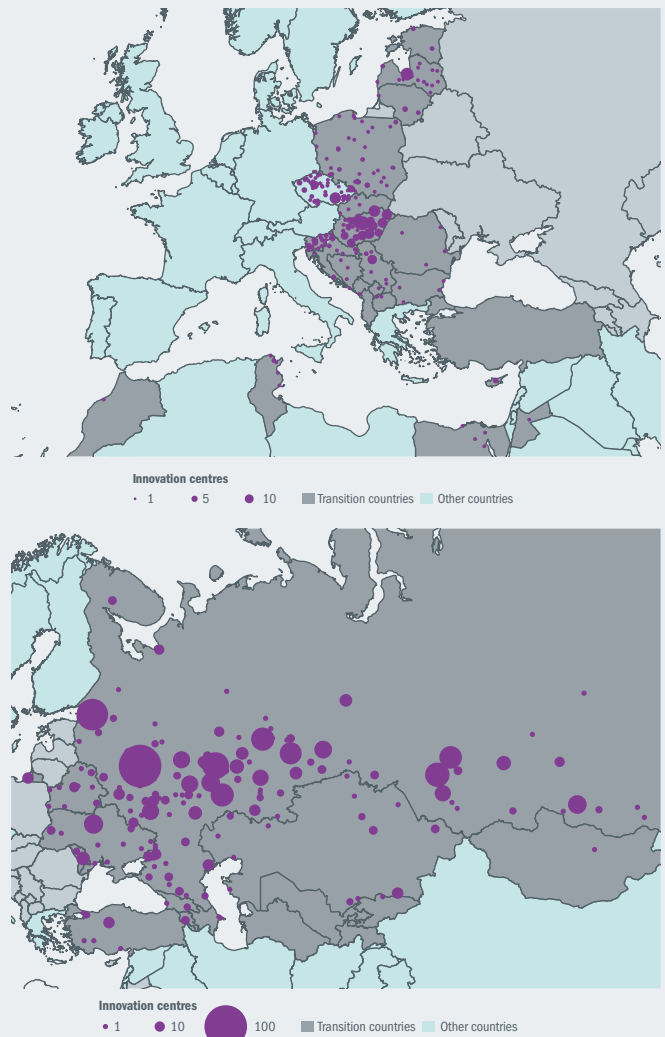
Most of these parks are linked to a specific university or research institution and publicly funded (particularly in Russia), further highlighting the focus on the supply of new technology. However, there are exceptions, such as Technopolis Pulkovo (a commercially funded science and technology park in St Petersburg), which is wholly owned by Technopolis plc, a Finnish public limited liability company.<sup>39</sup> The park aims to support knowledge-intensive companies and start-ups and foster links between academia and industry, which should contribute to the diversification of the region's economy. There is also expected to be some transfer of management skills from the team of international executives overseeing the operation of the park to their local Russian colleagues.

The rationale for location-based policies stems from the expectation that they will result in localised knowledge spillovers and lead to stronger economic growth. Knowledge-oriented location-based policies have so far received less attention than other location-based initiatives, not least because innovation and its outcomes are hard to measure. In general, empirical evidence on the performance of science parks – one of the most popular knowledge-oriented, location-based policy instruments – is mixed.<sup>40</sup>

In fact, there are hardly any studies of this kind for transition countries. Statistics available for Russian SEZs and innovation hubs suggest that firms located there are successful in terms of introducing new products and technologies and being granted patents, and that they spend more on R&D than other firms (see Chart 5.4.2). However, it is impossible to know whether they would achieve the same results if they were located outside these clusters.

Most existing evaluations of location-based policies are focused on short-term outcomes, making it difficult to judge the extent to which

CHART 5.4.1. Science, technology and research parks in transition countries



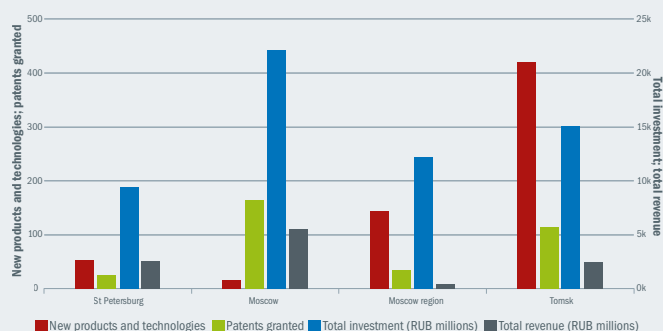
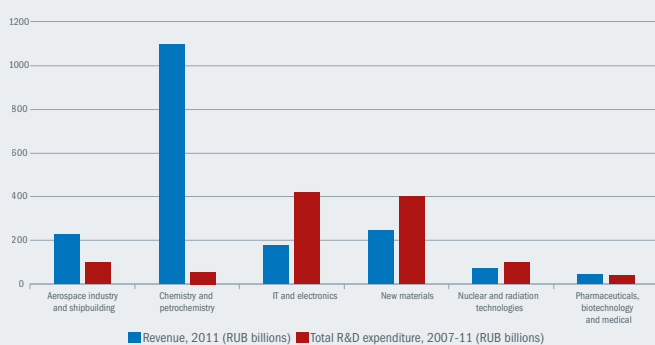
Source: EBRD innovation policy questionnaire and various public sources.  
Note: These maps show the location of business incubators, centres of excellence, industrial parks, innovation-oriented SEZs and other related types of clusters.

<sup>37</sup> See Cooper (2012).

<sup>38</sup> See RUSSEZ (2014).

<sup>39</sup> Expenditure on this park's two construction phases totalled €112.5 million, of which €56.3 million was invested by the EBRD.

<sup>40</sup> See Felsenstein (1994), Westhead (1997), Lindelöf and Löfsten (2003) and Yang et al. (2009).

**CHART 5.4.2. Performance of innovation-oriented SEZs and hubs in Russia**  
**(a) Innovation-oriented SEZs**

**(b) Innovation-oriented hubs**


Source: Russian Ministry of Economic Development, and Gokhberg and Shadrin (2013).

Note: Data in Chart 5.4.2a relate to the period 2005-13.

these policies contribute to stronger economic growth and have a more permanent impact. A recent study looked at the impact that Soviet-era science cities – towns with a high concentration of R&D facilities, as well as human capital – had on firms' innovation activities in the period covered by the fifth round of the Business Environment and Enterprise Performance Survey (BEEPS V). The study found that firms located in former science cities were an average of 6 to 9 percentage points more likely to introduce new products than similar firms located elsewhere. They were also an average of 7 to 8 percentage points more likely to introduce new processes. This impact is substantial, considering that around 13 per cent of firms located outside former science cities were engaged in either product or process innovation.<sup>41</sup> It provides some evidence of the persistence of accumulated human capital, resulting in localised spillovers of knowledge.

Firms located in academic towns (*akademgorodoks*), on the other hand, were an average of 8 percentage points less likely to introduce new products than similar firms located elsewhere. This provides further evidence that emphasis on the supply side does not necessarily improve industry's demand for innovation or result in higher rates of product innovation among local firms.

<sup>41</sup> See Schweiger and Zaccchia (2014).

**BOX 5.5. ICT-oriented innovation policies in Armenia, Azerbaijan and Egypt**

Almost all countries in the transition region regard ICT as a priority area when it comes to innovation. Armenia, Azerbaijan and Egypt, for example, all singled out the ICT sector as a driver of growth in the early 2000s. However, they have used different measures to support the development of the ICT sector and have made progress at different speeds.

**Armenia**

Armenia was one of the major R&D and production centres for computer science, electronics, precision engineering and chemicals in the former Soviet Union.<sup>42</sup> When many of these industries were shut down in the early 1990s, a number of highly qualified professionals emigrated and established companies abroad. However, they then contributed to the rise of the local ICT industry by creating development centres back home in Armenia.

In 2000 the government recognised the ICT sector's potential and declared its development a national priority. In 2002 it established the Enterprise Incubator Foundation (EIF), a one-stop support agency for innovative ICT companies. The agency delivers business and workforce development services, along with consultancy services and legal and financial support, with a focus on start-ups.<sup>43</sup>

The EIF has conducted several projects with international ICT companies, including firms with no specific ties to the Armenian diaspora.<sup>44</sup> Notable examples include the launch of the Cisco Systems Networking Academy Program in 2010, which fosters computer and software penetration in business and education, and the launch of the Microsoft Innovation Center in 2011, which provides resources and infrastructure to SMEs and start-ups in the ICT sector. In addition, a number of events targeting start-ups have taken place in Armenia in 2014, including the sixth BarCamp Yerevan, Digicamp, the launch of the Hive tech start-up accelerator and Seedstar Yerevan.

The ICT and high-tech sectors are among the fastest growing industries in Armenia. The number of ICT companies in Armenia has grown from around 175 in 2008 to around 380 in 2013. What is more, in 2011 exports accounted for 44 per cent of these firms' revenues. However, the development of the ICT sector is being constrained by a shortage of skilled labour with IT training. Several initiatives have been devised in order to overcome this problem. They include Sun Training Labs, a project established by the EIF, Sun Microsystems Inc. and USAID with a view to strengthening the skills of university graduates, and the Synopsys Armenia Educational Department, which provides training in microelectronics in partnership with major Armenian universities.<sup>45</sup>

**Azerbaijan**

Since the early 2000s Azerbaijan has acknowledged the importance of developing its non-oil sector and diversifying its resource-based economy. Until 2010 the focus was mostly on improving infrastructure, resulting in communications networks being completely digitalised and the capacity of external internet channels being increased. The liberalisation of the telecommunications market has opened up opportunities for the private sector and tariffs for unlimited broadband internet have plummeted.

A number of other initiatives have been carried out in recent years. The country's e-government portal was launched in November 2011, with a total of 40 state agencies signing up by 2013.<sup>46</sup> Total investment in ICT – both state and private investment – more than doubled between 2009 and 2011. Azerbaijan's high-technology park was launched in 2012, and its business incubation centre had accepted a total of 20 projects by March 2014. The country branded 2013 "The Year of ICT" and launched its Online Presence Project, which seeks to improve the accessibility of government and public institutions, as well as private companies, via online channels.<sup>47</sup> In July 2014 the State Fund for the Development of IT, which was established in 2012, awarded grants to 31 start-up projects in areas such as high-technology, e-payment software applications, air navigation systems and e-government.

2013 also saw the establishment of the University of Information Technology and the launch of Azerbaijan's first telecommunications satellite, AzerSpace-1. These developments will improve the quality of telecommunications throughout the Caucasus and foster the development of Azerbaijan's space industry.

Overall, Azerbaijan's ICT sector has grown by an average of 25 to 30 per cent per year over the last decade, becoming the second largest recipient of foreign investment after the oil industry.

**Egypt**

Similar to Armenia, Egypt drew up an ICT master plan in 2000 and launched the Egyptian Information Society Initiative, which aimed to foster Egypt's transformation into an information society and a hub for the offshoring and outsourcing (O&O) of ICT services. The Information Technology Industry Development Agency (ITIDA), which was established in Egypt in 2004, serves as a one-stop shop for O&O investors.

In recent years increasing emphasis has been placed on stimulating the provision of high-value and innovative ICT services. In 2010 the Technology Innovation and Entrepreneurship Centre (TIEC) was established with a view to supporting innovative ICT companies and start-ups. Success stories include SilGenix (a semiconductor intellectual property company specialising in on-chip power management solutions for system-on-chip products) and Bey2ollak (a mobile app for sharing real-time information about traffic in Cairo and Alexandria).

Since 2007 ITIDA and the Information Technology Institute have been running the EDUEgypt programme, which provides students (8,735 of them in 2012) with professional training in business process outsourcing (BPO) and IT outsourcing. Moreover, in 2013, in cooperation with Intel, the TIEC organised the Egypt Ideation Camp, a skills training workshop targeting young people. It also runs an innovation recognition programme which unearths young talent and provides links to the industry.

The O&O industry has grown strongly in recent years, as has the wider ICT sector. Exports of IT and BPO services totalled more than EGP 9 billion in 2012, with around 45,000 people employed in O&O centres,<sup>48</sup> working for firms such as IBM, Oracle, Orange, Vodafone and Yahoo.

In 2011 Egypt was ranked fourth in the Global Services Location Index, a list of the world's most attractive offshoring destinations, up from 12th place in 2005.<sup>49</sup> In 2014 Cairo and Alexandria were ranked 76th and 81st, respectively, in Tholons' list of the top 100 outsourcing destinations, with Cairo dropping 18 places compared with 2013 (mainly because of the continuing political unrest).<sup>50</sup>

<sup>42</sup> See EV Consulting (2010).

<sup>43</sup> In 2013, for example, the EIF organised the Innovation Matching Grants Competition, which offered grants of up to US\$ 50,000 to innovative SMEs and start-ups.

<sup>44</sup> See UNECE (2014). Examples include Synopsys, National Instruments and D-Link International.

<sup>45</sup> See EV Consulting (2014).

<sup>46</sup> See Mammadov (2013).

<sup>47</sup> The website [www.site.az](http://www.site.az), for example, provides firms with access to intuitive internet technology, helping them to create effective websites.

<sup>48</sup> See ITIDA (2013).

<sup>49</sup> See Kearney (2011).

<sup>50</sup> See Tholons (2013).

## ANNEX 5.1

# Strengthening competition law and encouraging innovation

Competition policy and private-sector innovation lie at the heart of a successful transition to a well-functioning market economy. Without an effective competition framework, monopolies and restrictive trade practices may emerge, stifling private-sector growth. Indeed, the ubiquitous role of the state in the country's planned economy may simply be replaced by dominant firms controlling segments of a distorted market economy. A sound competition policy will create a level playing field, thereby facilitating the entry of new market players and the introduction of new products and production processes.

The relationship between competition and innovation is a complex one. More competition does not necessarily yield a higher level of innovation.<sup>51</sup> This does not imply that the enforcement of competition law should be more lenient in innovative industries relative to other sectors. It does indicate, however, that specific events which affect competition and market structures should be assessed by competition authorities in terms of how they influence innovation. A sound competition policy will identify the effect that a specific event (such as a merger) has on the long-term incentives and innovative capacities of the firms involved.<sup>52</sup> In this way, competition authorities can play an important role in promoting innovation – either by curtailing or preventing conduct that is detrimental to innovation, or by fostering conduct that promotes it.

In recent years the EBRD has placed renewed emphasis on supporting innovation. Notably, in 2014 the Bank launched the Knowledge Economy Initiative, aimed at helping to identify, invest in and implement projects and policies that will improve competitiveness through innovation. However, many countries in the EBRD region are making little progress in implementing competition policies that will facilitate greater innovation. The Transition Report 2013 concluded that much of the region appeared to be “stuck in transition”,<sup>53</sup> indicating that competition policy was one area in which many transition countries had struggled to make significant progress.<sup>54</sup>

### Competition policy: the competition indicator

The EBRD's transition indicators have been mapping economic transition in the region since the Bank was first established. One of those indicators looks at the quality of competition policy, basing its assessment on survey responses and in-depth research undertaken by the Office of the Chief Economist. The survey is conducted every year, collecting information on both the institutional environment in which competition authorities operate and the actual enforcement of competition law (see Box A.5.1.1). The scoring system for the competition indicator ranges

#### BOX A.5.1.1. The EBRD's annual survey of competition authorities

The EBRD carries out an annual survey looking at competition policy and its enforcement in countries where the Bank works. That survey allows a better understanding of the policy framework in which companies operate, focusing on both the legal basis (that is to say, applicable competition law) and the actual enforcement activities of national competition authorities.

From an institutional perspective, the survey focuses on the following:

- whether competition law incorporates objectives that go beyond (and potentially conflict with) safeguarding competition and whether certain industries are exempt from the enforcement of competition law
- competition authorities' power to conduct investigations (including the power to conduct unannounced dawn raids on business premises) and the existence of clear judicial procedures for the exercising of such powers
- the extent to which competition authorities are legally independent of government
- the existence of an appeal system.

From an enforcement perspective, the information collected is used to measure the quantity and quality of the resources available to the competition authority, as well as the extent and quality of the authority's enforcement activities. In particular, the following elements are analysed:

- the number of cases that are investigated and ruled on by the national competition authority (including mergers, cartels and abuse of dominant positions)
- the level of the fines that are actually imposed on firms as a result of the competition authority's investigations
- the quantity and quality of the resources available to the competition authority (including its budget, staff numbers and composition).

The survey provides a clear picture of the main changes to the legislative framework, as well as describing new developments in terms of the authorities' activities. The survey results are complemented by in-depth desktop research, with the two combining to produce a final transition score for each country's policy regime.

from 1 (denoting a complete absence of competition legislation) to 4+ (denoting the kind of competition framework that is typical of an advanced industrialised economy).

The most recent transition indicator scores for competition across the countries in the EBRD region are shown in Chart A.5.1.1,<sup>55</sup> while Chart A.5.1.2 plots average regional variation in that indicator between 1997 and 2013.

The data show that the best-performing region is central Europe and the Baltic states (CEB), with an average score of 3.37. This reflects the fact that EU membership provides strong incentives and a collective anchor, encouraging market

<sup>51</sup> Arrow (1962) shows that competition can reduce profits, giving firms an incentive to escape competition by innovating. By contrast, Schumpeter (1942) argues that competition might reduce incentives to innovate, focusing on the market structure that emerges after innovation has taken place. Under this approach, greater competition reduces rents post innovation, thereby discouraging firms from innovating. As Aghion et al. (2005) point out, incumbent firms' incentives to innovate depend on the difference between pre-innovation and post-innovation rents. The authors model the relationship between competition and innovation as an inverted U-shape.

<sup>52</sup> As Baker (2007) and Shapiro (2011) note with regard to the enforcement of antitrust law, there is no need for a universal theory governing the relationship between competition and innovation. There is a need, however, for criteria determining whether specific conduct has a positive or negative impact on agents' incentives and ability to innovate.

<sup>53</sup> See EBRD (2013), page 8.

<sup>54</sup> See EBRD (2013), Table S.4, page 112. In this context, competition policy comprises the full set of prohibitions and obligations that make up the substantive rules of antitrust law, together with the range

reforms. These countries aligned their legislation with the EU's *acquis communautaire* as part of their accession programmes, which is reflected in the significant increase in scores between 1997 and 2013. Enforcement activities have also increased, with competition authorities generally being equipped with adequate resources and staff. However, owing to the financial crisis and increased pressure on government budgets, several countries have seen a reduction in the resources allocated to competition authorities, together with a reduction in the number of investigations conducted.

All the countries of south-eastern Europe (SEE) have scores of between 2.0 and 3.3. The experiences of these countries demonstrate the challenges faced when seeking to strengthen the institutions that implement competition policy.

Indeed, although Bulgaria and Romania have been EU member states since 2007 and most other SEE countries have taken major steps to align their institutional frameworks with the EU's *acquis communautaire* in view of their aspirations for future accession (translating into increases in their competition policy scores), the SEE region's enforcement record has been uneven.

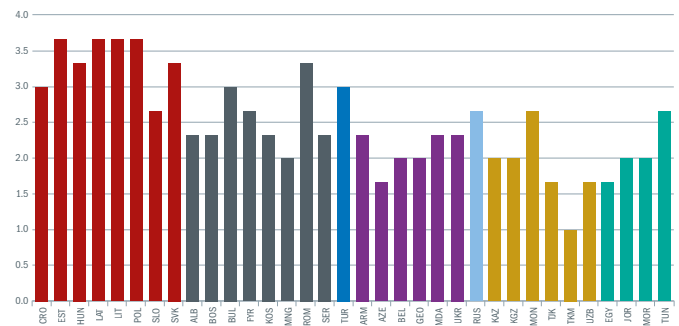
Significant action remains necessary to improve the implementation of competition law, which will involve strengthening the resources and institutional capacity of regulators, as well as developing the skills available to courts reviewing competition authorities' decisions. The lack of adequate skills is reflected in these countries' poor enforcement records, especially as regards the abuse of dominant positions and cartels. In such cases strong investigative tools are needed to collect and process evidence and significant expertise is required, in order to conduct the economic analysis needed to prove that rules have been violated.

Eastern Europe and the Caucasus (EEC) and Central Asia have two of the lowest average scores, averaging 2.1 and 1.8 respectively. These scores – and indeed the minimal progress observed over the years (as shown in Chart A.5.1.2) – reflect poor institutional environments and strong state involvement in the economy, especially in Central Asia.

Nevertheless, promising reforms have recently been introduced in a number of countries (such as Moldova and Georgia), with new competition legislation being adopted and competition authorities being established and strengthened. This may pave the way for more effective prosecution of anti-competitive behaviour in the future. However, much will depend on the authorities' ability to develop the necessary skills, competence and experience, as well as their ability to act as a public advocate for competition policy and compliance with the relevant rules.<sup>56</sup>

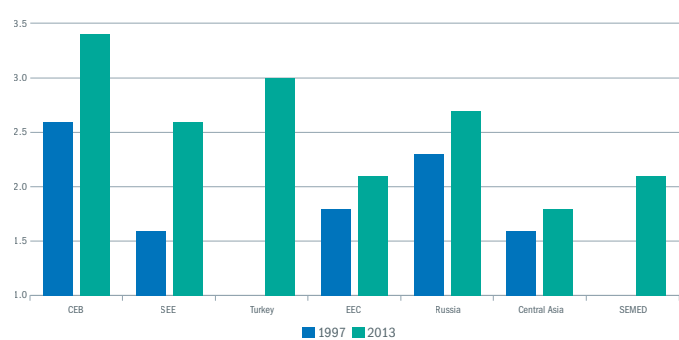
The countries of the southern and eastern Mediterranean (SEMED) region, which have only recently been included in the EBRD's assessment of competition policy, also have low scores, indicating that there is significant scope for improvement. The low scores in the SEMED region are related to both institutional and enforcement issues. Competition authorities in SEMED countries are often insufficiently independent of government, especially when it comes to mergers. From an enforcement perspective,

CHART A.5.1.1. Competition scores in individual countries



Source: EBRD.  
Note: Data relate to 2013.

CHART A.5.1.2. Average competition scores in various regions



Source: EBRD.  
Note: The SEMED region was first assessed in 2012, while Turkey was first assessed in 2009.

their lack of adequate resources and skills also represents a major problem. In addition, regulatory capture has sometimes prevented competition authorities from challenging established interest groups in these countries.

Overall, this transition indicator shows that governments need to strengthen their competition frameworks, especially in regions lying outside the EU's direct sphere of influence. This should be a priority, given the importance of competition policy as an anchor for private-sector development and given that competition policy is generally lagging behind other reform areas in the EBRD region.<sup>57</sup>

However, reform efforts must also take account of the fact that competition policy does not function in isolation and is embedded in a country's wider institutional system. Reforms to competition policy should occur in parallel with improvements in the effectiveness and transparency of the judiciary, especially as regards the courts' role in reviewing administrative decisions made by competition authorities. ◉

of tools that are available to competition authorities when it comes to policing these rules and punishing any violations.

<sup>56</sup> Cyprus became an EBRD recipient country in 2014 and will be included in the 2014 review of competition policy. However, since the latest data on this indicator relate to 2013, Cyprus does not feature in this analysis.

<sup>57</sup> This advocacy role is of critical importance in the early stages of developing a sound competition framework. Government and the private sector need to fully understand both the benefits of new

competition legislation and the importance of subjecting draft legislation to a competition assessment in order to identify potential conflicts with competition rules.

<sup>57</sup> One factor explaining this lag is the fact that competition authorities have a much shorter institutional history than better established and often politically connected – and sometimes even captured – sector-specific regulators in areas such as telecommunications, electricity, railways and aviation. Indeed, a certain amount of positioning can be observed in several countries where the EBRD invests, with sector-specific regulators (often with close links to government and industry) appearing to defend their regulatory territory against newly established competition authorities.

## Institutional reform efforts

Since 2012 the EBRD has gone beyond analysing this transition indicator, looking in more detail at the efforts made by a number of countries to respond to institutional challenges in the area of competition policy. Particular attention has been paid to south-eastern Europe, where a basic competition framework is in place and institutional shortcomings now represent the main obstacles to progress. This is where the real challenge lies. Adopting competition legislation and regulations and setting up new organisations is relatively easy; making those organisations run effectively is much more difficult.

It is clear from discussions with counterparts and practitioners in the SEE region that the views of local stakeholders regarding the competition policies of these countries are in line with the relevant transition indicator scores. These people repeatedly tell the same basic story, explaining that while the laws on the statute book are generally in good order, their implementation needs to be improved.

This kind of implementation gap is typical of the evolution of legal frameworks in the transition region. At the same time, there is a keen awareness in government circles of how important it is to strengthen the effectiveness of organisations involved in implementing and enforcing competition policy. Two activities are especially important in this regard: efforts to help courts deal with competition-related matters and measures to strengthen the institutional capacity of competition authorities. Some brief examples of each are discussed below.

## Judicial training

In 2012 the authorities in Bosnia and Herzegovina launched a project aimed at strengthening the skills of the judiciary in the area of competition law. Recent EU reports had noted that, although the country's Competition Act of 2005 was largely in compliance with the *acquis communautaire*, implementation remained uneven. This was in line with the country's transition indicator score of 2.3.

A module of judicial training was prepared, together with a specialist handbook for judges at the Court of Bosnia and Herzegovina (which hears appeals against the regulator, the Competition Council). Judges had not previously received any training in the field of competition, and few had any real experience in this area. One striking statistic was the fact that the Court had never ruled against the Competition Council in a claim brought by a private entity seeking to challenge a decision.

Special attention was paid to the discretion and legal remedies available to the Court when resolving claims in these areas, as well as awareness of the relevant market, economic and financial aspects of competition matters. In the view of both the authorities providing the training and the judges participating in it, the training module filled an important gap in the judges' education and put them in a better position to effectively review the decisions of the Competition Council.

In 2013 a programme of judicial training was implemented by the Serbian authorities for the benefit of judges of the Administrative Court, which hears appeals against decisions of

the Commission for the Protection of Competition (CPC). (Serbia's current transition indicator score for competition is 2.3 – again pointing to problems with the implementation of its competition framework.)

For the authorities in Serbia, the focus of concern was on strengthening judges' knowledge of the economic concepts that underpin competition law. The first question that arises in many competition cases concerns the definition of the relevant market. This involves the application of specific techniques, requiring an understanding not only of how markets work, but also of general economic theory.

The Administrative Court worked with the Judicial Academy of Serbia and the Centre for Liberal Democratic Studies in Belgrade, developing a training programme that covered areas such as: economic analysis for defining markets; economic analysis of monopoly power and price discrimination; and dominant market positions and their abuse (including predatory pricing and restraint of trade). The programme involved a series of seminars by leading Serbian academics, as well as guest lectures by judges from Croatia, the Czech Republic, Hungary and Romania.

An assessment of the project found that the training programme had improved the ability of judges to deal with competition matters effectively, providing them with a solid grounding as regards the application of economic concepts in competition cases. The project also led to the establishment of a variety of training resources. A dedicated website was created, which hosts all of the training material for the programme, as well as recordings of the various seminars and a self-test facility allowing participants to check their knowledge of the course content.

These capacity-building initiatives are welcome developments. Judges in administrative courts are often required to deal with non-legal disciplines pertaining to the jurisdictions of the administrative bodies whose decisions they are reviewing. The economics of competition cases is just one example; accounting matters relating to taxation cases are another major issue. It is important that such capacity-building initiatives are sensitive to judges' training needs – not only as regards substantive law, but also as regards such associated non-legal areas.

Judges do not necessarily need to have extensive expertise in these areas, but they must have a sufficient grasp of the relevant issues to be able to understand disputes, ask probing questions of counsel and expert witnesses, and come to well-reasoned conclusions, applying all of the academic disciplines relevant to the case.

## Capacity-building of competition authorities

Institutional reforms have also been observed at competition authorities elsewhere in the SEE region. In late 2013 Serbia's Commission for the Protection of Competition undertook a capacity-building exercise similar to that conducted at the Administrative Court. The training course on economic concepts that had been provided to these Serbian judges was revised and reworked for the CPC, since a higher level of specialisation and economic knowledge was expected of its members.

The training programme developed by the Serbian authorities covered the various microeconomic concepts underpinning competition policy and regulation, looking at their relevance for members and staff of the CPC (especially case handlers and decision-makers). One new element was a component explaining the relevance of econometric techniques in detecting violations of competition rules.

The project lasted several months and was concluded at the end of 2013. The CPC believes that this programme has improved its members' ability to effectively employ economic concepts and techniques in their work. It has also led the CPC to review its overall development needs, looking at other ways of increasing its effectiveness.

Indeed, a second, more ambitious project was launched in 2014 with the aim of building on that earlier work and making significant improvements to the CPC's general operational capacity. The 18-month project contains four main components.

First, CPC members will be given further training on how to conduct their own econometric studies. On-the-job training is considered to be the most effective way of doing this, building on the basic training given to members in 2013. The CPC will also acquire software facilitating the implementation of such econometric studies, and will organise training on the use of such tools.

The second component will involve practical advice and training to enable the CPC to make greater use of its statutory powers to conduct dawn raids. Various observers (including the European Union) have encouraged the Serbian authorities to exercise these powers in appropriate cases. However, entering premises and seizing evidence is an intrusive measure and needs to be carried out in a judicious manner, especially as the public are not accustomed to such procedures. Furthermore, the proper use of forensic software is required for analysing data seized in dawn raids.

The third component of the project will enhance members' capacity to perform the CPC's role as a public advocate for competition policy in Serbia. This is an important function, which has the potential to raise public awareness of competition policy in a country where competition rules are still not well understood and in some cases remain counter-intuitive for the general public. The CPC wishes to be more visible in the eyes of the general public and raise its profile in Serbia's competition community.

The final component will facilitate closer cooperation between the CPC and sector-specific regulators, primarily the telecommunications and broadcasting regulator and the energy regulator. The CPC and the sector-specific regulators require a better understanding of the division of responsibilities between them, as well as the importance of approaching certain issues in a harmonised manner.

These represent significant steps and should allow Serbia to increase the effectiveness of its institutions and make progress in the area of competition policy. If all the above measures are implemented successfully in the course of the project, significant improvements can be expected in the implementation of competition law in Serbia. Such changes should be reflected in improvements in Serbia's transition indicator for competition.

## Capacity-building and innovation

Some countries' reform efforts have directly addressed the question of the interaction between competition policy and innovation. For example, Montenegro's Agency for the Protection of Competition is running training sessions for its members and staff focusing on European approaches to merger control. One of the sectors being analysed is the pharmaceutical sector, which will be an opportunity for participants to consider the implementation of merger control and competition policy in innovative industries.

Meanwhile, Moldova's Competition Council is developing its ability to conduct in-depth market investigations. This will entail a combination of seminar-based training and on-the-job learning, whereby international experts will work side-by-side with the Council to deliver a full assessment of a particular market and develop policy recommendations. The Council will select a sector involving substantial innovation, in order to gain experience of the potentially complex interplay between competition policy and innovation.

Of course, government efforts to strengthen institutions responsible for enforcing competition rules are not always explicitly linked to the objective of promoting innovation. However, the EBRD considers that this objective is served whenever such institutions are strengthened. This is consistent with the view that competition policy must also apply to innovative sectors, with each case being judged on its merits.

## Conclusion

It is important to recognise the efforts made by countries in the EBRD region with a view to strengthening the institutional effectiveness of their competition authorities and improving their judiciaries' ability to deal with competition matters. Perceptions about the efficacy of public institutions in transition countries tend to be unfavourable, so when improvements are made, they need to be communicated in order to bolster public confidence.

It is also necessary to study how such improved knowledge and capacity translate into practice. Will regulators now act with greater confidence and skill, and will courts now issue better and more consistent judgments? Progress is likely to be incremental and difficult to prove. But where it is identified, one can be confident that these achievements will benefit the innovation environment. The role of competition policy in fostering innovation should not be forgotten.

In particular, the complex relationship between competition and innovation should not be allowed to cast doubt on the importance of competition policy for fostering innovation. This is especially true when thinking about innovation more broadly – not just patentable inventions, but all new approaches to doing business. It is these innovations that are increasing the private sector's share of the region's economy, and they need a fair and level playing field in order to thrive.

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# MACROECONOMIC OVERVIEW



## AT A GLANCE

**20%**

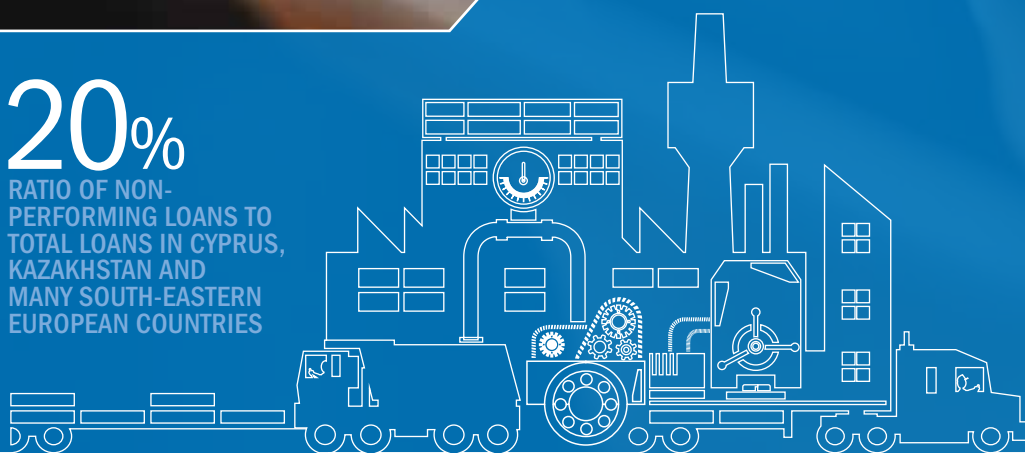
RATIO OF NON-PERFORMING LOANS TO TOTAL LOANS IN CYPRUS, KAZAKHSTAN AND MANY SOUTH-EASTERN EUROPEAN COUNTRIES

**16%**

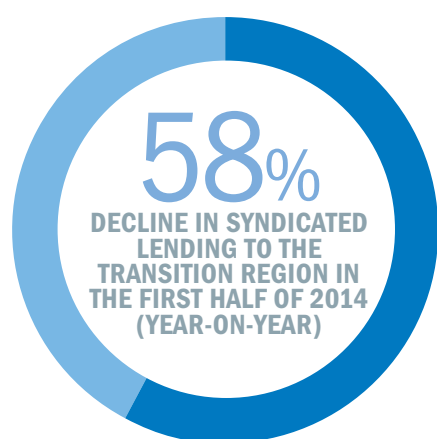
AVERAGE LONG-TERM UNEMPLOYMENT RATE IN SOUTH-EASTERN EUROPE

**4**

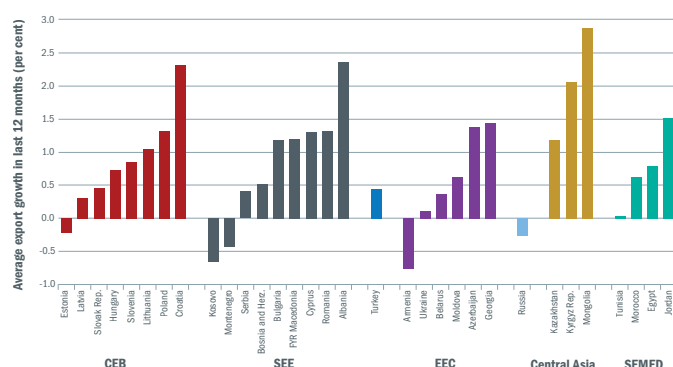
CONSECUTIVE YEARS OF GROWTH BELOW 3 PER CENT ON CURRENT PROJECTIONS THROUGH 2015



**Average annual growth in the transition region has slowed further. Indeed, 2014 is likely to see the region's annual growth rate standing below 3 per cent for the third consecutive year. Two major developments have negatively affected the performance of the region's economies. First, growth has been hampered by the political tensions observed in Ukraine since late 2013. Second, like other emerging markets, countries in the region have been affected by expectations of monetary tightening in the United States.**



**CHART M.1.** Export growth has contributed to the economic recovery in CEB and SEE countries



Source: National authorities via CEIC Data, and authors' calculations.

Note: The chart shows average seasonally adjusted month-on-month growth in the 12 months to June 2014.

## Introduction

Growth has remained relatively weak across most of the transition region over the past year. Following the initial recovery after the 2008-09 global financial crisis, growth began slowing in the second half of 2011, against the backdrop of the intensification of the sovereign debt crisis in the eurozone. While a recovery started to take hold in the single currency area in the second half of 2013, two other major developments have had a negative impact on the economic outlook for the region.

First, growth in the region has been negatively affected by the geopolitical events observed in Ukraine since late 2013, so the outlook for growth has become significantly more uncertain. Second, prior to that, some countries in the EBRD region were (like other emerging markets) affected by expectations that quantitative easing would be tapered in the United States and monetary policy would be tightened in advanced economies more generally, which prompted outflows of capital.

The region as a whole grew at an annual rate of 2.3 per cent in 2013, compared with 2.6 per cent in 2012. Stronger growth in south-eastern Europe (SEE) and Turkey was more than offset by decelerating growth in Russia. Average growth in the southern and eastern Mediterranean (SEMED) region picked up only slightly, mainly on account of a strengthening in the performance of Morocco's economy. Morocco benefited from a strong harvest, as well as increased foreign direct investment (FDI), on account of a more favourable policy environment.

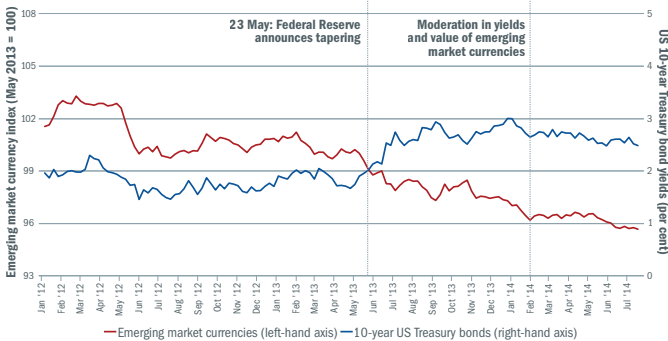
Thus, the average annual growth rate in the region has now declined every year since 2011, and current projections suggest that 2014 will see it standing below 3 per cent for the third consecutive year. Growth has not been this weak over a three-year period since the transition recession of the early 1990s. This episode of moderate growth is likely to extend into 2015 and underscores the need to address structural impediments to growth across the region.

## External conditions

Over the past year, modest improvements in the external economic environment have been more than offset by the crisis in Ukraine. The recovery in the eurozone took hold in the second half of 2013, with seasonally adjusted quarterly data suggesting that the single currency area returned to positive growth as early as the second quarter of that year, and by the first quarter of 2014 the crisis-hit economies of the eurozone's periphery – including Portugal, Greece and Ireland – were able to return to the international bond markets, borrowing at relatively favourable interest rates.

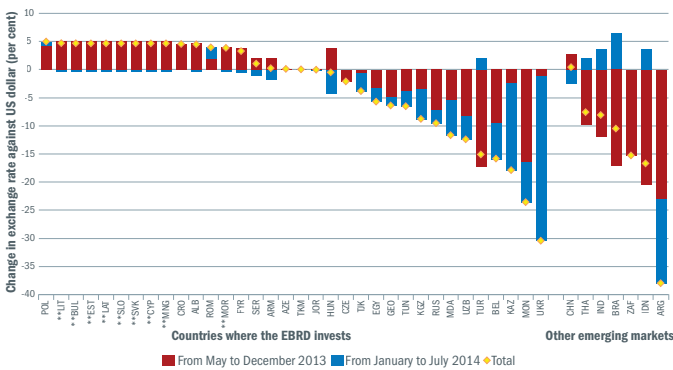
The recovery in the eurozone has benefited the transition region, particularly central Europe and the Baltic states (CEB) and south-eastern Europe. In most of these countries the recovery has been underpinned by renewed growth in exports (see Chart M.1), following a significant contraction in 2011-12 at the height of the eurozone crisis. Supported by an increase in exports, Bosnia and Herzegovina, FYR Macedonia, Hungary,

**CHART M.2. Tapering of quantitative easing leads to pressure on emerging market currencies**



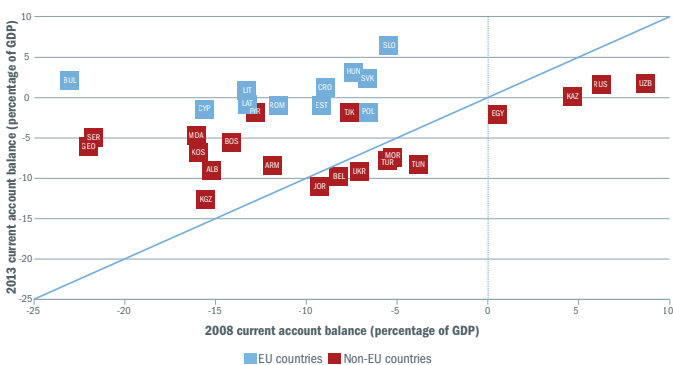
**Source:** Bloomberg and authors' calculations.  
**Note:** The emerging market currency index is a simple average of currency movements against the US dollar for 121 developing countries and emerging markets.

**CHART M.3. Changes in exchange rates against the US dollar**



**Source:** Bloomberg and authors' calculations.  
**Note:** Positive values indicate appreciation against the US dollar. \*\* denotes a country that uses the euro either as legal tender or as a reference currency for the exchange rate peg.

**CHART M.4. External positions of countries where the EBRD invests have improved since the 2008-09 crisis**



**Source:** IMF World Economic Outlook.  
**Note:** Countries to the left of the 45-degree line improved their external positions.

Montenegro and Serbia all returned to positive growth in 2013. Growth remained negative in Slovenia, however, while in Croatia the recession continued into 2014.

An economic recovery has also taken hold in the United States, prompting the Federal Reserve to start tapering its quantitative easing programme by reducing its monthly asset purchases. The Federal Reserve first alluded to the increased likelihood of such tapering in May 2013. Expectations of tighter monetary policy led to a gradual increase in US long-term interest rates (see Chart M.2). This made risk-adjusted returns on emerging market assets less attractive in relative terms and led to a sharp decline in capital flows to emerging markets in the summer of 2013. As a result, the stock markets and currencies of those countries came under pressure (see Chart M.3).

In the second half of 2013 the CEB region and most SEE countries were less strongly affected by expectations of tapering than emerging markets in Asia and Latin America (see Chart M.3). In part, this reflected smaller inflows of capital prior to May 2013. It was also a sign of stronger investor confidence in the region, boosted by the news of a recovery in the eurozone. Improvements in economic fundamentals following the 2008-09 crisis – such as smaller current account deficits (or larger surpluses) and larger primary fiscal balances, particularly in the new EU member states – also helped to mitigate the impact that the tapering of quantitative easing had on capital flows to the region (see Chart M.4).

When the Federal Reserve actually started reducing its monthly purchases of assets in December 2013 (initially from US\$ 85 billion to US\$ 75 billion per month), emerging market currencies and interest rates in mature economies largely stabilised. By then, expectations of future monetary tightening had largely been priced in by the markets. Moreover, the low investment levels that have generally characterised the post-crisis recovery in mature markets gave indications that long-term interest rates could remain low for longer than had initially been anticipated. Although emerging markets may be negatively affected by higher interest rates in the United States, the strong growth in advanced economies which underpins that monetary tightening will translate into increased demand for emerging market exports and thus benefit their economies.<sup>1</sup>

By contrast with trends observed in the second half of 2013, the currencies of a number of countries in the EBRD region came under stronger pressure in the first few months of 2014, while emerging markets in Asia and Latin America saw their currencies stabilising and appreciating somewhat. In a number of countries – including Hungary, Mongolia, Russia and Ukraine (see Chart M.3) – this largely reflected country-specific developments.

### Increased economic uncertainty

Events in Ukraine have sharply increased economic uncertainty in the region, dashing hopes that the continuous decline seen in the region's growth rate since 2011 would be reversed. As the events in Crimea developed in late February and early March 2014, Ukraine's currency lost around 30 per cent of its value against

<sup>1</sup> See IMF (2014) for a comparative analysis of these various factors.

the US dollar between January and May 2014. At the same time, credit default swap spreads on government bonds widened sharply, while net private capital inflows turned sharply negative. In late March it was announced that an IMF programme had been agreed, but this brought only temporary respite, as disturbing news from eastern Ukraine further unsettled markets. A two-year IMF stand-by agreement was approved to assist Ukraine with the macroeconomic adjustments and structural reforms necessary to improve the country's external position.

In Russia, equity markets and the currency also came under substantial pressure. This partly reflected the impact of the various waves of economic sanctions that the United States and the European Union had introduced since March 2014. Those sanctions, combined with uncertainty about their possible escalation in the future, negatively affected business confidence, limited the ability of companies and banks to access international debt markets and contributed to an increase in private capital outflow.

Net private capital outflows, which have persisted for several years, increased to around US\$ 75 billion in the first half of 2014, as investor confidence weakened and Russian companies postponed or cancelled plans to borrow in international markets. This affected the annual growth rate of the Russian economy, which had already fallen to 1.3 per cent in 2013, down from between 3.0 and 5.0 per cent in 2010-12. Growth then slowed further to stand at 0.9 per cent year-on-year in the first quarter of 2014, while fixed capital investment contracted by 7.0 per cent over the same period.

### Economic linkages in the region

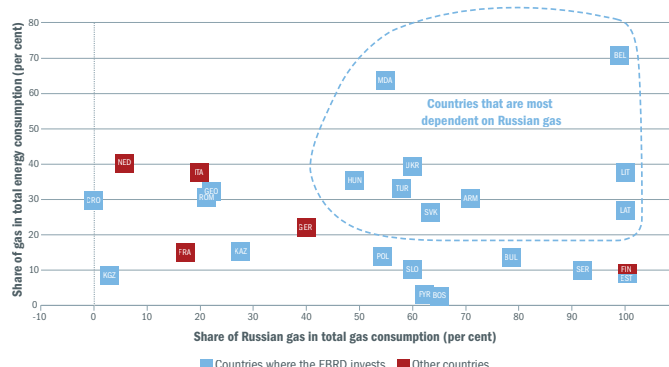
Events in Ukraine have had a negative impact on investor confidence and growth prospects for the transition region more broadly. Various mechanisms play a role in this regard.

First, as tensions have escalated, concerns about energy security have been mounting in a number of countries in the region. Many countries – particularly CEB and SEE countries and those of eastern Europe and the Caucasus (EEC) – rely heavily on imports of Russian gas, with gas playing a major role in their overall energy mix and Russian supplies accounting for a large percentage of their total gas consumption (see Chart M.5). Furthermore, Russia and Ukraine also account for a large percentage of Egypt's wheat imports.

Second, Russia is also an important source of export demand for many countries (see Chart M.6), and weaker growth in Russia affects those countries through the trade channel, as well as through reductions in inward foreign direct investment.

Third, a number of countries in the EEC region and Central Asia are vulnerable to a slow-down in remittances from Russia. In the case of Tajikistan annual remittances account for over 45 per cent of GDP, with the vast majority coming from Russia. Growth in remittances from Russia to Central Asia and the EEC region turned negative in the first quarter of 2014, the first time this had been observed since 2009 (see Chart M.7). However, the reduced volumes of US dollar-denominated remittances

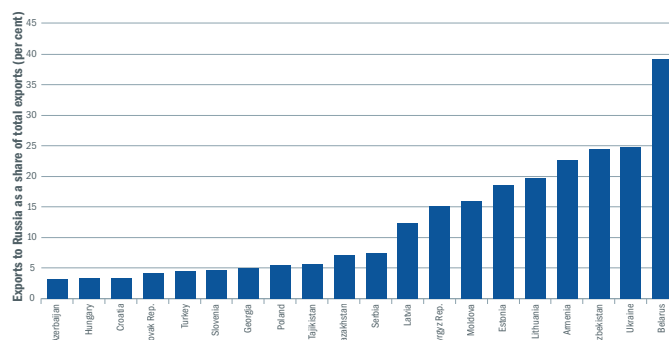
CHART M.5. A number of countries rely heavily on imports of Russian gas



Source: US Energy Information Administration (EIA), United Nations Conference on Trade and Development (UNCTAD) and authors' calculations.

Note: Based on data for 2012.

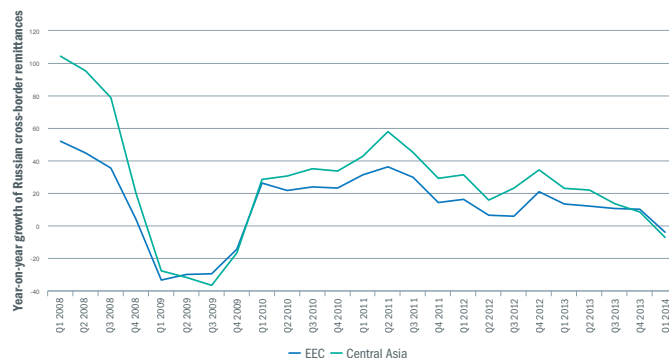
CHART M.6. Exports to Russia as a percentage of total goods exports



Source: International Trade Centre's TradeMap database and UNCTAD.

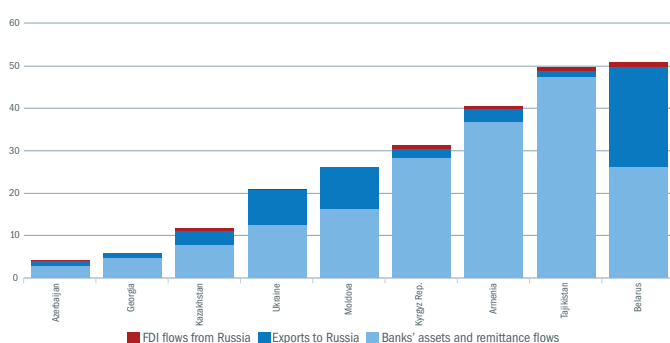
Note: Based on averages of 2012 and 2013 exports.

CHART M.7. Growth in remittances from Russia has been slowing



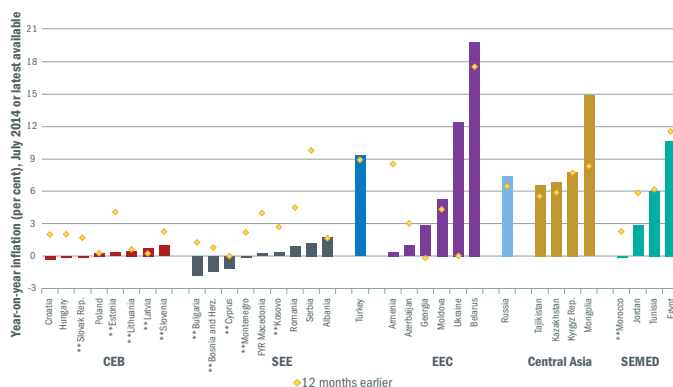
Source: Central Bank of Russia.

Note: Based on data on remittances to Armenia, Azerbaijan, Belarus, Georgia, Kyrgyz Republic, Moldova, Mongolia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

**CHART M.8. Economic exposure to Russia as a percentage of GDP**


**Source:** International Trade Centre's TradeMap database, Central Bank of Russia, national authorities and authors' calculations.

**Note:** The index is calculated as the sum of FDI flows from Russia as a percentage of GDP, exports to Russia as a percentage of GDP, assets of Russian banks as a percentage of GDP and remittance flows as a percentage of GDP, all based on available data for 2012.

**CHART M.9. Inflation rates have declined in most countries**


**Source:** National authorities via CEIC Data.

**Note:** The rates shown are year-on-year figures based on consumer price indices. \*\* denotes a country that uses the euro either as legal tender or as a reference currency for the exchange rate peg.

have been partly offset by the rising purchasing power of remitted US dollars, following the weakening of the currencies of several recipient countries.

In contrast, early data suggest that growth in remittances to SEE countries returned to positive territory in 2013, following a contraction in the previous year. This probably reflects both the recovery seen in the eurozone in the second half of the year and the increased use of formal channels for remittances owing to reductions in the cost of international transfers.<sup>2</sup>

Fourth, the depreciation of the Russian rouble may also be adding to pressures on EEC and Central Asian currencies. The weakening of the rouble in early 2014 led to expectations that neighbouring countries would adjust their currencies' exchange rates downwards, and purchases of foreign currency by residents of those countries increased. In early February the National Bank of Kazakhstan made a one-off adjustment to the exchange rate of the tenge, resulting in a devaluation of close to 20 per cent. The Kyrgyz som then also weakened against the US dollar.

Chart M.8 summarises selected transition countries' overall exposure to a slow-down in Russia through various channels, including trade, investment and remittances. The composite index plotted in the chart is similar to the index of economic exposure to the eurozone presented in the *Transition Report 2012*.<sup>3</sup> The chart shows that Belarus and Tajikistan have the highest overall economic exposure to Russia. In the case of Tajikistan this is driven primarily by large remittance flows.

## Inflation and unemployment

Inflation rates have declined further in most countries (see Chart M.9). This reflects a combination of: (i) slower growth, and hence weaker demand pressures; (ii) broadly stable or falling prices for energy and metal commodities; and (iii) a decline in food prices, following one of the best harvests on record in 2013, coupled with expectations of a strong harvest in 2014.

In a number of countries in the CEB, SEE and EEC regions – predominantly those that use the euro as legal tender or as an anchor for their exchange rate peg – inflation has turned negative (in year-on-year terms). In some cases (in Hungary, for instance), administrative measures aimed at lowering regulated tariffs have temporarily contributed to lower inflation. At the same time, inflation has been persistently high in Belarus, Egypt, Mongolia, Russia and Turkey, where currency depreciation and resulting increases in import prices have contributed to upward price pressures. In Egypt bottlenecks in the food supply chain have further exacerbated food price inflation.

Unemployment remains persistently high in a number of countries, particularly in the CEB, SEE and SEMED regions. Of particular concern are the persistent (and in many cases rising) levels of long-term unemployment – the percentage of people in the labour force who have been unemployed for more than 12 months. Long-term unemployment now averages around 6 per cent in CEB countries and 16 per cent in SEE countries. The Baltic states are a notable exception: their long-term unemployment

<sup>2</sup> Increased use of official channels for money transfers may, to some extent, overstate the growth rate of remittances, as some previously uncounted flows have begun to be officially recorded. Various other factors may also affect the timing and magnitude of remittance flows (see Vargas-Silva and Huang, 2006).

<sup>3</sup> See Chart 2.19 on page 38 of the *Transition Report 2012*.

rate has been declining since 2011, testimony to the strength of their post-crisis recovery and their more flexible labour markets.

Youth unemployment (that is to say, unemployment among people aged between 15 and 24) remains particularly high in the SEE and SEMED regions. In the SEMED region the problem of youth unemployment is amplified by demographic trends, as young labour market entrants account for a large and rising share of the population.

### Capital flows

Net capital flows to the EBRD region have been volatile, reflecting both the general volatility of capital flows to emerging markets and regional factors such as the crisis in Ukraine. Net capital inflows declined in the third quarter of 2013, following increased expectations that quantitative easing would be tapered.

Turkey – where non-FDI capital inflows finance a major part of the persistently large current account deficit – was one of the emerging markets that was most significantly affected by that fall in capital inflows. The impact of that tapering moderated in subsequent quarters, but in early 2014 the outflows increased again, particularly for Russia and the EEC region, as tensions in Ukraine escalated (see Chart M.10). In the first half of 2014, syndicated lending to the region declined by 58 per cent year on year in volume terms, driven by declines in Russia and Turkey, while globally the volume of syndicated lending increased by 7 per cent over the same period.

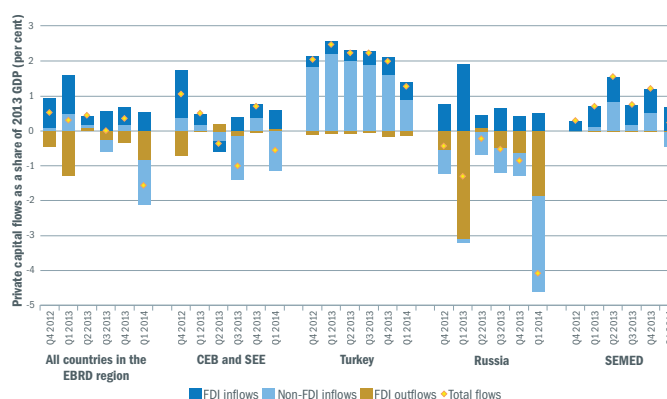
### Persistent non-performing loans

Cross-border bank deleveraging has continued, albeit at a slower rate overall, with foreign banks continuing to withdraw funds from the EBRD region. The pace of such deleveraging picked up in the third quarter of 2013, following the announcement of the forthcoming tapering of quantitative easing, as well as a number of interest rate cuts in the region, but it then moderated somewhat. Sustained deleveraging over a number of years has delayed the resumption of credit growth, particularly in the CEB and SEE regions, despite various credit surveys indicating that demand for loans has picked up in 2014.

In Bulgaria the banking sector came under stress in the summer of 2014, with runs on two major locally owned banks. The authorities took prompt action, putting one of the banks into administration and securing emergency liquidity support for the banking system as a whole, with the approval (under state aid rules) of the European Commission. The authorities' response has helped to ease the situation, but the episode has raised concerns about supervisory standards. The Bulgarian authorities have subsequently signalled their intention to opt into the Single Supervisory Mechanism under the European Union's banking union project.

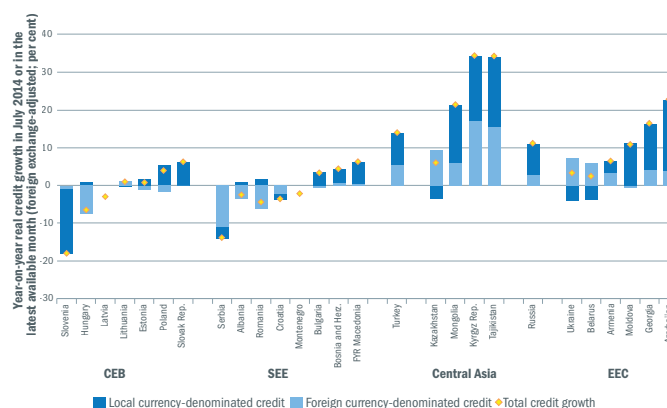
On the positive side, deleveraging in the region has tended to be accompanied by a reduction in the percentage of credit which is denominated in foreign currency. New lending has increasingly been denominated in local currency, reflecting a greater

CHART M.10. Capital flows have been volatile



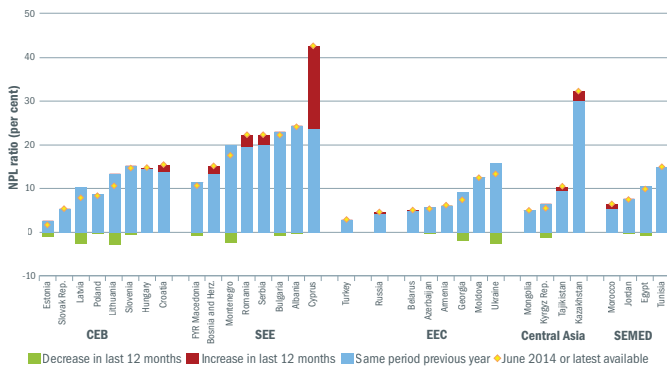
Source: National authorities via CEIC Data, and authors' calculations.  
 Note: Data are derived from the capital and financial accounts of individual countries in the EBRD region. Private non-FDI flows are the sum of the capital account, portfolio investment, other investment, and net errors and omissions. In some countries net errors and omissions are a significant channel for the financing of current account deficits or a major channel for capital flight, hence their inclusion.

CHART M.11. Credit growth has predominantly been accounted for by growth in local currency-denominated lending



Source: National authorities via CEIC Data, and authors' calculations.  
 Note: The chart shows total year-on-year growth in credit to the private sector in real terms, broken down into local currency and foreign currency-denominated lending. Growth rates are based on values expressed in local currency terms, adjusted for changes in exchange rates.

**CHART M.12. Persistently high levels of non-performing loans**



**Source:** National authorities via CEIC Data.  
**Note:** Definitions of non-performing loans may vary across countries. As a result, the ratios shown in the chart are comparable over time, but may not be perfectly comparable across countries.

**CHART M.13. Primary fiscal balances**



**Source:** National authorities via CEIC Data, and IMF World Economic Outlook.  
**Note:** Data for Mongolia do not include operations by the Development Bank of Mongolia.

reliance on domestic funding, while in countries where credit has continued to contract in real terms, the contraction has been largely at the expense of foreign currency-denominated loans (see Chart M.11).

A number of other factors have also contributed to this trend, including reduced interest rate differentials between loans denominated in local and foreign currencies (owing to lower levels of inflation) and stricter standards for lending to unhedged borrowers (for instance in Poland). In certain cases subsidised lending programmes (such as the Funding for Growth programme in Hungary) have also played a role.

Non-performing loans (NPLs) continue to account for a large percentage of total loans, and that ratio has even increased further in a number of countries, limiting the post-crisis recovery. In Hungary, Croatia, Ukraine and most SEE countries the ratio of NPLs to total loans is close to or in excess of 15 per cent

(see Chart M.12). In Kazakhstan the NPL ratio has remained close to 30 per cent since mid-2009. The highest rate is in Cyprus, where NPLs account for more than 40 per cent of total loans and a significant contraction is still being observed for GDP. In Slovenia estimates of banks' NPLs were revised upwards in late 2013 in the context of an asset quality review conducted by independent assessors at the request of national and EU authorities, while the subsequent recapitalisation of banks led to a reduction in NPL levels. Similar upward revisions of NPL ratios may follow in other countries conducting asset quality reviews.

**Macroeconomic policy**

The macroeconomic policies of countries in the EBRD region have generally been characterised by fiscal tightening, combined with accommodative monetary policies. A number of countries in the CEB and SEE regions (including Albania, Hungary, Romania and Serbia) have implemented further interest rate cuts to stimulate aggregate demand. These cuts have been facilitated by lower levels of inflation and moderating inflation expectations. Hungary and Mongolia have continued using unconventional monetary policy tools (including subsidised lending programmes) to boost credit to the private sector.

At the same time, central banks in a number of countries (including Turkey and Ukraine) have raised interest rates in response to capital outflows. However, the Central Bank of Turkey has subsequently reversed some of those interest rate increases. Moreover, the Central Bank of Russia increased its policy rate by 150 basis points (to 7 per cent) with effect from 3 March 2014 against the background of events in Crimea, stronger net capital outflows and persistently high inflation. Further rate increases followed in April and July 2014.

In January 2014, Latvia became the fifth country in the region to join the eurozone, following in the footsteps of Slovenia, Cyprus, the Slovak Republic and Estonia. Lithuania has been given the green light to follow suit in January 2015.

Primary fiscal deficits (that is to say, fiscal deficits net of the cost of servicing public debt) generally declined in 2013 relative to 2012, reflecting a slight tightening of fiscal policy (see Chart M.13). In some countries, notably in the SEE region, stronger economic growth contributed to increases in government revenues. SEMED countries continued to run sizeable primary fiscal deficits, partly reflecting the high fiscal cost of fuel subsidies. At the same time, all countries in the SEMED region adopted measures aimed at reducing energy subsidies, which should help to improve fiscal sustainability over the medium term. In Slovenia the general government deficit more than tripled compared with the previous year, owing to the considerable cost of recapitalising banks.

Looking ahead, countries in the region may find that they have less scope to combine fiscal tightening with accommodative monetary policies. In particular, when interest rates in advanced markets start to rise, there will be less scope for monetary policy easing, and monetary authorities may need to tighten policies in response to changes in cross-border capital flows.



## Outlook and risks

The annual growth rate in the transition region is expected to decline from 2.3 per cent in 2013 to 1.3 per cent in 2014. This reflects the impact that the crisis in Ukraine has had on the economies of Ukraine, Russia and neighbouring countries, as well as a number of country-specific factors (including the damaging floods seen in Serbia and Bosnia and Herzegovina in May 2014).

Recovery in CEB and SEE countries will continue at a moderate pace. The lift provided by recovery in the single currency area will be only partly offset by weaker demand from Russia and the impact of the ban on selected food exports to Russia. Growth is expected to decelerate in Central Asia, due to the region's strong economic ties with Russia, as well as various country-specific factors. Countries that rely heavily on remittances from Russia are at particular risk of a sharper economic slow-down. Growth is expected to remain robust in the SEMED region, where countries have taken steps to reduce energy price subsidies and improve fiscal sustainability over the medium term.

The transition region's annual growth rate is projected to strengthen somewhat in 2015, increasing to 1.7 per cent. Output contraction in Ukraine is likely to be less severe in 2015. Growth may resume towards the end of the year, if the necessary macroeconomic adjustments and structural reforms are implemented and tensions do not escalate further. Russia is expected to experience a mild recession in 2015, reflecting increased uncertainty and the impact of economic sanctions. This slow-down is expected to constrain growth in the EEC region and Central Asia, where many economies rely heavily on export demand and remittance flows from Russia. Growth in the SEMED countries is also projected to strengthen on account of a more stable political environment.

The outlook for growth is subject to an exceptional degree of uncertainty related to geopolitical developments, with significant downside risks. Any further deepening of the crisis in Ukraine and Western sanctions on Russia will have direct implications for the two economies and a significant impact on investor confidence and growth in the transition region. In particular, a recession in Russia would reduce demand for the exports of many regional trade partners and weaken growth in remittance flows to EEC and Central Asian countries. A major economic slow-down in China or an abrupt correction in interest rates and asset prices in advanced markets could lead to a deterioration in the global economic outlook, potentially encouraging European parent banks to withdraw more funds from the region. This, in turn, would exacerbate the contraction of credit in the region, negatively affecting investment and consumption.

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# STRUCTURAL REFORM



IN

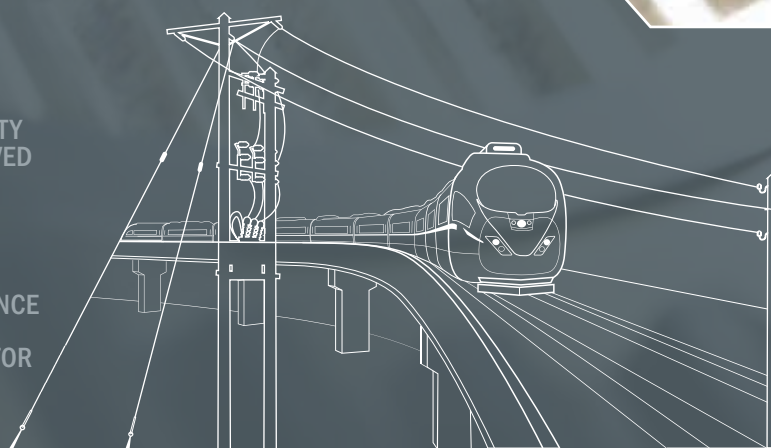
# 11

COUNTRIES  
MATERNAL MORTALITY  
RATES HAVE IMPROVED

# 3

THE NEGATIVE BALANCE  
OF SECTOR-LEVEL  
TRANSITION INDICATOR  
UPGRADES VERSUS  
DOWNGRADES

AT A GLANCE

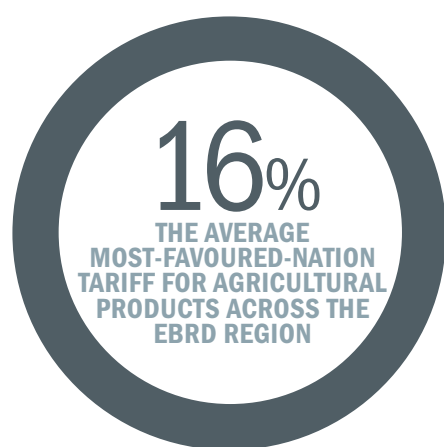


APPROXIMATELY

# 170 km

THE LENGTH OF  
ESTLINK 2, THE NEW  
INTERCONNECTION  
BETWEEN THE BALTIC  
AND NORDIC ELECTRICITY  
MARKETS

**The political and economic environment in many countries remains difficult for governments that are seeking to implement structural reforms. At the sector level, downgrades outnumber upgrades for the first time as some countries move away from commercial principles. The financial sector is still under pressure, but positive trends suggest that these difficulties can be overcome. However, fostering growth that is based on greater economic inclusion remains a challenge.**



## Introduction

Amid new and continuing political and economic challenges, the readiness of countries to implement reforms seems to have waned. The *Transition Report 2013* noted that the difficult environment was limiting the ability of governments – and, in certain cases, their willingness – to implement much-needed structural reforms and return their countries to a path of sustainable growth. As noted in 2013, it appears that, despite the difficult circumstances, there has been no wholesale reversal of previous reforms. However, there has been an increase in the number of downgrades relating to either the reversal of reforms or a lack of much-needed action to lift countries out of the crisis. As a result, there have been more downgrades than upgrades this year.

The EBRD continues to measure the progress of reforms in two ways. The first is a review of country-level reforms in areas such as privatisation, competition policy and trade. This review has been conducted since 1994 and has been extended to cover all years since 1989. While by no means comprehensive, it can be a useful tool to illustrate the progress that countries have made in allowing the private sector to develop and thrive as an important pillar of a functioning market economy. The second is a more disaggregated assessment at sector level which captures the distance relative to an industrialised market economy in terms of market structure and market-supporting institutions.

At sector level, the number of downgrades has continued to increase, surpassing the number of upgrades for the first time since the assessment began in 2010. Similar to last year, downgrades are driven mainly by EU countries (albeit there have also been a number of downgrades in Central Asia). The country-level indicators continue the trend witnessed in previous years of fewer changes being observed. Indeed, there have been only two upgrades and one downgrade this year.

With Cyprus becoming an EBRD recipient country in May 2014, sector and country-level assessments have been conducted for the country for the first time.

### Sector-level transition indicators

Table S.1 shows the transition scores for 16 sectors in all of the countries where the EBRD works. The methodology is broadly unchanged from previous years (see Chapter 1 of the *Transition Report 2010* for a detailed explanation), but some adjustments have been made in the capital markets sector.<sup>1</sup>

Tables S.2 and S.3 show the component ratings for market structure and market-supporting institutions and policies respectively, which together make up the overall sector-level assessment. There have been nine upgrades and 12 downgrades<sup>2</sup> – indicated by upward and downward arrows respectively – the reasons for which are outlined in the following sections (see also the “Countries” section of the online *Transition Report*, at [tr.ebrd.com](http://tr.ebrd.com)). Changes to inclusion assessments, which have also undergone some methodological adjustments, are presented in Tables S.4 to S.6 (see pages 120-122), as well as being explained in detail on page 119. ◉

<sup>1</sup> Please refer to the methodological notes in the online version of this *Transition Report* ([tr.ebrd.com](http://tr.ebrd.com)) for details of such changes.

<sup>2</sup> This refers only to changes in numerical scores and does not include changes to sector-level transition gaps.

**TABLE S.1. Sector-level transition indicators 2014: overall scores**

	Corporate sectors			Energy		Infrastructure			Financial sectors							
	Agribusiness	General industry	Real estate	ICT	Natural resources	Sustainable energy	Electric power	Water and wastewater	Urban transport	Roads	Railways	Banking	Insurance and other financial services	MSME finance	Private equity	Capital markets
<b>Central Europe and the Baltic states</b>																
Croatia	3	3+	4	4	4-	3-	3	3+	3+	3+	3-	3+	3+	3-	2-↓	3+
Estonia	3+	4+	4	4	4	3-	4+↑	4	3+	3	4	4-	3+	3+	3-↓	3
Hungary	4	4-	4-↓	4-	4-	3	3↓	3-↓	3+	4-	3+	3↓	3	3	3	3+
Latvia	3	4-	4-	4-	4-	3+	3+	3+	4-	3	4-	3+	3+	3	2-↓	3+
Lithuania	3+	4	4-	4-	4-	3+	3+	3+	4-	3	3	3+	3+	3	2+	3
Poland	3+	4-	4	4	3	3	3+	4-	4-	4-	4-	4-	3+	3	3+	4-↓
Slovak Republic	3+	4+	4	4-	4-	3	4	3+	3+↑	3+↑	3+	4-	3+	4-	2+	3
Slovenia	4-	3+	4	3+	3+	3+	3	3+	3	3	3	3	3+	3-	3-	3+
<b>South-eastern Europe</b>																
Albania	3-	2+	3-	3+	3-	3+	2+	2+	3-	3-	2	3-	2	3+↑	1	2-
Bosnia and Herzegovina	3-	2-	2-	2+	2	2	2	2	2+	3	3+	3-	2+	2+	2-	2
Bulgaria	3	3+	4-	4-	3+	3-	3	3	3+	3-	3+	3	3+	3	3-	3-
Cyprus	3-	4+	3	4-	3-	3-	3	3+	3+	3	Not applicable	3-	Not available	Not available	Not available	3+
FYR Macedonia	3-	3	4-	4-	2+	2+	3	2+	3-	3-	3-	3-	3-	3	1	2-
Kosovo	2+	2-	2-	2+	2	2-	2+	2+	2+	2+	3-	2+	2	3+↑	1	1
Montenegro	2+	2+	2+	3+	3+	2	2+	2	3	2+	2+	3-	2+	3↑	1	2
Romania	3	3+	3+	3+	4-	3+	3+	4-	3+	3	3+	3	3+	3	3-	3-
Serbia	3-	3-	3	3	2	2+	2+	2+	3-	3-	3	3-	3	3	2↑	2
Turkey	3-	3	3+	3+	3+	3	3+	3-	3	3-	3-	3+	3	3↑	3-	4
<b>Eastern Europe and the Caucasus</b>																
Armenia	3-	3	3	3	2+	3-	3+	3-	2+	3-	2+	2+	2	2+	1	2
Azerbaijan	2+	2	2-	2-	2+	2+	2+	2-	2	2+	2	2	2	2	1	2-
Belarus	2+	2	2	2	1	2	1	2-	2	2	1	2	2	2	1	2-
Georgia	3-	3-	3-	3-	2-	3-	3+	2	2+	2+	3	3-	2	3-	1	2-
Moldova	3-	2-	3	3	3	2+	3	2	3↑	3↑	2	2+	2+	2	2	2
Ukraine	3-	2+	3-	3-	2-	2+	3	2+	3-	3-	2+	3-	2+	2+	2	2↓
Russia	3-	3-	3	3+	2	2	3+	3	3	3-	4-	3-	3-	2	2+	4-
<b>Central Asia</b>																
Kazakhstan	3-	2	3	3	2-	2-	3	2+	2+	3-	3	2-↓	2+	2	2-	2↓
Kyrgyz Republic	2+	2	3	3	2-	2	2+	2	2	2-	1	2	2-	2-	1	2-
Mongolia	3-	2+	2	3	2	2	2+	2	2	2-	3-	2+	2	2+	2-	2-↓
Tajikistan	2	2-	2-	2+	1	2+	2	2	2	2-	1	2	2-	2-	1	1
Turkmenistan	1	1	1	2-	1	1	1	1	1	1	1	1	2-	1	1	1
Uzbekistan	2	1	2	2	1	2-	2+	2-	2	1	3-	1	2	1	1	1
<b>Southern and eastern Mediterranean</b>																
Egypt	2	2	2+	3	1	2+	2+	1	2	2+	2-	2+	2+	2-	2	2+
Jordan	2	2+	3-	3+	2+	2+	3	2-	2+	3-	2	3	2+	2+	2	2
Morocco	2+	3-	3-	3+	2-	3	2	2+	3	3-	2	3	3-	2+	2+	3
Tunisia	3-	3+	3-	3	2	3-	2	2	2+	2+	2+	2+	2+	2	2-	2+

Source: EBRD.

Note: The transition indicators range from 1 to 4+, with 1 representing little or no change relative to a rigid centrally planned economy and 4+ representing the standards of an industrialised market economy. For a detailed breakdown of each of the areas of reform, see the methodological notes in the online version of this *Transition Report* ([tr.ebrd.com](http://tr.ebrd.com)). Upgrades and downgrades are marked by upward and downward arrows respectively. A colour code is used for ease of recognition: green indicates a sector that is at a fairly advanced stage of transition, scoring 3+ or higher. Conversely, dark red denotes sectors where transition has barely advanced and the score is 2 or lower. There were nine one-notch upgrades this year: electric power (Moldova), roads (Moldova and the Slovak Republic), MSME finance (Albania, Kosovo, Montenegro and Turkey) and private equity (Serbia). There were 12 downgrades: ICT (Hungary), electric power (Hungary), water and wastewater (Hungary), banking (Hungary and Kazakhstan), private equity (Croatia, Estonia and Latvia) and capital markets (Kazakhstan, Mongolia, Poland and Ukraine). A methodological adjustment in the capital market sector has also led to a number of changes (affecting Bulgaria, Croatia, Jordan, Latvia, Moldova, Montenegro, Morocco, Romania, Serbia and Slovenia), which are not marked as upgrades or downgrades as they do not represent improvements in or the reversal of capital market reforms. Scores for sustainable energy are currently undergoing revision. Please note that not all scores for Cyprus were available at the time of printing, but will be added to the online version of this *Transition Report*.

## Energy

The last few years have been difficult for energy markets in the EBRD region. While some countries have announced reforms, progress with implementation has been slow. In some cases, reforms have even been reversed, leading to six downgrades in the electric power sector in the past two years. With only one downgrade and one upgrade, 2014 may mark a turning point for this sector. However, it is too early to say with certainty, particularly given the increase in energy-related challenges in the region, not least because of the crisis in Ukraine.

Hungary has been downgraded for the third year in a row, this time from 3+ to 3, owing to a further deterioration in market-supporting institutions. Government interference in this sector has continued, especially with regard to tariff setting, reversing earlier tariff liberalisation efforts. The government has announced further price reductions and is continuing unequal treatment among users, with businesses having to pay higher electricity prices than households and public institutions. In addition, the presence of private utilities in the market is actively being reduced as a result of acquisitions by the state-owned incumbent.

In contrast, progress has been made in Estonia, leading to an upgrade from 4 to 4+. This upgrade is mainly driven by the full opening-up of Estonia's electricity market in 2013, in line with the country's EU accession agreement. All customers can now choose their electricity supplier. This was the only major challenge remaining in the area of market structure, meaning that the country has now reached the maximum score in terms of aligning its structures and institutions with those of an energy sector within a well-functioning market economy. This achievement is underpinned by the positive outlook for cross-border trade, especially with the undersea power cable EstLink 2 beginning to operate in 2014. The cable will enhance interconnection and help to increase the flow of electricity between the Baltic states and the Nordic countries.

## Infrastructure

There have been a number of positive developments in the area of infrastructure, leading to three upgrades in the Slovak Republic and Moldova. However, Hungary's increasingly state-oriented and non-commercial approach to economic policy has had a negative effect on the water and wastewater sector, leading to a downgrade. In addition, Bulgaria has been downgraded in regard to urban transport, mainly owing to a number of municipalities returning to providing bus services without private sector involvement.

The downgrade for Hungary in the water and wastewater sector, from 4 to 3+, is related to changes in market-supporting institutions. Legal changes have been adopted which turn for-profit operators into not-for-profit entities, and the country's newly established water regulator is limiting commercial pricing. In addition, private sector participation has fallen from its previously high level. Thus, this sector is moving further away from commercially based mechanisms, effectively jeopardising its long-term financial sustainability.

However, there have been upgrades in the road sector. The score for the Slovak Republic, for example, has increased from 3 to 3+. The public-private partnership (PPP) relating to the R1 motorway has been refinanced via the issuance of bonds – a landmark transaction indicating that this sector is approaching maturity. While this is the only road-related PPP project in the Slovak Republic, its completion and capital refinancing have demonstrated the viability of the PPP mechanism in the country. Moldova has also been upgraded (from 3- to 3), reflecting reforms relating to the funding of road maintenance. These reforms include moves towards formula-based allocation, as well as a substantial increase in allocated funds – resulting in a total of some MDL 1.2 billion (approximately €65 million) for 2014. In addition, more than 30 state-owned maintenance companies have been merged to form 11 larger entities, resulting in much-needed consolidation in the sector.

Similarly, Moldova has seen another important development in the urban transport sector. Public service contracts (PSCs) have been introduced in major cities such as Chisinau and Balti. Early evidence of more regular payments under these contracts reinforces the positive demonstration effect that these may have on other cities. In contrast, while the PSC framework in Bulgaria has also been improved, the city of Sofia's failure to honour contractual obligations in recent years has dampened their demonstration effect. In addition, the return to municipal management of urban bus services in several Bulgarian cities in order to obtain larger EU grants has led to Bulgaria's market structure gap widening from small to medium.

## Financial sectors

While last year's observation that financial sector reforms had proven resilient still holds true, there are some notable exceptions, with three downgrades in the banking sector this year compared with none last year. The difficult economic and socio-political environment has also revealed a number of structural challenges in the micro, small and medium-sized enterprise (MSME), private equity and capital market sectors. However, some improvements have also been observed – particularly in the MSME sector, where improved access to finance for SMEs has triggered a number of upgrades.

In the banking sector, Hungary has been downgraded from 3+ to 3 owing to a number of tax measures that led to cost-cutting and rapid deleveraging among banks. Restitution of certain loan charges made on foreign-currency-denominated retail loans, and uncertainty over the announced future conversion of such loans into domestic currency, have further eroded banks' appetite for lending. The government has announced targets to reduce the role of foreign banks within the sector and to expand the role of state-owned institutions. Non-performing loans (NPLs) stand at about 18 per cent in both corporate and retail loans. While this represents a small reduction, incentives for banks to clean up portfolios remain weak, and there is a need to develop more effective out-of-court restructuring mechanisms. The downgrading of Kazakhstan can be explained by the failure to reduce the high level of NPLs (about 30 per cent), despite the

**TABLE S.2. Sector-level transition indicators 2014: market structure**

	Corporate sectors			Energy			Infrastructure			Financial sectors						
	Agrifusiness	General industry	Real estate	ICT	Natural resources	Sustainable energy	Electric power	Water and wastewater	Urban transport	Roads	Railways	Banking	Insurance and other financial services	MSME finance	Private equity	Capital markets
<b>Central Europe and the Baltic states</b>																
Croatia	Small	Small	Medium	Small	Small	Medium	Large	Medium	Medium	Small	Medium	Small	Small	Medium	Medium	Medium
Estonia	Small	Negligible	Negligible	Small	Small	Medium	Negligible	Negligible	Small	Medium	Small	Small	Small	Small	Medium	Medium
Hungary	Small	Small	Small	Small	Small	Medium	Medium	Small	Medium	Medium	Medium	Small	Small	Medium	Medium	Medium
Latvia	Small	Negligible	Small	Small	Medium	Medium	Medium	Small	Small	Medium	Small	Small	Small	Medium	Medium	Medium
Lithuania	Small	Negligible	Small	Small	Medium	Medium	Medium	Medium	Small	Medium	Medium	Small	Small	Medium	Medium	Medium
Poland	Small	Small	Small	Small	Small	Medium	Medium	Small	Small	Small	Small	Small	Small	Medium	Small	Small
Slovak Republic	Small	Negligible	Small	Small	Small	Medium	Small	Medium	Medium	Small	Small	Small	Small	Medium	Medium	Medium
Slovenia	Small	Small	Negligible	Small	Small	Small	Medium	Small	Small	Medium	Medium	Medium	Small	Medium	Medium	Medium
<b>South-eastern Europe</b>																
Albania	Medium	Medium	Large	Medium	Medium	Small	Large	Large	Medium	Medium	Large	Medium	Large	Medium	Large	Large
Bosnia and Herzegovina	Medium	Large	Large	Medium	Large	Large	Large	Large	Medium	Medium	Medium	Medium	Medium	Medium	Large	Large
Bulgaria	Small	Small	Medium	Small	Small	Large	Large	Medium	Medium	Medium	Small	Small	Small	Small	Medium	Medium
Cyprus	Medium	Negligible	Medium	Small	Medium	Medium	Large	Medium	Medium	Medium	Not applicable	Medium	Small	Not available	Not available	Medium
FYR Macedonia	Medium	Medium	Large	Small	Medium	Large	Medium	Large	Medium	Medium	Medium	Medium	Medium	Medium	Large	Large
Kosovo	Medium	Medium	Large	Medium	Medium	Large	Large	Large	Medium	Medium	Medium	Medium	Large	Medium	Large	Large
Montenegro	Medium	Medium	Medium	Small	Small	Large	Large	Large	Small	Medium	Medium	Medium	Medium	Medium	Large	Large
Romania	Small	Small	Medium	Small	Small	Medium	Medium	Small	Small	Small	Small	Small	Small	Medium	Medium	Medium
Serbia	Medium	Medium	Large	Medium	Medium	Large	Large	Large	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Large
Turkey	Medium	Small	Small	Medium	Medium	Medium	Medium	Large	Medium	Medium	Medium	Medium	Medium	Small	Medium	Negligible
<b>Eastern Europe and the Caucasus</b>																
Armenia	Medium	Medium	Large	Medium	Medium	Medium	Medium	Medium	Large	Medium	Medium	Large	Large	Medium	Large	Large
Azerbaijan	Medium	Large	Large	Large	Large	Large	Large	Large	Large	Medium	Medium	Large	Large	Large	Large	Large
Belarus	Large	Large	Large	Medium	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Georgia	Medium	Medium	Large	Medium	Large	Medium	Medium	Large	Large	Medium	Medium	Medium	Large	Medium	Large	Large
Moldova	Medium	Medium	Large	Medium	Medium	Large	Medium	Large	Medium	Large	Large	Large	Large	Large	Large	Large
Ukraine	Medium	Medium	Large	Medium	Large	Large	Large	Large	Medium	Medium	Medium	Medium	Medium	Large	Medium	Large
Russia	Medium	Medium	Medium	Medium	Large	Large	Medium	Medium	Small	Medium	Small	Medium	Medium	Large	Medium	Small
<b>Central Asia</b>																
Kazakhstan	Medium	Large	Medium	Medium	Large	Large	Large	Large	Medium	Medium	Medium	Medium	Medium	Large	Large	Large
Kyrgyz Republic	Medium	Large	Large	Large	Large	Large	Medium	Large	Medium	Large	Large	Large	Large	Large	Large	Large
Mongolia	Medium	Large	Large	Large	Medium	Large	Large	Large	Large	Medium	Medium	Large	Large	Medium	Large	Large
Tajikistan	Medium	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Turkmenistan	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Uzbekistan	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
<b>Southern and eastern Mediterranean</b>																
Egypt	Large	Large	Medium	Medium	Large	Large	Large	Large	Large	Large	Large	Medium	Large	Large	Large	Medium
Jordan	Medium	Medium	Medium	Small	Medium	Large	Medium	Large	Medium	Large	Large	Small	Medium	Medium	Medium	Large
Morocco	Medium	Medium	Medium	Small	Large	Medium	Large	Medium	Medium	Medium	Large	Medium	Medium	Medium	Medium	Medium
Tunisia	Medium	Medium	Medium	Medium	Large	Large	Large	Large	Large	Large	Large	Medium	Medium	Large	Medium	Medium

Source: EBRD.

Note: "Large" indicates a major transition gap. "Negligible" indicates standards and performance that are typical of advanced industrialised economies. A historical revision taking into account the availability of new data has been conducted for Jordan's capital market sector. Please also note the correction for Hungary's railway sector which was previously misreported. In addition, not all gaps for Cyprus were available at the time of printing, but will be added to the online version of this *Transition Report*.

TABLE S.3. Sector-level transition indicators 2014: market-supporting institutions

	Corporate sectors			Energy			Infrastructure			Financial sectors						
	Agribusiness	General industry	Real estate	ICT	Natural resources	Sustainable energy	Electric power	Water and wastewater	Urban transport	Roads	Railways	Banking	Insurance and other financial services	MSME finance	Private equity	Capital markets
<b>Central Europe and the Baltic states</b>																
Croatia	Medium	Small	Small	Small	Small	Medium	Medium	Small	Small	Medium	Medium	Small	Small	Medium	Medium	Small
Estonia	Medium	Negligible	Negligible	Negligible	Negligible	Medium	Negligible	Small	Medium	Medium	Negligible	Small	Small	Small	Medium	Small
Hungary	Small	Small	Negligible	Small	Small	Small	Large	Medium	Small	Negligible	Small	Medium	Small	Small	Small	Small
Latvia	Medium	Small	Negligible	Negligible	Negligible	Small	Negligible	Small	Small	Medium	Negligible	Small	Small	Small	Medium	Small
Lithuania	Medium	Small	Negligible	Negligible	Negligible	Small	Small	Small	Small	Medium	Small	Small	Small	Small	Medium	Small
Poland	Small	Small	Small	Negligible	Medium	Small	Negligible	Small	Small	Small	Small	Small	Small	Small	Small	Small
Slovak Republic	Small	Negligible	Negligible	Small	Small	Small	Small	Small	Small	Medium	Medium	Small	Small	Negligible	Small	Small
Slovenia	Medium	Small	Negligible	Negligible	Small	Small	Small	Small	Small	Medium	Small	Medium	Small	Small	Medium	Small
<b>South-eastern Europe</b>																
Albania	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Large	Large	Medium	Large	Medium	Medium	Medium	Large	Large
Bosnia and Herzegovina	Medium	Medium	Large	Medium	Large	Large	Large	Large	Large	Medium	Small	Medium	Medium	Medium	Large	Large
Bulgaria	Medium	Medium	Small	Small	Medium	Small	Medium	Small	Small	Medium	Medium	Medium	Small	Medium	Small	Small
Cyprus	Medium	Negligible	Small	Small	Medium	Medium	Medium	Small	Small	Medium	Not applicable	Medium	Not available	Medium	Not available	Small
FYR Macedonia	Medium	Medium	Medium	Small	Medium	Medium	Medium	Large	Large	Medium	Medium	Medium	Medium	Medium	Large	Large
Kosovo	Large	Large	Large	Medium	Large	Large	Large	Medium	Large	Large	Medium	Medium	Large	Large	Large	Large
Montenegro	Medium	Medium	Medium	Medium	Small	Medium	Medium	Large	Large	Medium	Medium	Medium	Medium	Medium	Large	Medium
Romania	Medium	Small	Small	Small	Small	Small	Medium	Small	Small	Medium	Small	Small	Small	Small	Small	Small
Serbia	Medium	Medium	Medium	Medium	Large	Medium	Large	Large	Large	Medium	Small	Medium	Small	Medium	Medium	Medium
Turkey	Small	Medium	Medium	Small	Small	Medium	Medium	Medium	Medium	Medium	Medium	Small	Small	Medium	Small	Small
<b>Eastern Europe and the Caucasus</b>																
Armenia	Medium	Small	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Large	Medium	Large	Medium	Large	Medium
Azerbaijan	Medium	Large	Large	Large	Medium	Large	Large	Large	Large	Medium	Large	Large	Medium	Large	Large	Large
Belarus	Medium	Large	Large	Large	Large	Medium	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Georgia	Medium	Medium	Small	Small	Large	Large	Medium	Large	Large	Medium	Medium	Medium	Medium	Medium	Large	Large
Moldova	Medium	Large	Medium	Medium	Medium	Small	Large	Large	Medium	Medium	Large	Medium	Medium	Medium	Medium	Large
Ukraine	Medium	Large	Medium	Medium	Large	Small	Large	Large	Large	Medium	Large	Medium	Medium	Medium	Large	Medium
Russia	Medium	Medium	Medium	Medium	Large	Medium	Medium	Medium	Medium	Medium	Small	Medium	Medium	Large	Medium	Medium
<b>Central Asia</b>																
Kazakhstan	Medium	Large	Small	Medium	Large	Large	Medium	Large	Large	Medium	Medium	Medium	Medium	Large	Medium	Medium
Kyrgyz Republic	Medium	Medium	Medium	Medium	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Mongolia	Medium	Medium	Large	Medium	Large	Medium	Large	Large	Large	Medium	Medium	Medium	Large	Large	Medium	Medium
Tajikistan	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Turkmenistan	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Uzbekistan	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
<b>Southern and eastern Mediterranean</b>																
Egypt	Large	Medium	Large	Medium	Large	Medium	Large	Large	Large	Medium	Large	Medium	Medium	Large	Medium	Medium
Jordan	Large	Large	Medium	Medium	Medium	Medium	Medium	Large	Large	Medium	Medium	Medium	Medium	Large	Medium	Large
Morocco	Medium	Medium	Medium	Medium	Large	Medium	Large	Large	Large	Medium	Medium	Medium	Medium	Large	Medium	Medium
Tunisia	Medium	Small	Medium	Medium	Large	Medium	Large	Large	Large	Medium	Medium	Large	Medium	Large	Large	Medium

Source: EBRD.

Note: "Large" indicates a major transition gap. "Negligible" indicates standards and performance that are typical of advanced industrialised economies. A historical revision taking into account the availability of new data has been conducted for Jordan's capital market sector. Please also note the correction for Poland's capital markets sector which was previously misreported. In addition, not all gaps for Cyprus were available at the time of printing, but will be added to the online version of this *Transition Report*.

Central Bank directing its efforts towards solving the problem. In addition, there has been a decline in the percentage of total banking assets that are foreign-owned, driven partly by sales of bank subsidiaries to local competitors. In contrast, Romania's gap for market-supporting institutions has narrowed from medium to small, as banking regulation has been improved (including compulsory stress testing for foreign currency lending).

In the area of MSME lending, the market structure gap has widened from medium to large in Ukraine. This is driven by the fact that there is currently scant MSME lending available, owing to the poor situation of many banks, which are suffering from very high NPL ratios. As a result, the current priority is to clean up banks' balance sheets. This is having a disproportionate effect on MSMEs, not least because they represent the segment with the highest level of NPLs. On the other hand, Turkey has seen its market structure gap narrow from medium to small. This reflects positive developments in terms of increased lending to SMEs, more favourable interest rates and greater availability of alternative financing options in the market. Three other upgrades in Albania, Kosovo and Montenegro have been driven by better access to finance for SMEs, in addition to improvements in the skills of loan officers and lending departments dealing with credit applications by SMEs.

Changes in the private equity sector have been driven mainly by the presence of fund managers in the market, or a lack thereof, particularly in central and eastern Europe. However, they also reflect the availability of private equity more generally. Downgrades in Croatia (from 3- to 2+), Estonia (market structure gap from small to medium) and Latvia (from 3- to 2+) can be explained by unfavourable changes in the number of fund managers – and the types of fund manager – that are investing in these countries. However, there have also been upgrades in both the Slovak Republic and Serbia, where market structure gaps have narrowed from large to medium, as the amount of private equity capital invested has more than doubled in both countries. In addition, in the Slovak Republic the permitted scope of investment for funds has been widened to include assets designated as being distressed or in need of restructuring.

In the capital market sector, a number of changes have been driven by a methodological adjustment that has led to the recalibration of overall scores in order to reflect differences between countries more accurately. The downgrades in Kazakhstan and Poland are linked to pension reforms, which have marginalised the role of private pension funds and had a significant negative effect on the institutional investor base in both countries. In addition, the endemic problems in Kazakhstan's banking sector – see above – have brought a halt to the capital market development observed prior to the financial crisis. In Ukraine, the market structure gap has widened owing to a deterioration of liquidity indicators – in particular, government and corporate bond market indices. In Tunisia, by contrast, a comprehensive development plan for capital markets has been put in place, supporting further progress and leading to a narrowing of the market institutions gap from large to medium.

### Corporate sectors

Progress in the corporate sector continues to be mixed, with both positive and negative developments in the transition region. This year there have been two downgrades and one upgrade.

In general industry, the market institutions gap in Bulgaria has widened from small to medium, reflecting the ongoing deterioration in the business environment. Although foreign firms – manufacturers of automotive parts, for example – continue to show interest in Bulgaria, the weak economic growth in recent years, combined with political turbulence, has led to low levels of both foreign direct investment and domestic investment. The political interference seen in the electric power sector (which was downgraded last year), combined with low feed-in tariffs, is having a significant effect on the corporate sector by discouraging investments in resource efficiency.

Hungary has also suffered a downgrade in the ICT sector, with the market institutions gap widening from negligible – the highest rating – to small. A new special tax on advertising and media services was introduced recently. Even though the special tax on telecommunications operators introduced in 2010 as a temporary measure was phased out as of 2013, it was replaced by a new tax on telecommunications services (telephone calls and text messages). The uncertainties related to frequent changes in sector-specific taxation may affect operators' willingness to invest in network infrastructure and may make the sector less attractive for new investors.

The sole upgrade is observed in the real estate sector, with Montenegro's market institutions gap narrowing from large to medium. This is due mainly to progress in reducing bureaucratic obstacles to obtain building permits. Processes have been significantly streamlined, including the introduction of a one-stop shop, as well as strict time limits for the provision of approval.

Although they have not led to any rating changes this year, significant developments have also been observed in the agribusiness sector across the EBRD region. Examples include plans to move away from highly subsidised food schemes in Egypt, which will, however, be challenging to implement. In addition, efforts to reform land markets have begun in Croatia and Turkey, which may help to prevent the further fragmentation of farm land and facilitate productivity gains. In Russia, a number of ad hoc trade barriers have been introduced. In addition, temporary import bans have been put in place in response to sanctions imposed by the United States and the EU. The potential structural effects of these measures have yet to be assessed.

### Cyprus

Cyprus became an EBRD recipient country in May 2014, so this is the first time that it has been included in this annual assessment of structural reform progress. Despite being an EU member state and relatively advanced in certain sectors, the country faces major challenges in a few very specific areas – particularly in the financial and infrastructure sectors. In these two sectors, its scores range from 3- to 3+. The key challenges in the financial sector span most of the banking industry, with a very high NPL ratio of around 50 per cent, low levels of funding and a need



to push through further restructuring. These problems are restricting companies' access to finance, particularly in the case of SMEs, while alternative financial products are not readily available in the market. In the infrastructure sector, wider private-sector participation – for example via PPPs and the introduction of performance-based contracts – remain a challenge. In the corporate sector, market structures and institutions appear to be more robust, particularly in the general industry and the ICT sectors, which have scores of at least 4-. However, specific challenges relating to privatisation and corporate restructuring remain.

## Inclusion

Given the importance of economic inclusion for the development of sustainable economic systems, the EBRD assesses the level of inclusion across a range of market sectors in the countries where it works. This assessment was carried out for the first time last year, and Chapter 5 of the *Transition Report 2013* provides a detailed explanation of the rationale behind it, as well as the methodology used. Of the three existing measures of inclusion, only the gender gaps and youth gaps have been updated this year. The regional gaps will be updated once the results of the next *Life in Transition Survey* – which is scheduled for 2015 – are available.

Most of the changes in the assessment of gender gaps relate to health services and education. In the area of health services, they result from slight improvements in maternal mortality, particularly in the majority of southern and eastern Mediterranean (SEMED) countries (namely Egypt, Jordan and Morocco), as well as in Georgia, Kazakhstan, Moldova, Mongolia, Russia, Serbia, Turkmenistan and Ukraine. However, Lithuania has been downgraded from small to medium owing to a slight increase in maternal mortality. Meanwhile, three countries (Azerbaijan, Belarus and Uzbekistan) have made some progress in education by closing the gender gap in terms of enrolment in and completion of secondary and tertiary education, leading to upgrades. At the same time, completion rates for primary education have decreased among the female population of Bulgaria, Jordan and Romania, leading to downgrades. In the areas of labour practices, access to finance, and employment and firm ownership, gender gaps remain medium to large overall (particularly in the SEMED countries, where gaps are large across all three dimensions).

As regards youth gaps, most upgrades and downgrades are concentrated in the fields of education, financial inclusion and labour market structure. There have been a few upgrades in terms of the quality and quantity of education, driven by better PISA scores (Albania and Montenegro) or increases in the number of years of schooling (Bulgaria, Jordan, Latvia and Romania). Changes to the flexibility of hiring, firing and wage determination in the labour market have led to three downgrades (Bosnia and Herzegovina, Georgia and Romania) and two upgrades (Estonia and Hungary). In terms of financial inclusion, changes generally reflect improvements in the area of access to

financial services, resulting in just one downgrade (Georgia) and four upgrades (Jordan, Latvia, FYR Macedonia and the Kyrgyz Republic). Opportunities for young people have not changed much in the past year, so gaps remain large in a number of countries, particularly in the SEMED region, as well as south-eastern Europe.

## Country-level transition indicators

Alongside the sector-level transition scores discussed above, the traditional country-level transition indicators – which cover cross-cutting issues such as privatisation, liberalisation and governance – have been retained (see Table S.7). However, only a few developments in the past year have warranted changes to those scores, either up or down. There have been just three changes: a downgrade for Russia in the area of trade and foreign exchange, and upgrades for Croatia and Montenegro in the area of competition policy.

Russia's downgrade comes against the backdrop of Western sanctions resulting from the crisis in Ukraine and the countermeasures adopted by Russia in response. The Russian authorities have introduced a one-year import ban with effect from August 2014 targeting EU food products. Separate measures include a ban on imports of Ukrainian food products, including dairy and confectionery. In addition, a number of temporary measures have been adopted over the past year that affect agricultural and manufacturing imports. As a result, Russia's score has been reduced from 4 to 4-.

Meanwhile, Croatia has been upgraded from 3 to 3+ in the area of competition in light of the country's accession to the EU and the important amendments to the country's Competition Act that entered into force in mid-2013. These amendments include the provision of greater clarity regarding the separation of powers and responsibilities between the competition authority and the courts. Croatia has also strengthened the procedures governing raids conducted by the competition authority, which may be associated with firmer and more frequent enforcement of antitrust rules. In Montenegro, the establishment of a fully independent competition authority has led to an upgrade of the competition policy indicator from 2 to 2+. This upgrade is underpinned by signs of increasing prosecution of cartels, despite deficiencies in terms of resources and the resulting enforcement levels.

**TABLE S.4. Inclusion gaps for gender**

	Legal regulations	Health services	Education	Labour policy	Labour practices	Employment and firm ownership	Access to finance
<b>Central Europe and the Baltic states</b>							
Croatia	Negligible	Small	Negligible	Medium	Large	Small	Small
Estonia	Negligible	Small	Negligible	Small	Large	Medium	Medium
Hungary	Negligible	Small	Negligible	Negligible	Medium	Medium	Medium
Latvia	Small	Medium	Negligible	Small	Large	Medium	Small
Lithuania	Negligible	Medium	Negligible	Small	Medium	Medium	Medium
Poland	Small	Small	Negligible	Small	Medium	Medium	Medium
Slovak Republic	Small	Small	Negligible	Small	Medium	Medium	Medium
Slovenia	Negligible	Small	Negligible	Small	Medium	Medium	Small
<b>South-eastern Europe</b>							
Albania	Negligible	Medium	Small	Small	Large	Large	Large
Bosnia and Herzegovina	Negligible	Medium	Negligible	Medium	Large	Large	Medium
Bulgaria	Negligible	Small	Small	Small	Large	Medium	Medium
Cyprus	Not available	Medium	Negligible	Not available	Not available	Small	Large
FYR Macedonia	Small	Medium	Small	Small	Large	Medium	Medium
Kosovo	Not available	Not available	Not available	Not available	Not available	Not available	Large
Montenegro	Small	Medium	Negligible	Medium	Large	Medium	Medium
Romania	Negligible	Medium	Small	Small	Large	Medium	Medium
Serbia	Small	Small	Negligible	Medium	Large	Large	Small
Turkey	Small	Small	Medium	Small	Large	Large	Large
<b>Eastern Europe and the Caucasus</b>							
Armenia	Medium	Medium	Negligible	Small	Large	Large	Medium
Azerbaijan	Negligible	Medium	Negligible	Medium	Large	Medium	Large
Belarus	Small	Small	Negligible	Medium	Large	Small	Medium
Georgia	Small	Medium	Negligible	Small	Large	Medium	Small
Moldova	Small	Small	Negligible	Small	Large	Small	Medium
Ukraine	Small	Small	Negligible	Small	Large	Medium	Medium
Russia	Small	Small	Negligible	Medium	Large	Medium	Medium
<b>Central Asia</b>							
Kazakhstan	Small	Medium	Negligible	Medium	Large	Large	Medium
Kyrgyz Republic	Medium	Large	Negligible	Medium	Large	Medium	Small
Mongolia	Small	Medium	Negligible	Medium	Large	Medium	Small
Tajikistan	Medium	Large	Medium	Small	Large	Medium	Large
Turkmenistan	Large	Medium	Small	Medium	Large	Large	Not available
Uzbekistan	Medium	Medium	Small	Medium	Large	Large	Large
<b>Southern and eastern Mediterranean</b>							
Egypt	Medium	Medium	Medium	Medium	Large	Large	Large
Jordan	Medium	Medium	Small	Medium	Large	Large	Large
Morocco	Medium	Medium	Medium	Medium	Large	Large	Large
Tunisia	Small	Medium	Small	Small	Large	Large	Large
<b>Comparator countries</b>							
France	Negligible	Small	Negligible	Small	Medium	Medium	Medium
Germany	Negligible	Small	Negligible	Negligible	Medium	Small	Medium
Italy	Negligible	Small	Negligible	Small	Medium	Large	Large
Sweden	Negligible	Small	Negligible	Negligible	Medium	Small	Medium
United Kingdom	Negligible	Small	Negligible	Small	Medium	Medium	Medium

Source: EBRD.

Note: Methodological changes have been made in the following areas: employment and firm ownership, access to finance and labour practices. These are driven mainly by amendments to the BEPS questionnaire. Please refer to the methodological notes in the online version of this *Transition Report* ([tr.ebrd.com](http://tr.ebrd.com)) for further details.

TABLE S.5. Inclusion gaps for youth

	Labour market structure	Opportunities for youth	Quantity of education	Quality of education	Financial inclusion
<b>Central Europe and the Baltic states</b>					
Croatia	Medium	Large	Small	Medium	Medium
Estonia	Small	Medium	Negligible	Medium	Small
Hungary	Medium	Medium	Negligible	Small	Medium
Latvia	Small	Medium	Negligible	Medium	Small
Lithuania	Medium	Medium	Small	Medium	Large
Poland	Medium	Medium	Small	Medium	Medium
Slovak Republic	Medium	Large	Small	Large	Medium
Slovenia	Medium	Small	Small	Small	Negligible
<b>South-eastern Europe</b>					
Albania	Medium	Large	Small	Medium	Negligible
Bosnia and Herzegovina	Medium	Large	Medium	Not available	Small
Bulgaria	Small	Large	Negligible	Medium	Small
Cyprus	Small	Large	Small	Medium	Medium
FYR Macedonia	Medium	Large	Medium	Large	Small
Kosovo	Not available	Not available	Not available	Not available	Not available
Montenegro	Medium	Large	Small	Medium	Medium
Romania	Small	Large	Negligible	Medium	Small
Serbia	Small	Large	Large	Medium	Large
Turkey	Medium	Large	Large	Medium	Large
<b>Eastern Europe and the Caucasus</b>					
Armenia	Small	Large	Small	Medium	Negligible
Azerbaijan	Medium	Large	Small	Large	Small
Belarus	Not available	Medium	Negligible	Not available	Medium
Georgia	Small	Large	Negligible	Medium	Medium
Moldova	Medium	Large	Small	Large	Negligible
Ukraine	Medium	Small	Small	Large	Negligible
Russia	Medium	Medium	Negligible	Medium	Medium
<b>Central Asia</b>					
Kazakhstan	Small	Medium	Small	Large	Medium
Kyrgyz Republic	Medium	Large	Medium	Large	Negligible
Mongolia	Small	Medium	Large	Not available	Small
Tajikistan	Medium	Medium	Small	Not available	Negligible
Turkmenistan	Not available	Not available	Small	Not available	Negligible
Uzbekistan	Not available	Not available	Small	Not available	Small
<b>Southern and eastern Mediterranean</b>					
Egypt	Medium	Large	Large	Not available	Negligible
Jordan	Small	Large	Medium	Medium	Medium
Morocco	Medium	Large	Large	Large	Medium
Tunisia	Medium	Large	Large	Large	Small
<b>Comparator countries</b>					
France	Medium	Medium	Negligible	Small	Medium
Germany	Medium	Negligible	Small	Small	Negligible
Italy	Medium	Large	Negligible	Medium	Large
Sweden	Medium	Medium	Small	Small	Small
United Kingdom	Small	Medium	Small	Small	Negligible

Source: EBRD.

Note: Methodological changes have been made in the following areas: opportunities for youth and financial inclusion. These are driven mainly by the availability of new data. Please refer to the methodological notes in the online version of this *Transition Report* ([tr.ebrd.com](http://tr.ebrd.com)) for further details.

**TABLE S.6. Inclusion gaps for regions**

	Institutions	Access to services	Labour markets	Education
<b>Central Europe and the Baltic states</b>				
Croatia	Medium	Medium	Small	Medium
Estonia	Small	Medium	Negligible	Small
Hungary	Medium	Small	Large	Small
Latvia	Small	Medium	Small	Medium
Lithuania	Medium	Large	Small	Small
Poland	Medium	Medium	Medium	Small
Slovak Republic	Medium	Small	Medium	Small
Slovenia	Small	Negligible	Small	Small
<b>South-eastern Europe</b>				
Albania	Medium	Medium	Large	Small
Bosnia and Herzegovina	Large	Large	Large	Small
Bulgaria	Medium	Medium	Medium	Medium
Cyprus	Not available	Not available	Not available	Not available
FYR Macedonia	Small	Medium	Large	Large
Kosovo	Medium	Large	Large	Small
Montenegro	Medium	Medium	Large	Small
Romania	Medium	Large	Medium	Medium
Serbia	Large	Medium	Large	Large
Turkey	Medium	Large	Medium	Large
<b>Eastern Europe and the Caucasus</b>				
Armenia	Medium	Medium	Large	Medium
Azerbaijan	Medium	Small	Large	Small
Belarus	Medium	Negligible	Small	Negligible
Georgia	Negligible	Large	Large	Medium
Moldova	Medium	Large	Large	Large
Ukraine	Medium	Medium	Medium	Small
Russia	Medium	Small	Small	Medium
<b>Central Asia</b>				
Kazakhstan	Small	Small	Medium	Medium
Kyrgyz Republic	Medium	Large	Medium	Small
Mongolia	Negligible	Medium	Medium	Medium
Tajikistan	Medium	Large	Large	Small
Turkmenistan	Not available	Not available	Not available	Not available
Uzbekistan	Large	Medium	Large	Large
<b>Southern and eastern Mediterranean</b>				
Egypt	Not available	Not available	Not available	Large
Jordan	Not available	Not available	Not available	Small
Morocco	Not available	Not available	Not available	Large
Tunisia	Not available	Not available	Not available	Not available
<b>Comparator countries</b>				
France	Negligible	Medium	Medium	Medium
Germany	Negligible	Large	Negligible	Medium
Italy	Large	Medium	Negligible	Small
Sweden	Medium	Small	Small	Small
United Kingdom	Medium	Small	Small	Large

Source: EBRD.

Note: Please note that the regional gaps have not been updated this year, as they are largely based on the results of the EBRD-World Bank *Life in Transition Survey*, the next round of which is scheduled for 2015.

TABLE S.7. Country-level transition indicators 2014

	Enterprises			Price liberalisation	Markets and trade	
	Large-scale privatisation	Small-scale privatisation	Governance and enterprise restructuring		Trade and foreign exchange system	Competition policy
<b>Central Europe and the Baltic states</b>						
Croatia	4-	4+	3+	4	4+	3+ ↑
Estonia	4	4+	4-	4+	4+	4-
Hungary	4	4+	4-	4	4	3+
Latvia	4-	4+	3+	4+	4+	4-
Lithuania	4	4+	3	4+	4+	4-
Poland	4-	4+	4-	4+	4+	4-
Slovak Republic	4	4+	4-	4+	4	3+
Slovenia	3	4+	3	4	4+	3-
<b>South-eastern Europe</b>						
Albania	4-	4	2+	4+	4+	2+
Bosnia and Herzegovina	3	3	2	4	4	2+
Bulgaria	4	4	3-	4+	4+	3
Cyprus	4-	4+	3	4+	4+	4-
FYR Macedonia	3+	4	3-	4+	4+	3-
Kosovo	2-	3+	2	4	4	2+
Montenegro	3+	4-	2+	4	4+	2+ ↑
Romania	4-	4-	3-	4+	4+	3+
Serbia	3-	4-	2+	4	4	2+
Turkey	3+	4	3-	4	4+	3
<b>Eastern Europe and the Caucasus</b>						
Armenia	4-	4	2+	4	4+	2+
Azerbaijan	2	4-	2	4	4	2-
Belarus	2-	2+	2-	3	2+	2
Georgia	4	4	2+	4+	4+	2
Moldova	3	4	2	4	4+	2+
Ukraine	3	4	2+	4	4	2+
Russia	3	4	2+	4	4- ↓	3-
<b>Central Asia</b>						
Kazakhstan	3	4	2	4-	4-	2
Kyrgyz Republic	4-	4	2	4+	4+	2
Mongolia	3+	4	2	4+	4+	3-
Tajikistan	2+	4	2	4	4-	2-
Turkmenistan	1	2+	1	3	2+	1
Uzbekistan	3-	3+	2-	3-	2-	2-
<b>Southern and eastern Mediterranean</b>						
Egypt	3	4-	2	3+	4	2-
Jordan	3	4-	2+	4-	4+	2
Morocco	3+	4-	2+	4	4-	2
Tunisia	3	4-	2	4	4	3-

Source: EBRD.

Note: The transition indicators range from 1 to 4+, with 1 representing little or no change relative to a rigid centrally planned economy and 4+ representing the standards of an industrialised market economy. For a detailed breakdown of each of the areas of reform, see the methodological notes in the online version of this *Transition Report* (tr.ebrd.com). Upward and downward arrows indicate one-notch upgrades and downgrades relative to the previous year.

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