European Bank
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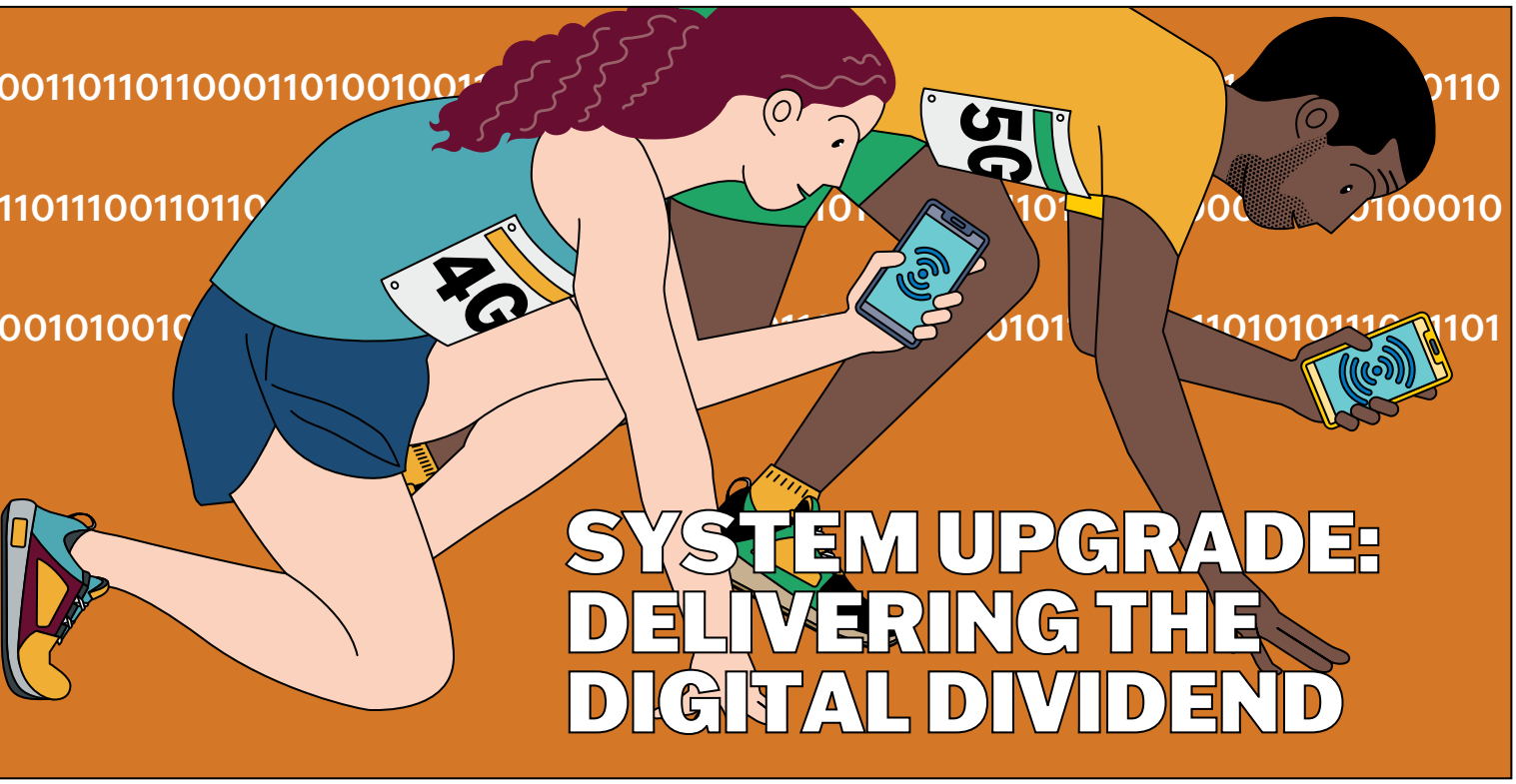
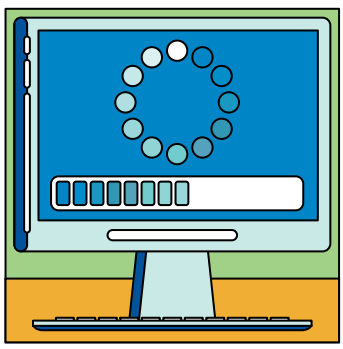
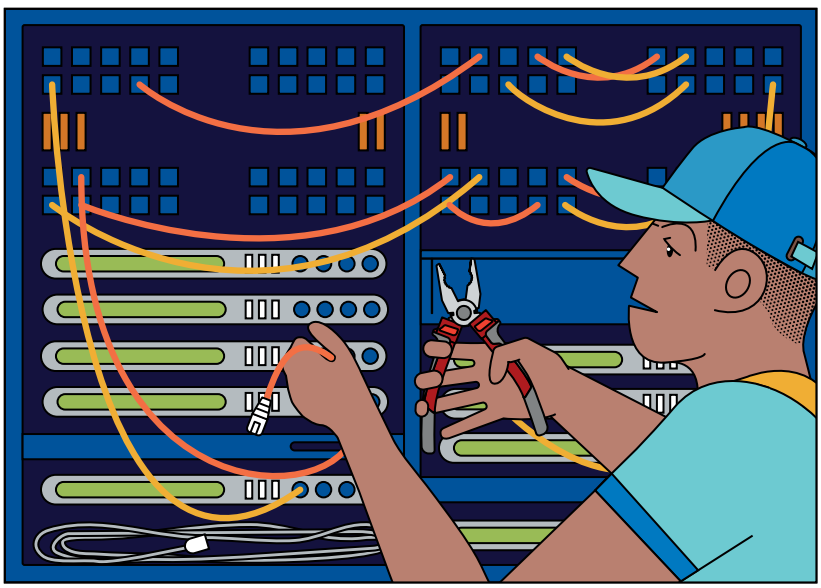
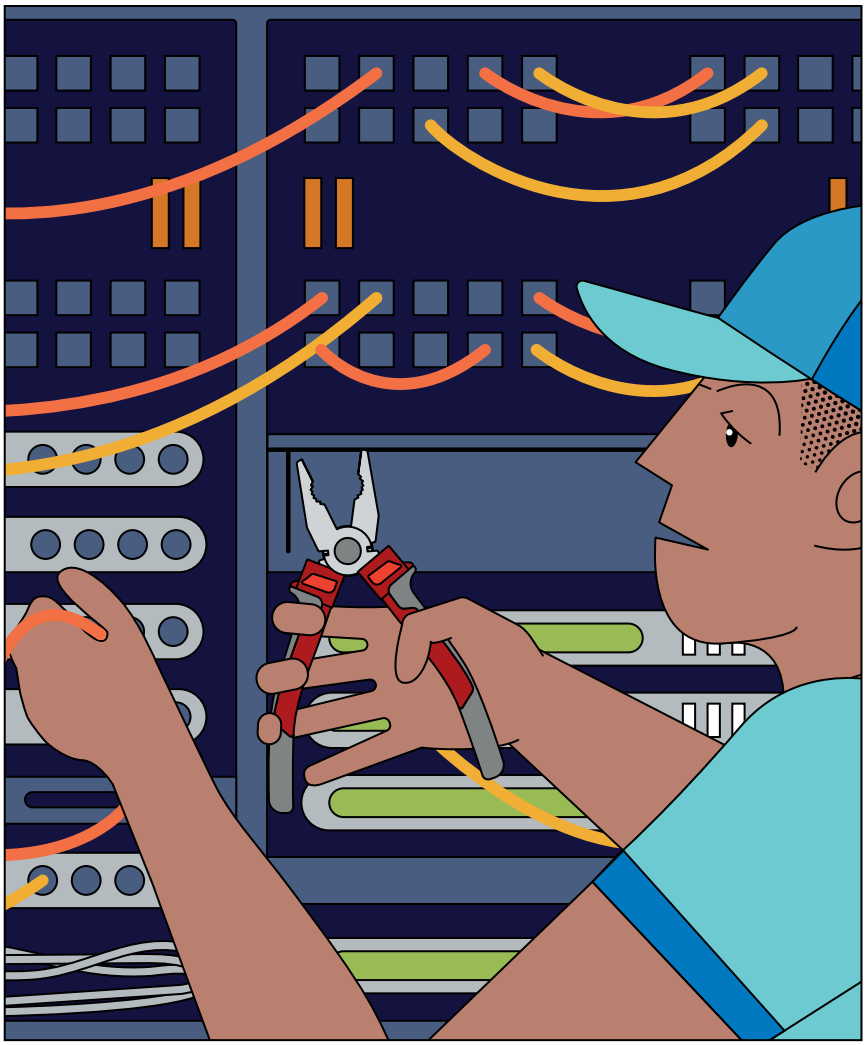
TRANSITION REPORT 2021-22

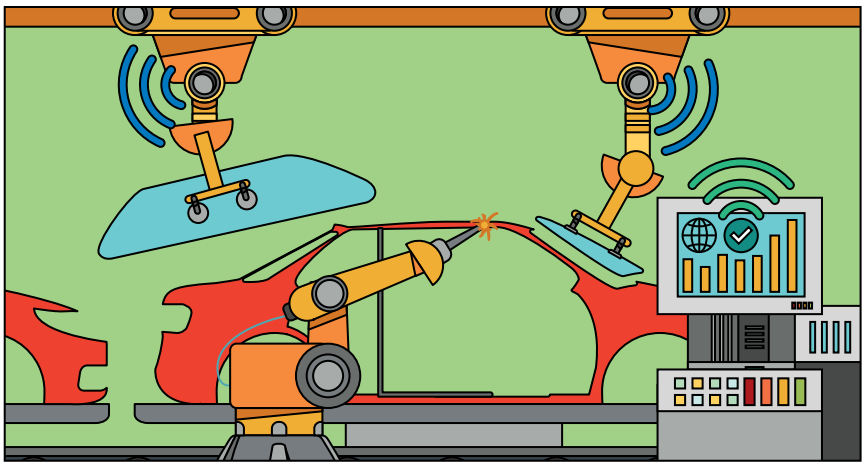


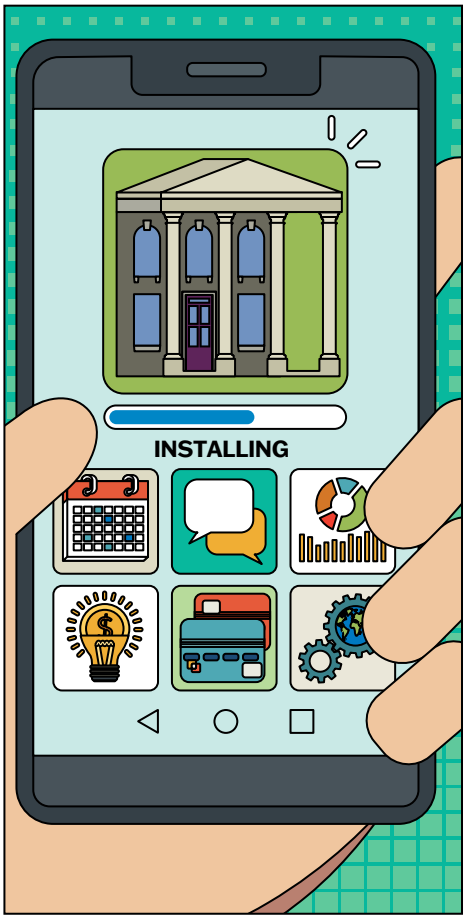
SYSTEM UPGRADE: DELIVERING THE DIGITAL DIVIDEND











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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 the economies where it invests. 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.

Responsibility for the content of the report is taken by the Office of the Chief Economist. The assessments and views expressed are not necessarily those of the EBRD. All assessments and data in the online country assessments are based on information as of late October 2021.

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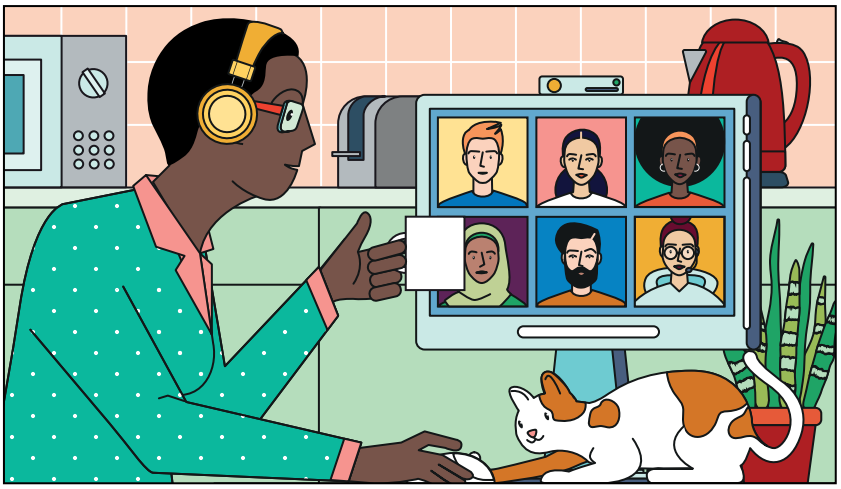

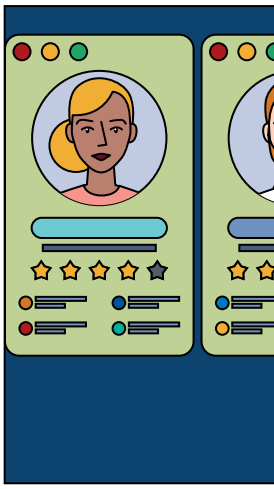

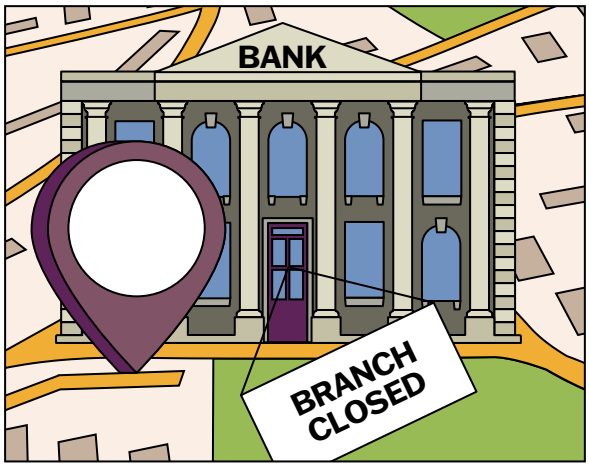

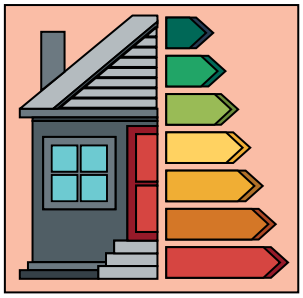

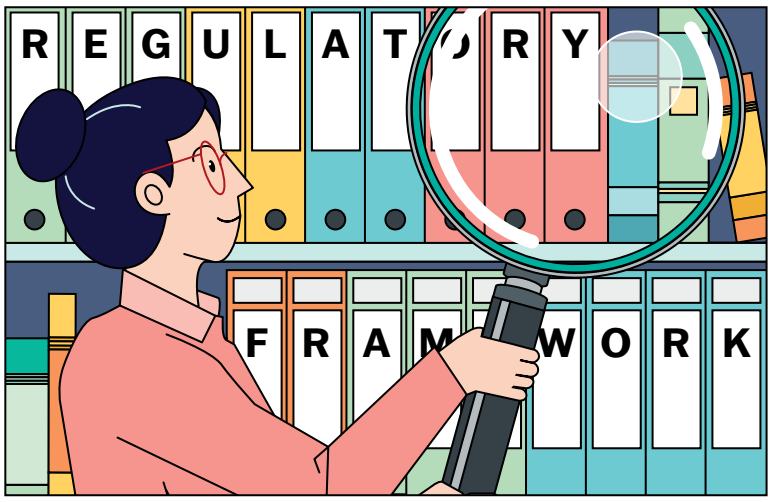

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EXECUTIVE SUMMARY

SYSTEM UPGRADE: DELIVERING THE DIGITAL DIVIDEND

This report explores ways in which economies in the EBRD regions can deliver the digital dividend, both in the context of the global Covid-19 pandemic and beyond. Building on rich sources of data, it introduces a new index of digital transformation and provides an overview of digital divides across and within countries.

While economies with medium levels of digitalisation have been catching up with advanced economies, those with the lowest levels have been falling further behind. Within countries, while individuals with medium levels of education and income and the middle-aged have been catching up with the most digitally literate, older individuals and those with lower levels of education and income are increasingly being left behind.

Digitalisation is affecting the world of labour across the EBRD regions. While the effect is limited, occupations that are more exposed to automation through the use of artificial intelligence have seen more job losses. Consequently, upskilling to support workers' transition to higher-skill, less automatable occupations remains a key policy challenge. More generally, this report finds that underdeveloped digital skills are the key constraint holding back digital upgrades to economic systems in many parts of the EBRD regions.

Despite improvements in internet infrastructure over the last 15 years, many economies in the EBRD regions are still lagging behind western European comparators, especially when it comes to faster 4G and broadband technologies. A case study looking at Turkey shows how internet connectivity can enable firms to reach out to distant export markets. As digital technologies help the best-run companies to improve their productivity, digitalisation has also been contributing to increased divergence of performance across firms – a trend that has been further amplified by the Covid-19 crisis.

Digitalisation is also transforming the global financial system, with fintech innovators such as peer-to-peer lending platforms putting pressure on banks. Banks' response to those competitive pressures has been twofold. On the one hand, banks themselves have started to make substantial investments in various new technologies, from digital wallet solutions to sophisticated algorithms for screening borrowers. On the other hand, they have also responded by expanding their online banking services, while pruning their branch networks. The growth of digital finance has improved access to financial services for households and small businesses, but it is not without risk.

1

DIGITAL DIVIDES

Investment in digital technologies can boost productivity growth by increasing the efficiency with which resources are allocated across industries and by allowing capital and labour to be combined more effectively within individual sectors. However, the pace of digitalisation has been uneven.

Large digital divides have emerged across countries, with the gap between the EBRD regions and advanced economies being especially pronounced for advanced technologies. Some digital divides have narrowed over the last five years, as economies with medium levels of digitalisation have made significant gains. However, many economies with low adoption rates for digital technologies have seen limited improvements and are falling further behind.

Most of the EBRD regions have seen significant improvements in digital infrastructure. Updating the relevant regulations will now become more important, since more advanced technologies require more complex regulatory and legal frameworks.

Insufficient skills are the key constraint impeding digitalisation in many economies in the EBRD regions. Indeed, the returns to investment in digital-intensive capital are significantly higher in economies with stronger skills. While workers in those regions are just as likely to access free independent training on digital skills as their counterparts in advanced economies, the amount of training provided by employers is considerably lower than in advanced comparators. Furthermore, many economies in the EBRD regions are experiencing significant "brain drain", as people with strong digital skills are moving abroad.

Within economies, individuals with medium levels of education and income and the middle-aged are catching up with the most digitally literate. However, older individuals and those with lower levels of education and income are increasingly being left behind.

Digital divides may also contribute to increased divergence in the performance of firms, with larger, better-managed and more innovative firms being more likely to reap digital dividends. Such firms are also more likely to have increased their use of digital technologies during the Covid-19 crisis.

https://2021.tr-ebrd.com/digital-divides

2

DIGITAL INFRASTRUCTURE AND FIRMS' PERFORMANCE

The digitalisation of information and its dissemination via the internet can bring substantial benefits for firms. It can facilitate the finding of new products, improve the matching of workers to firms, reduce the time and effort required to learn new skills, and expand firms' market reach.

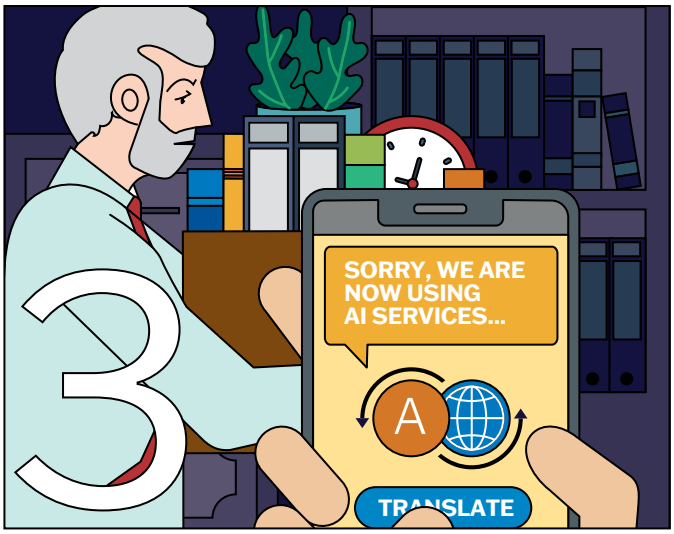
The accessibility of fixed broadband and mobile internet has increased substantially in the EBRD regions over the last 15 years. Countries with higher GDP per capita and greater population density generally provide mobile internet to larger percentages of their populations. However, many economies in the EBRD regions still lag behind western European peers, especially as regards faster 4G technologies. While there are many economies where nearly everyone has access to 4G mobile internet, coverage rates of between 20 and 80 per cent remain common. The adoption of fixed broadband also remains relatively limited in the EBRD regions, despite it offering some of the fastest connection speeds.

A case study looking at high-speed broadband in Turkey shows that firms with better connectivity are more likely to export and introduce new products. Small manufacturing firms have benefited most from Turkey's improved broadband infrastructure, which has allowed them to sell to new foreign markets.

In Russia, meanwhile, smaller firms have, on average, increased staff numbers by about 19 per cent following the roll-out of 4G. The effect on hiring has been especially strong for the smallest firms in the service sector. Those firms have also been more likely to introduce new products or processes on the back of their increased use of digital technologies.

Overall, the evidence suggests that improvements in digital infrastructure may be particularly beneficial for small firms and their workers, partially offsetting the negative impact that digitalisation may have on economic inclusion through other channels.

https://2021.tr-ebrd.com/digital-infrastructure-and-firms-performance



TELEWORKING, AI AND THE LABOUR FORCE

Digitalisation is changing the jobs that we do and the way that we do them. That digital transformation has taken a leap forward during the pandemic, as Covid-19 has accelerated the adoption of digital tools, especially for people working from home. In the EBRD regions, young people and women are more likely to have "teleworkable" occupations than older cohorts and men. What is more, people with a tertiary qualification are up to three times more likely to have a teleworkable occupation than those with lower levels of education.

An EBRD survey on attitudes towards working from home that was conducted in summer 2021 shows growing support for a more flexible approach to work, with employees feeling that they are more productive at home. However, many employers are unwilling – or unable – to embrace frequent remote working. That may partly reflect a lack of trust, since economies with greater interpersonal trust tend to have larger percentages of employees working from home, even after controlling for the teleworkability of occupations and industries.

Overall, reported levels of remote working are weakly correlated with the levels that one might expect given the structure of individual economies and the teleworkability of their occupations. Poor digital skills are probably also a barrier to greater remote working, especially among older workers. Unlike in advanced economies, older cohorts in the EBRD regions are less likely to have teleworkable occupations than younger workers.

While the effect is limited, occupations that are more exposed to automation involving artificial intelligence have experienced greater job losses in the EBRD regions. Thus far, automation has predominantly resulted in medium and low-skill jobs being replaced with higher-skill jobs. Upskilling to support workers' transition to higher-skill, less automatable occupations remains a key policy challenge.

https://2021.tr-ebrd.com/teleworking-ai-and-the-labour-force

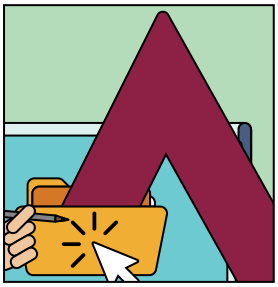
FINTECH AND BANKS IN TRANSITION

Technological disruption is transforming financial services across the EBRD regions. Indeed, banks' CEOs regard digitalisation as the biggest challenge they will face in the coming years. While alternative finance is still a fairly new concept in many EBRD regions, a number of countries in those regions are relatively advanced in specific areas, such as peer-to-peer lending. In contrast, equity-based models – such as equity-based crowdfunding – remain virtually non-existent. Thus, the advent of alternative finance has exacerbated emerging Europe's heavy dependence on debt instruments and has not contributed to the much-needed rebalancing of financial systems.

A large-scale survey of bank CEOs reveals significant variation in banks' strategies when it comes to responding to digitalisation. On the one hand, banks themselves have now started to make substantial investments in new technologies – particularly digital wallet solutions, biometric identification systems and sophisticated algorithms for screening borrowers. On the other hand, they have also responded by expanding their online banking services, while pruning their branch networks.

Small firms and households both have the potential to benefit from further digitalisation in the financial sector. As this chapter shows, digital infrastructure in the form of faster mobile internet has helped to ease credit constraints on businesses and allowed households to access a broader palette of financial services.

While branch reduction is a key part of banks' digitalisation strategies, this chapter shows that access to mobile networks is most beneficial to firms located in districts with relatively large numbers of physical bank branches. Thus, digitalisation could potentially exacerbate firms' credit constraints in regions that lack access to high-quality mobile networks and have low levels of branch density. Those regions risk being left behind in terms of both digital infrastructure and traditional delivery channels for banking services.



https://2021.tr-ebrd.com/fintech-and-banks-in-transition

THE FINANCIAL MARKET DEVELOPMENT INDEX

This chapter introduces a new index capturing the development of financial markets in the EBRD regions and comparator economies. The first part of the index covers conditions that support the supply of capital market instruments: the macroeconomic environment, legislative and regulatory frameworks, market infrastructure and the depth of the local investor base. The second part captures the depth, liquidity and diversification of markets across several different asset classes. The two parts are closely related, although smaller economies tend to have markets that are shallower than the supporting conditions alone might suggest.

Despite notable improvements since 2014 in terms of the conditions for financial market development, the EBRD regions still face substantial challenges. The absence of a well-developed local investor base is a key constraint in most economies that lack well-established defined contribution pension systems. In addition, life insurance companies tend to have low investment capacity.

While market infrastructure tends to be a key constraint in economies with less developed financial markets, more developed markets (including Poland and Slovenia) also face challenges in the area of clearing and nominee accounts.

Macroeconomic conditions are less of a constraint in the EBRD regions. However, several economies still have significant dollarisation of loans and deposits. And in smaller, less developed markets, interest rate differentials between comparable debt instruments denominated in local and foreign currencies can be large and persistent, exceeding average long-term currency depreciation by 5 percentage points or more.

Overall, south-eastern Europe and Russia have seen the greatest improvements in conditions supporting financial market development. Overall progress in reducing the distance to the frontier has been slowest in Turkey and the southern and eastern Mediterranean, where improvements in market infrastructure have been offset by weak macroeconomic frameworks.

https://2021.tr-ebrd.com/financial-market-development

STRUCTURAL REFORM

This section presents updated transition scores for the EBRD regions and discusses reforms implemented by governments. As well as examining developments over the last year, it also adopts a medium-term perspective, assessing scores over the period 2016-21. It focuses on six key qualities of a sustainable market economy, looking at whether economies are competitive, well-governed, green, inclusive, resilient and integrated.

While the pandemic has caused substantial economic turmoil, many governments have pushed ahead with reform agendas or restarted reform efforts that were temporarily on hold owing to the increased uncertainty. Those developments are reflected in improved transition scores, particularly as regards governance, the green economy and economic resilience. At the same time, several economies have seen declining scores and the reversal of reforms, particularly as regards inclusion.

Improvements over the last year have been concentrated mainly in central Europe and the Baltic states, south-eastern Europe and Central Asia. Declining scores, meanwhile, have been observed primarily in eastern Europe and the Caucasus and the southern and eastern Mediterranean.

Over the period 2016-21, most economies have made steady progress with improving the business climate, enhancing SMEs' access to finance and supporting the knowledge economy. Improvements relating to governance have been driven mainly by increased compliance with AML/CFT standards, greater protection of intellectual property rights, improved frameworks for challenging regulations and greater participation in e-government. Declines in that area primarily reflect gradual deteriorations in the effectiveness of courts, informality, perceived corruption and frameworks for challenging regulations. Meanwhile, improved green scores reflect stronger commitments to reducing greenhouse gas emissions. A number of countries have also seen their financial resilience scores improve, driven by declining NPL ratios and progress with legal and regulatory frameworks, while improvements to integration scores reflect the upgrading of ICT infrastructure.

https://2021.tr-ebrd.com/structural-reform

FOREWORD

It is a well-documented fact that major upheavals such as pandemics, wars and natural disasters act as catalysts for system upgrades – momentous societal, political and technological changes. As the historian Yuval Noah Harari points out, such emergencies "fast-forward historical processes". Digitalisation during the Covid-19 crisis is a case in point. In many countries, large parts of the economy, as well as schools and universities, went online in a matter of days. Decisions that could, in normal times, have taken years of deliberation were made and implemented with astonishing speed. This gigantic natural experiment was made possible by – and, in turn, gave a massive additional boost to – digital technologies.

The digitalisation process is destined to continue and will remain one of the key forces shaping developments around the world – including in the EBRD regions. It is therefore quite fitting that this year's *Transition Report* is devoted to that subject, and that supporting digitalisation is one of the EBRD's strategic priorities.

As this report shows, there are large digital divides between the EBRD regions and advanced economies, between the various economies in the EBRD regions, and within individual countries. Those divides reflect differences in both digital infrastructure and digital skills. To give just one example, around 90 per cent of people in the United Kingdom purchased something online last year, compared with 61 per cent of people in Poland and only 30 per cent in Turkey. When asked about their reasons for not shopping online, people in central and south-eastern Europe and Turkey are more likely to cite a lack of skills than concerns about the security of online payments.

Where digital infrastructure has improved in recent years – whether in the form of high-speed fibre internet or 4G mobile networks – it has lowered the cost of obtaining information and allowed small firms to find new customers. Indeed, such advances in infrastructure have boosted the exports of small manufacturers in Turkey and increased employment at small service sector firms in Russia. However, digitalisation may be a double-edged sword: while it allows small firms to access customer markets outside the regions where the firms are located, it also brings competition from firms located further afield. This benefits customers and increases the market shares of more productive firms, while reducing the shares of lesser performers (or even forcing them to exit the market entirely).

Structural changes brought about by digitalisation are already visible in many economies. In the last 10 years, the vast majority of the economies in the EBRD regions have seen employment in digital intensive sectors increase faster than employment in other sectors. In some cases, sectors with low digital intensity have seen no employment growth whatsoever, or have even experienced declines. At the same time, in both advanced economies and the EBRD regions alike, around 40 per cent of all jobs may potentially be exposed to automation of some kind in the medium term.

Insufficient digital skills are hampering progress across all areas of digitalisation. In many economies in the EBRD regions, this problem is being exacerbated by a significant "brain drain", as people with strong digital skills are moving abroad. Some divides within economies in terms of skills have been growing, with older individuals and those with lower levels of education and income increasingly falling behind. The statistics are striking in this regard: in western Europe, more than two-thirds of people between the ages of 55 and 74 bought something online in 2020, compared with less than a third in EU member states in the EBRD regions and around 15 per cent in the Western Balkans. The acceleration of the digitalisation process will make it very difficult for many older workers to remain employed, which will further jeopardise the sustainability of pension systems in countries that are already dealing with demographic transitions, significant outward migration and low labour force participation rates among older individuals.

Financial services are another area where technological disruption has taken place. While alternative finance is still a relatively new concept in many economies in the EBRD

The digitalisation process is destined to continue and will remain one of the key forces shaping developments around the world – including in the EBRD regions.

regions, a number of countries (including Armenia, the Baltic states, Georgia and Moldova) are among global leaders in that field. However, progress has been concentrated in specific areas, such as peer-to-peer lending platforms, while equity based models (such as equity-based crowdfunding) have remained virtually non-existent. Thus, the advent of alternative finance has exacerbated emerging Europe's heavy dependence on debt instruments and has not contributed to the much-needed rebalancing of financial systems.

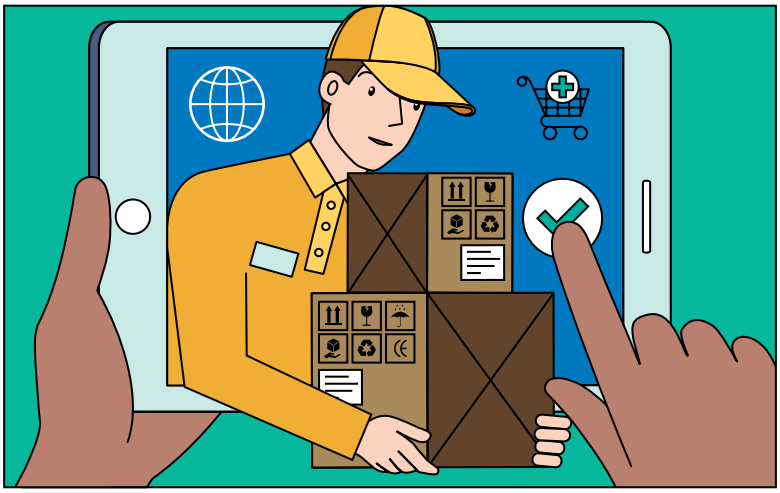
These fast-moving developments in the field of financial services pose a plethora of challenges for policymakers, from helping consumers to avoid falling into a debt spiral when borrowing from alternative lenders to addressing the problem of the banking system's excessive reliance on a small number of global providers of cloud services. With that in mind, a number of economies in the EBRD regions (including Estonia, Greece and Poland) are planning to use regulatory sandboxes to experiment with different approaches in a controlled environment.

I am very pleased to present this year's *Transition Report*, which tackles a crucial subject with many implications for economic and social development. The future is digital, and our task is to deliver the digital dividend as quickly and smoothly as possible, taking advantage of the opportunities that are on offer while facing up to the challenges that such rapid changes entail. I firmly believe that with the right kind of digital transition, the economies of the EBRD regions will enjoy increased prosperity, better social outcomes and greater environmental sustainability.

Beata Javorcik

Beata Javorcik
Chief Economist
EBRD


DIGITAL DIVIDES
3G
3G
ABSOLUTE BEGINNERS
HOW-TO GUIDE
COMPUTER SKILLS
USER GUIDE
LIBRARY



This chapter introduces a new index of digitalisation and provides an overview of digital divides in the EBRD regions, both across and within economies. While countries with medium levels of digitalisation have been catching up with advanced economies, the countries with the lowest levels have been falling further behind. Low levels of digital skills are the key constraint holding back digitalisation in many economies in the EBRD regions. Within economies, while individuals with medium levels of education and income and the middle-aged have been catching up with the most digitally literate, older individuals and those with lower levels of education and income are increasingly being left behind. Digital technologies are also contributing to increased divergence in the performance of firms, which is being amplified by the Covid-19 crisis.

Introduction

The Covid-19 crisis has boosted digitalisation in many economies, changing the role that technology plays in the way that we learn, work and live. Overall, this is a welcome development. Investment in digital technologies can increase growth and improve productivity through greater efficiency in the allocation of resources across industries and by allowing capital and labour to be combined more efficiently within individual sectors. Such structural shifts underpinning growth in total factor productivity (TFP) have been the leading source of growth over the last decade, in the EBRD regions and advanced economies alike (see Box 1.1). A number of studies have documented a positive correlation between digitalisation and productivity growth in the medium term, both within firms and across economies.[1]

At the same time, the crisis has also exposed growing digital divides, both across and within economies. While the better off and those living in cities and more advanced economies have been more able to order goods and services online, do their banking via the internet and even work from home, large parts of the population remain excluded from such benefits of digitalisation. Similarly, while some firms have taken advantage of the new opportunities provided by digitalisation, others have fallen further behind. Against that background, this chapter provides an overview of digitalisation in the EBRD regions and a few select comparator economies (both emerging markets and advanced economies), looking at developments both across and within countries.

The first part of the chapter introduces a new index of digitalisation and looks at how countries in the EBRD regions and comparator economies compare in terms of the preconditions for digitalisation ("digital enablers") and the use of digital technologies by individuals and firms ("digital outcomes"). It also looks at the evolution of those differences over time.

That analysis documents large digital divides across countries, with the gap between the EBRD regions and advanced economies being especially pronounced for more advanced digital technologies (such as digital tools used in production management). Some digital divides have narrowed over the last five years: economies with medium levels of digitalisation – such as those in eastern Europe and south eastern Europe (SEE) – have made large gains and

[1] See Hernandez et al. (2016) for a review. See also Niebel (2018), Aly (2020), Solomon and Van Klyton (2020) and Brynjolfsson et al. (2017).

closed some of the gap relative to advanced economies. However, other economies – such as those of Central Asia and the southern and eastern Mediterranean (SEMED) – have seen only limited improvements in the area of digitalisation, despite starting from a low base, and are thus falling further behind.

The digitalisation index also highlights the constraints that appear to be impeding digitalisation the most, which vary from economy to economy. Most of the EBRD regions have seen significant improvements in infrastructure over the last five years (although in some economies, such as those of Central Asia, investment in digital infrastructure remains a priority). Many economies in the EBRD regions have also made large gains in terms of the digital provision of government services. Getting regulation right may become more challenging as digitalisation increases, since more advanced digital technologies require more complex regulatory and legal frameworks.

Insufficient digital skills are the key constraint holding back digitalisation in many economies in the EBRD regions. Indeed, returns to investment in digital-intensive capital are found to be significantly higher in economies with strong skills relative to economies where human capital is weak. Thus far, the EBRD regions have benefited from high levels of human capital – in some cases, on a par with advanced economies and above the levels observed in other emerging markets. However, the quality of schooling (as assessed using standardised international tests) appears to be falling, and the EBRD regions are lagging behind in terms of digital skills (for instance, when it comes to finding information online, sending emails, shopping online, using a word processor or updating software).

While workers in the EBRD regions appear to be just as likely to access free online courses and other independent training in the area of digital skills as their counterparts in advanced economies, the amount of training provided by employers is considerably lower than in advanced economies. Furthermore, many economies in the EBRD regions are experiencing significant "brain drain", with people with strong digital skills moving abroad.

The resulting low levels of digital skills are already holding back people's use of digital technologies, even where the relevant digital infrastructure and services are available. This is likely to become even more of a constraint in the future, as the structure of production is shifting towards more digital-intensive industries. Moreover, the importance of digital skills *within* individual industries is also increasing – even in industries far removed from the information and communication technology (ICT) sector.

The second part of the chapter focuses on digital divides ***within*** countries, looking at how the use of digital technologies varies across individuals and firms with different characteristics. It shows the existence of significant digital divides within countries, which typically coincide with deep socio-economic disparities.

While some digital divides within economies have narrowed, others have widened. Individuals with medium levels of education and income and the middle-aged have been catching up with the most digitally literate groups (those with high levels of education and income and the young). However, people aged 55 or over, people with only lower-secondary education and people in the poorest income quartile have made only limited gains in terms of digital proficiency, despite starting from a low base. Those groups are at risk of falling further behind, since their non-digital skills may quickly become obsolete as digital skills gain in importance in sectors not traditionally thought of as digital-intensive.

Digital divides may also contribute to increased divergence in the performance of firms, with larger, better managed and more innovative firms being more likely to take advantage of digitalisation. Such firms are also more likely to have increased their use of digital technologies during the Covid-19 crisis, suggesting that digital gaps between firms may widen in the future. That increased dispersion in the productivity of firms could, in turn, weigh on average productivity in the economy.[2]

THE INDEX AGGREGATES

22 DIFFERENT MEASURES OF DIGITALISATION

[2] See, for instance, Berlingieri et al. (2020) and Gal et al. (2019).

An index of digitalisation

A country's level of digitalisation consists of various different aspects, such as the infrastructure that allows access to the internet, the regulation that governs the provision and use of digital solutions, and the use of digital technologies by firms and individuals.

This first section of the chapter introduces a new digitalisation index looking at economies in the EBRD regions and a number of comparator economies (see Annex 1.2 in the online version of this report for more details). The index, which compares the situation in 2015 and 2020, is informed by a number of existing indices with different areas of focus and differing coverage in terms of countries: EIB (2019) focuses on firms; European Commission (2020c) focuses on households; and World Bank (2016) focuses on the supply of digital technologies.[3]

Digital enablers

The index described in this chapter aggregates 22 different measures, capturing both (i) preconditions for the use of digital technologies (enablers) and (ii) the use of digital technologies by individuals and firms (outcomes). The enabler pillars of the index cover key areas that facilitate the application of digital technologies by households and firms: infrastructure, skills, regulation and digital provision of government services.

The infrastructure pillar captures the availability, quality and affordability of mobile and broadband internet using indicators such as coverage of mobile networks supporting internet (3G or above), fixed and mobile phone subscriptions, download speeds and the cost of devices (see Chapter 2 for more detailed analysis of internet access infrastructure).

The skills pillar looks at the quality of education in general (quality-adjusted years of schooling), as well as digital skills specifically, and internet access in schools.

The regulation pillar covers legislation relating to the provision of ICT services (mostly focusing on operators), legal and technical measures relating to cybersecurity, and the adaptability of legal frameworks to digital business (capturing, for instance, the legal framework governing e-commerce; see also Box 1.2 for examples of different approaches to digital regulation and Annex 1.1 on investors' perceptions of regulatory frameworks for ICT).

The last pillar of the enabler part of the index tracks the provision of digital services by governments. A measure of e-government looks at whether the public sector provides information on laws or public spending initiatives online and whether the public are able to access services via the internet (for instance, whether they can make appointments or pay taxes online; see also Box 1.3 on e-government services and digital identification). A measure of e-participation looks at information sharing online, including consultation with stakeholders in the context of new initiatives or construction projects.

Digital outcomes

On the outcome side, the index assesses the use of digital technologies by (i) individuals (looking at the percentage of the population that use the internet, shop online or make/receive payments online) and (ii) firms (looking at the percentage of firms that have a website, as well as the number of secure servers relative to the size of the population – a commonly used measure of firms' use of digital technologies).[4] Within all pillars, the various indicators are weighted equally.

For each pillar, scores are expressed on a scale of 0 to 100, where 100 corresponds to the frontier (which represents the highest-scoring economy across the two years covered by the index). For infrastructure and regulation, for instance, the frontier is the United States of America in 2020; for skills, it is Sweden in 2015 (with skill levels having deteriorated in recent years, as discussed later in the chapter); and for the digital provision of government services, it is Estonia in 2020. Similarly, individuals' use of digital technologies is expressed relative to the situation in Canada in 2020, and firms' use of digital technologies is relative to the situation in Germany in 2020. Thus, the overall index, which averages scores across the six subcomponents, represents the distance to a hypothetical frontier that aggregates the strongest enablers and outcomes across all economies, with no economy in the sample currently standing at that frontier.

Many of the observations that were used to construct the index date back to 2019, which means that the index mainly captures the level of digitalisation prior to the Covid-19 crisis. Indicators were selected with a view to ensuring broad coverage of the economies in the EBRD regions, and the choice of emerging market comparators was also driven by the availability of data. Data gaps were filled using interpolation (see Annex 1.2 in the online version of the report for details). A total of about 5 per cent of observations were imputed. In the case of Kosovo, the majority of its values had to be imputed, so it has been omitted from this analysis.

[3] See also World Economic Forum (2016, 2020) and World Wide Web Foundation (2014).

[4] See, for instance, Coppel (2000).

TABLE 1.1. Digital enablers

Economy	Enablers in 2020					Enablers in 2015				
	Overall	Infrastructure	Skills	Regulation	Government services	Overall	Infrastructure	Skills	Regulation	Government services
United States of America	95.4	100.0	84.3	100.0	97.5	91.9	89.1	94.6	90.9	92.9
Estonia	94.7	88.4	93.9	96.3	100.0	80.7	74.8	92.2	81.0	74.7
Sweden	92.1	97.0	96.7	90.0	84.8	83.1	91.6	100.0	78.8	62.0
United Kingdom	91.6	85.5	85.9	98.1	96.8	86.6	84.6	87.0	82.4	92.6
Canada	89.2	93.6	89.3	85.4	88.4	84.2	79.9	92.9	78.5	85.6
France	87.4	97.9	72.5	90.4	88.6	82.8	90.1	71.8	71.1	98.1
Japan	86.1	94.5	78.4	77.0	94.6	79.0	80.9	77.4	62.5	95.1
Lithuania	86.0	87.8	81.9	96.8	77.6	74.7	77.8	85.3	68.7	67.2
Germany	84.3	89.8	79.1	96.3	71.9	79.1	82.2	84.0	84.1	65.9
Slovenia	81.0	75.7	81.0	83.0	84.3	61.3	72.6	85.2	52.4	35.0
Spain	80.4	93.6	65.2	77.4	85.5	73.6	85.3	61.5	62.4	85.1
Poland	79.5	80.5	69.2	77.8	90.7	63.0	72.7	71.2	61.2	46.9
Cyprus	77.5	73.2	70.8	75.3	90.7	54.8	61.1	76.3	48.8	33.1
Italy	76.6	80.1	58.4	87.0	81.0	69.6	74.0	62.4	67.2	74.6
Czech Republic	75.0	81.6	78.5	69.9	70.0	58.4	62.4	87.7	59.2	24.2
Russia	74.6	71.5	76.1	67.6	83.1	63.9	67.5	79.4	41.7	66.9
Slovak Republic	72.7	81.0	64.4	77.0	68.3	62.9	65.7	72.1	62.1	51.7
Hungary	72.5	89.8	50.9	80.6	68.5	60.7	71.3	58.4	67.8	45.5
Turkey	71.3	67.6	43.4	87.6	86.7	54.4	56.9	42.6	70.5	47.7
Kazakhstan	71.1	67.7	60.7	66.5	89.5	60.6	60.2	75.3	33.6	73.5
Romania	70.9	85.1	46.5	77.4	74.7	58.1	79.3	52.4	60.6	40.3
Latvia	70.2	72.6	76.5	77.4	54.3	68.9	71.0	79.0	58.1	67.6
Bulgaria	68.2	65.2	53.4	72.3	81.9	47.9	58.1	59.0	57.6	17.1
Croatia	68.1	67.8	48.1	75.7	81.0	51.2	58.3	58.2	54.3	33.8
Serbia	68.0	59.9	50.5	82.5	79.1	49.0	52.7	61.4	47.7	34.4
Greece	67.3	74.4	49.8	72.8	72.4	56.6	66.0	53.0	39.2	68.1
Albania	65.4	55.6	55.8	67.2	83.0	46.1	44.1	55.7	40.6	44.1
Belarus	64.2	70.3	72.0	44.0	70.4	47.8	63.7	76.7	23.6	27.3
Azerbaijan	63.9	56.9	58.4	73.3	67.0	49.6	46.6	58.0	56.1	37.6
Moldova	63.8	63.6	48.0	70.2	73.6	50.4	49.1	48.5	50.2	53.8
India	63.3	41.9	41.4	85.4	84.3	42.6	23.0	27.5	65.3	54.7
Mexico	62.5	51.6	41.5	76.4	80.7	48.5	40.1	40.5	53.3	59.9
Brazil	62.4	56.8	26.8	77.9	88.0	52.5	55.2	28.2	64.3	62.1
Ukraine	61.3	51.8	62.5	58.4	72.5	45.9	49.7	67.5	37.4	28.8
North Macedonia	59.3	52.2	36.5	71.7	77.0	33.6	45.3	36.1	37.9	15.3
Georgia	58.8	57.8	38.6	80.8	58.0	53.3	51.0	45.1	61.8	55.4
Montenegro	58.5	68.0	49.0	66.9	50.0	52.8	57.4	44.6	57.7	51.6
Armenia	58.5	54.1	45.9	63.9	70.0	46.4	44.2	43.5	45.1	52.9
Uzbekistan	52.6	36.1	51.9	44.5	77.8	35.0	22.7	57.8	19.0	40.7
South Africa	52.3	51.2	17.5	67.7	72.6	35.2	52.3	14.3	44.6	29.5
Egypt	50.4	45.2	28.3	78.6	49.6	41.1	43.2	15.7	52.8	52.8
Tunisia	49.8	46.1	26.9	63.7	62.6	43.3	40.8	26.0	45.7	60.9
Morocco	48.4	52.3	21.0	73.4	47.1	47.0	31.8	21.0	62.3	72.7
Jordan	47.7	35.7	48.7	78.1	28.1	45.8	43.5	47.4	47.6	44.5
Kyrgyz Republic	47.1	36.2	38.2	48.7	65.2	30.8	24.7	40.7	29.6	28.1
Mongolia	46.5	44.8	50.5	37.9	52.8	47.9	40.1	52.2	37.5	61.8
Bosnia and Herzegovina	45.2	51.3	33.6	42.9	53.1	35.2	46.4	40.9	34.9	18.5
West Bank and Gaza	37.7	35.1	41.9	30.0	43.7	34.3	25.5	35.8	24.4	51.3
Lebanon	35.4	47.3	37.6	25.4	31.2	30.0	37.7	41.1	15.6	25.6
Tajikistan	29.7	31.0	39.0	22.4	26.6	21.4	21.0	44.3	20.3	0.0
Turkmenistan	23.7	31.4	34.3	18.4	10.9	22.1	31.5	40.5	15.0	1.3

Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: Data relate to 2020 (or the latest year available) and 2015 (or the closest year available), with a score of 100 representing the frontier. See Annex 1.2 in the online version of the report for details. Economies are ranked on the basis of the overall enabler score for 2020, which is an average of the four enabler pillars. The lowest scores in each year are highlighted.

TABLE 1.2. Digital outcomes

Economy	Outcomes in 2020			Outcomes in 2015		
	Overall	Individuals	Firms	Overall	Individuals	Firms
Sweden	97.3	99.2	95.4	88.5	95.5	81.6
Canada	96.3	100.0	92.5	81.7	90.9	72.6
Germany	92.3	84.6	100.0	81.1	82.9	79.3
United Kingdom	90.2	88.9	91.5	82.1	88.9	75.3
United States of America	89.9	86.2	93.7	76.1	75.6	76.5
Estonia	89.7	90.2	89.3	80.8	89.2	72.4
Japan	84.4	73.1	95.7	70.6	67.5	73.7
Slovenia	84.3	73.4	95.1	69.8	65.1	74.4
Czech Republic	84.0	71.3	96.6	72.7	67.3	78.1
Spain	83.3	79.6	87.0	66.4	72.2	60.5
Slovak Republic	80.0	70.8	89.2	69.6	65.3	74.0
France	77.8	72.6	83.1	64.2	69.7	58.8
Latvia	77.7	77.9	77.5	60.2	73.0	47.3
Lithuania	76.9	65.4	88.5	57.1	56.0	58.2
Italy	74.1	66.1	82.1	53.4	51.0	55.8
Croatia	73.8	65.4	82.1	56.5	56.2	56.7
Poland	73.4	72.5	74.3	61.4	53.7	69.0
Cyprus	70.1	59.8	80.5	56.4	47.9	64.9
Hungary	69.8	54.9	84.7	52.0	49.4	54.6
Belarus	69.2	64.1	74.3	43.1	45.6	40.5
Russia	62.8	58.2	67.5	46.7	45.0	48.4
Greece	62.8	45.4	80.2	44.1	28.2	60.0
Serbia	60.8	42.0	79.6	41.2	34.4	47.9
Turkey	58.6	49.8	67.5	44.8	38.4	51.2
Ukraine	54.1	39.5	68.8	33.3	29.2	37.3
Brazil	53.0	38.7	67.2	40.3	32.7	47.9
Bulgaria	50.7	34.7	66.6	39.3	29.5	49.0
Moldova	49.9	45.1	54.8	32.3	29.0	35.5
Romania	49.7	33.3	66.1	38.8	25.4	52.2
Kazakhstan	48.3	43.5	53.1	26.9	31.9	21.9
North Macedonia	47.7	41.6	53.8	36.3	34.7	37.8
Bosnia and Herzegovina	47.5	29.9	65.1	29.6	20.2	38.9
South Africa	46.2	28.8	63.6	35.3	32.5	38.1
Lebanon	43.1	39.7	46.5	33.5	27.5	39.5
Mongolia	42.1	44.1	40.1	30.2	26.3	34.1
Georgia	41.9	29.7	54.1	24.5	16.5	32.5
Armenia	39.7	32.1	47.2	31.5	17.2	45.8
Mexico	39.5	26.8	52.2	31.9	23.1	40.7
Azerbaijan	39.0	29.0	49.0	17.9	23.6	12.2
Jordan	38.0	24.4	51.7	18.6	14.6	22.7
Montenegro	36.9	36.3	37.6	23.3	27.2	19.4
Albania	35.9	20.4	51.4	24.7	17.1	32.3
Tunisia	32.3	21.7	42.9	22.4	13.0	31.9
Kyrgyz Republic	32.2	19.4	44.9	17.5	8.0	27.1
Morocco	32.0	20.0	43.9	21.7	12.5	30.9
India	25.1	9.7	40.5	11.9	7.2	16.7
Uzbekistan	24.5	24.9	24.1	11.1	22.2	0.0
West Bank and Gaza	23.5	19.2	27.7	13.1	14.2	11.9
Tajikistan	17.7	20.1	15.2	6.7	5.5	7.9
Egypt	16.6	12.7	20.5	7.2	7.2	7.2
Turkmenistan	8.4	7.1	9.7	0.9	1.8	0.0

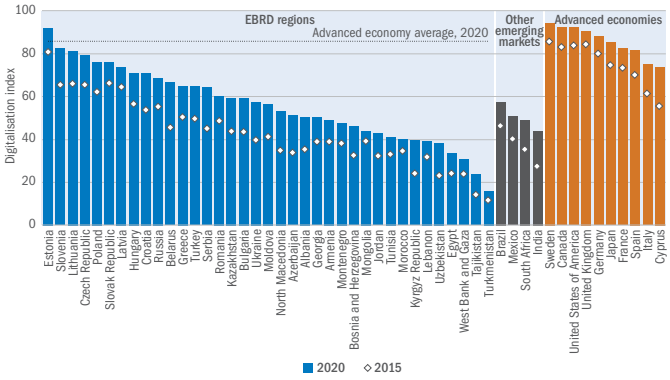
Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: Data relate to 2020 (or the latest year available) and 2015 (or the closest year available), with a score of 100 representing the frontier. See Annex 1.2 in the online version of the report for details. Economies are ranked on the basis of the overall outcome score for 2020, which is an average of the two outcome pillars.

Digital divides across economies

This digitalisation index points to large digital divides across economies in the EBRD regions (see Chart 1.1, which presents scores averaged across digital enablers and digital outcomes; divides look similar when considering enablers and outcomes separately, as Tables 1.1 and 1.2 show). The economies with the highest levels of digitalisation are Estonia, Lithuania and Slovenia, while those with the lowest levels are Tajikistan, Turkmenistan and the West Bank and Gaza. These rankings would remain broadly unchanged if alternative indicators were used to construct the index or the indicators were weighted differently. Most economies in the EBRD regions lag far behind the average level of digitalisation seen in advanced economies, and a number of economies lag behind emerging market comparators such as Brazil, India, Mexico or South Africa.

As one might expect, countries' levels of digitalisation are closely correlated with their overall levels of development. For instance, while 89 per cent of people living in advanced economies used the internet in 2019, the equivalent figure for the EBRD regions is only around 76 per cent. Differences in countries' gross domestic product (GDP) per capita (measured in US dollars at market exchange rates) explain around 80 per cent of the cross-country differences in digitalisation that are observed for 2020.

CHART 1.1. There are large digital divides across economies

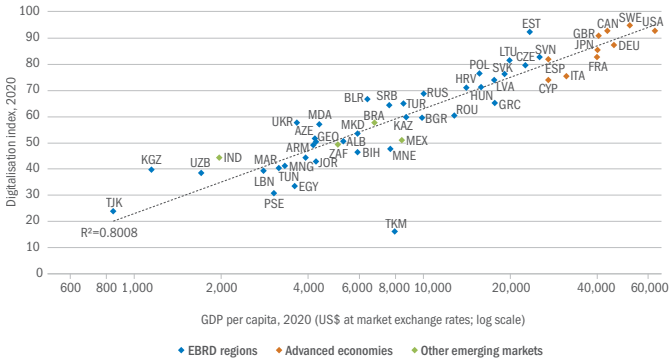


Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, International Telecommunication Union (ITU-D ICT Statistics and Global Cybersecurity Index Reports), Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, World Economic Forum (WEF) Global Competitiveness Index, United Nations (UN) E-Government Development Index and Knowledgebase, UN Conference on Trade and Development (UNCTAD) and authors' calculations.
Note: Data relate to 2020 (or the latest year available) and 2015 (or the closest year available), with a score of 100 representing the frontier. See Annex 1.2 in the online version of the report for details. Advanced economies are based on the classification used by the International Monetary Fund (IMF).

Nonetheless, that correlation is not perfect. For instance, Estonia, Belarus, the Kyrgyz Republic and Ukraine stand out as having a high level of digitalisation relative to their overall level of development, while some economies in the SEMED region have levels of digitalisation that are lower than one would expect on the basis of their GDP per capita (see Chart 1.2).

Additional analysis reveals that economies with stronger administrative and fiscal capacity (as captured by an index presented in the *Transition Report 2020-21*)[5] tend to have better digital enablers, even taking into account their overall level of development. Similarly, economies with higher-quality economic and political institutions in 2015 (measured using the Worldwide Governance Indicators assessing voice and accountability, political stability and the absence of violence, government effectiveness, regulatory quality, the rule of law and control of corruption) are characterised by stronger digital enablers in 2020, taking into account their overall level of development, with government effectiveness and the rule of law having the largest impact. Geographical differences also play a role, with enablers tending to be weaker in countries with more mountainous terrain, where the provision of infrastructure may be costlier.

CHART 1.2. Countries' levels of digitalisation are closely correlated with their overall levels of development



Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, IMF, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: Data relate to 2020 or the latest year available.

Digital divides are starker for more advanced technologies

Digital divides across countries are more pronounced for more advanced digital technologies. For example, 89 per cent of adult residents of advanced economies have made or received payments online in the last year, compared with just 44 per cent in the EBRD regions (see Chapter 4 for a detailed discussion of digital finance). Similarly, while 52 per cent of adults in advanced economies make purchases online, the equivalent figure for the EBRD regions is only around 21 per cent.[6]

ONLY AROUND
21%
OF ADULTS IN THE EBRD REGIONS MAKE PURCHASES ONLINE, COMPARED WITH
52%
IN ADVANCED ECONOMIES

Similar patterns can be observed for firms. For instance, 94 per cent of firms in the EBRD regions use the internet and 71 per cent have a website – similar to the levels observed in advanced economies (98 and 78 per cent respectively). However, the percentage of firms using enterprise resource planning (ERP) technology (software which allows integrated digital management of a firm's main business processes in real time) for production management is much lower. Strikingly, while three-quarters of firms in Hungary have a website (similar to the level seen in Spain), only 14 per cent use ERP technology (compared with 43 per cent in Spain). Overall, 29 per cent of firms in the EBRD regions use digital business management tools, compared with 36 per cent in advanced economies.[7]

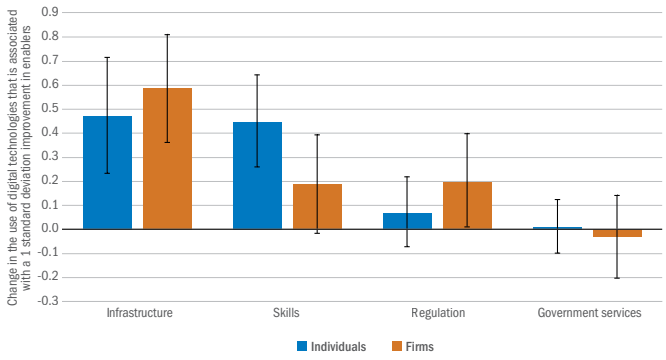
Digital enablers affect the use of digital technologies by individuals and firms

More than three-quarters of all cross-country differences in the use of digital technologies by individuals and firms in 2020 can be explained by differences in conditions that are supportive of digitalisation – differences in infrastructure, skills, regulation and government services.

Where basic digital infrastructure is in place, skills appear to be especially important for individuals' use of digital technologies, while the quality of regulation matters for firms' adoption of digital technologies. A 1 standard deviation improvement in digital skills (which roughly corresponds to the difference between Kazakhstan and Slovenia in 2020) increases households' use of digital technologies by 0.45 of a standard deviation, taking into account the

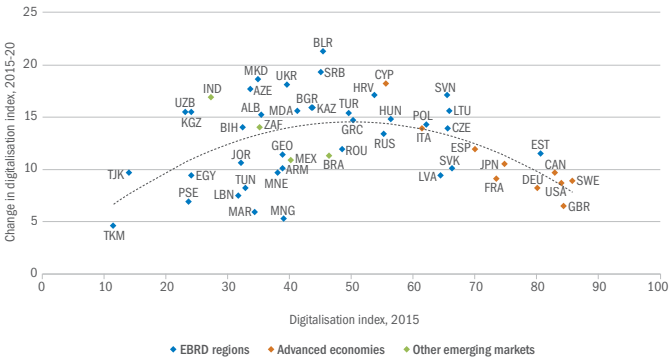
[5] See EBRD (2020a).
[6] Based on data for 2017 in the Global Findex Database and data for 2019 in the ITU-D ICT Statistics dataset. These figures are simple averages across 38 economies in the EBRD regions and 10 advanced economies.
[7] Based on information from the 2019/20 round of Enterprise Surveys, Eurostat and UNCTAD. These figures are simple averages across 14 economies in the EBRD regions and 7 advanced economies. See also EBRD (2022).

CHART 1.3. Skills and regulation have a large impact on the use of digital technologies by individuals and firms respectively



Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: Bars denote the coefficients derived from regressing individuals' and firms' use of digital technologies on the four enablers (pooled across 2015 and 2020; all expressed as z-scores – that is to say, standardised deviations from the mean). 95 per cent confidence intervals are shown.

CHART 1.4. The largest gains have been seen in economies with medium levels of digitalisation



Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: Data relate to 2020 (or the latest year available) and 2015 (or the closest year available), with a score of 100 representing the frontier. See Annex 1.2 in the online version of the report for details.

94% OF FIRMS IN THE EBRD REGIONS USE THE INTERNET AND **71%** HAVE A WEBSITE

quality of infrastructure and digital government services (see Chart 1.3). This corresponds to almost 40 per cent of the difference observed between households' use of digital technologies in Kazakhstan and Slovenia.

Similarly, a 1 standard deviation improvement in the quality of regulation (which roughly corresponds to the difference between Croatia and Estonia) increases firms' use of digital technologies by 0.2 of a standard deviation (equivalent to two-thirds of the actual difference between firms' levels of digitalisation in those two economies). Indeed, improvements in the quality of regulation can explain more than half of the total increase seen in firms' use of digital technologies in the EBRD regions between 2015 and 2020 (based on regressing the change in firms' level of digitalisation on changes in the four enabler scores).

Some digital divides have narrowed over time

Chart 1.4 compares changes in the digitalisation index between 2015 and 2020 with the levels recorded in 2015. Its inverted-U shape indicates that the sharpest improvements were seen in economies that had medium levels of digitalisation in 2015. Belarus, North Macedonia, Serbia and Ukraine saw the biggest gains, driven by large improvements in regulation and government services and associated increases in firms' use of digital technologies. Gains were more limited in economies that already had high levels of digitalisation in 2015, such as Estonia, Latvia, the Slovak Republic and most advanced economies.

But other economies are falling further behind

At the same time, however, many economies that had low levels of digitalisation in 2015 have made little progress since then and are thus at risk of falling further behind. In Egypt, Lebanon, Mongolia, Morocco, Tajikistan, Tunisia, Turkmenistan and the West Bank and Gaza, for instance, gains have been smaller than those seen in advanced economies, despite starting from a low base. For those economies, therefore, the digital divide has widened.

Broad-based improvements in the quality of digital infrastructure

Digital infrastructure improved in almost all economies in the EBRD regions between 2015 and 2020 (see Chart 1.5; see also Chapter 2). Gains mostly reflected improvements in the quality and affordability of digital infrastructure. Similar improvements were seen in the digital infrastructure underpinning financial markets during this period (see Chapter 5).

Large gains in terms of the quality of digital government services and regulation

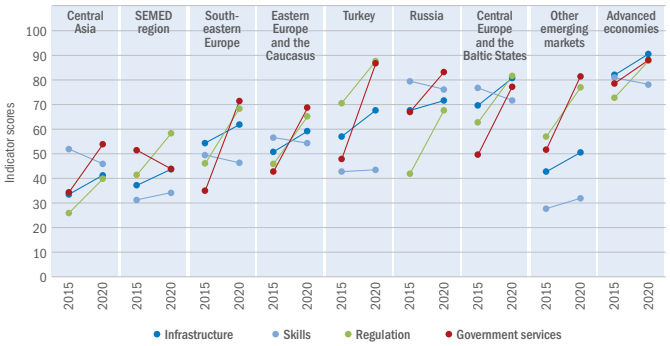
Many economies have also seen significant improvements in the quality of digital government services and the regulatory framework governing digitalisation (see Chart 1.5; see also the Structural Reform section for examples of recent digitalisation initiatives in the context of the Covid-19 crisis). The largest improvements in regulation have been seen in Greece, North Macedonia, Russia and Serbia, largely owing to perceived improvements in cybersecurity. Government services have also improved in many economies in the EBRD regions and other emerging markets.

Skill levels are a key constraint

As documented in previous *Transition Reports*, a number of economies in the EBRD regions – such as those of central Europe and the Baltic states (CEB), as well as Russia – have high levels of human capital relative to other emerging markets.[8] Nevertheless, the average gap relative to advanced economies is sizeable. The EBRD regions are only one year behind advanced economies in terms of the average number of years of schooling; however, when adjusted for the quality of schooling (based on standardised international tests administered to recent cohorts of students), the gap is more than two years (see Chart 1.6).[9]

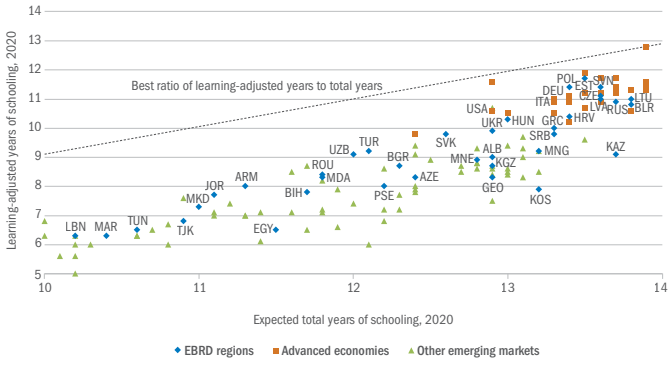
Strikingly, in 55 per cent of economies in the EBRD regions, as well as some advanced economies (including Germany, Italy and the United States of America), quality-adjusted years of schooling declined between 2017 and 2020. For instance, in Bulgaria, Kazakhstan, Russia and Serbia, quality adjusted years of schooling fell by over a year

CHART 1.5. Regulation and government services have improved most, while skills have worsened



Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: Data relate to 2020 (or the latest year available) and 2015 (or the closest year available), with a score of 100 representing the frontier. See Annex 1.2 in the online version of the report for details. Data for comparator economies are simple averages across 4 emerging markets and 10 advanced economies.

CHART 1.6. The EBRD regions compare less favourably with advanced economies when years of schooling are adjusted for quality



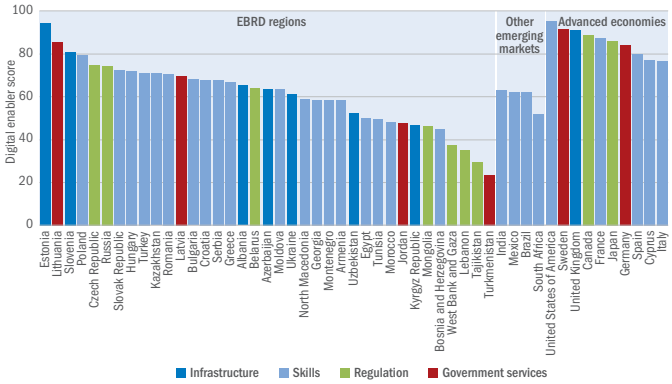
Source: World Bank and authors' calculations.

THE EBRD REGIONS ARE ONLY
1 YEAR
BEHIND ADVANCED ECONOMIES IN TERMS OF THE AVERAGE NUMBER OF YEARS OF SCHOOLING

[8] See, for example, EBRD (2018).
[9] Learning-adjusted years of schooling are derived by adjusting a country's average years of schooling on the basis of its test performance relative to a global high-performance benchmark (see Filmer et al., 2018).

IN 55%
OF ECONOMIES IN THE EBRD REGIONS, QUALITY-ADJUSTED YEARS OF SCHOOLING DECLINED BETWEEN 2017 AND 2020

CHART 1.7. In the EBRD regions, skills are most likely to be the key constraint impeding digitalisation



Source: Enterprise Surveys, Global Findex Database, GSMA Mobile Connectivity Index, ITU-D ICT Statistics and Global Cybersecurity Index Reports, Ookla Speedtest Open Data, World Bank Netcraft and World Development Indicators, WEF Global Competitiveness Index, UN E-Government Development Index and Knowledgebase, UNCTAD and authors' calculations.
Note: The bars indicate the overall enabler score for each economy (with economies ranked on that basis). However, the colour of an economy's bar indicates its key constraint. For each economy, the key constraint is the enabler with the score that is furthest from the frontier. Although, in practice, some economies have more than one constraint, only the enabler with the lowest score is indicated here.

between 2017 and 2020, largely owing to growing dispersion of test scores within those countries (with total years of schooling remaining broadly unchanged).[10]

This indicator may overstate the downward trend in terms of an economy's overall stock of human capital (which also includes people who were educated in the past) to the extent that estimates are based on a sample of recent secondary-school leavers. However, it is a warning that economies' comparative advantages in terms of the strength of their skill base are at risk of being eroded.

However, there have been some gains, too. Within the EBRD regions, skills have improved most in Egypt (albeit from a low base), with improvements in terms of total years of schooling, quality adjusted years of schooling, digital skills and access to internet in schools. In 2017, Egypt introduced a set of educational reforms entitled "Education 2.0", which involved updates to curriculums, changes to teaching methods and student assessments, enhanced teacher training and greater emphasis on digital technology.[11]

Identifying policy priorities in terms of supporting digitalisation

Although the relationship between the four enablers is strong, priorities in terms of improving the conditions for digitalisation vary across economies. The key constraint for each economy is assumed to be the one where its digital enabler score is furthest from the frontier. By construction, this analysis identifies a key constraint for each economy, regardless of its level of digitalisation. For instance, while Estonia is close to the frontier for all of its enablers (and was the top performer for government services in 2020), its digital infrastructure is assessed as being furthest from the frontier (see Table 1.1 and Chart 1.7).

Infrastructure is often a key constraint in lower-income economies with lower scores for digital enablers (such as the Kyrgyz Republic and Uzbekistan). However, it is also a key constraint in some economies with high levels of digitalisation, such as Estonia, Slovenia and the United Kingdom. (A similar pattern can be observed for infrastructure supporting the development of financial markets, as discussed in Chapter 5.)

Regulation tends to be a key constraint in economies where the quality of digital enablers is lower than one would expect on the basis of the overall level of development, such as Lebanon, Mongolia, Tajikistan and the West Bank and Gaza. Moreover, it remains the key constraint in Russia, despite significant improvements in the last five years (including the simplification of requirements for some electronic transactions and new regulations facilitating digital contracts). It is also a key constraint in some economies with higher levels of digitalisation (including

[10] See OECD (2019b).
[11] See also Saavedra (2019).

THE NUMBER OF ICT PROFESSIONALS AND TECHNICIANS WORKING IN THE EBRD REGIONS IS AROUND HALF OF THE LEVEL SEEN IN ADVANCED ECONOMIES AS A PERCENTAGE OF TOTAL EMPLOYMENT

Canada, the Czech Republic and Japan), as more advanced digital technologies require a more complex regulatory and legal framework to govern them.

If we compare the data for 2020 with the equivalent figures for 2015, there has been a significant decline in the number of economies in the EBRD regions where government services are the key constraint, reflecting the progress made in that area.

Skills are often a key constraint in the EBRD regions

In the EBRD regions, skills are often the key constraint impeding digitalisation, especially in economies with medium levels of digitalisation, such as those in central, eastern and south-eastern Europe. The number of economies where skills are the key constraint has increased in recent years as infrastructure, the quality of regulation and the availability of government services have improved. Skills are also the key constraint in a number of emerging market comparators. As the analysis in Box 1.1 shows, economies with high skill levels enjoy significantly greater returns to investment in digital-intensive capital than economies with low skill levels.

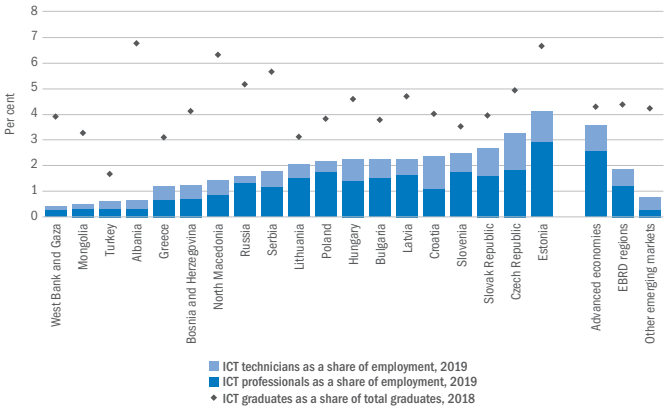
The skill gap discussed in the context of average quality-adjusted years of schooling is also present in the digital sphere. While around two-thirds of people living in advanced European economies have at least basic digital skills (which is defined as being able, for instance, to find information online, send emails, shop online, use a word processor or update software), this is true of less than a quarter of people living in most economies in the SEE region, based on data from Eurostat.

Digital brain drain

The lack of digital skills in the working-age populations of economies in the EBRD regions is being exacerbated by a brain drain – the outward migration of people with higher levels of education and, in particular, better digital skills. While the EBRD regions are similar to advanced economies in terms of ICT graduates as a percentage of total graduates (with both averaging around 4.5 per cent), the number of ICT professionals and technicians working in the EBRD regions (as a percentage of total employment) is around half of the level seen in advanced economies (see Chart 1.8). In other words, many ICT graduates in the EBRD regions end up migrating to advanced economies or working in different fields (differences may also reflect a time lag). The differences between education and employment patterns are somewhat more pronounced for ICT specialists than for other highly skilled professionals (such as lawyers or teachers), whose qualifications are less likely to be recognised abroad (or less transferable to other sectors). Similar patterns can be observed in other emerging markets.

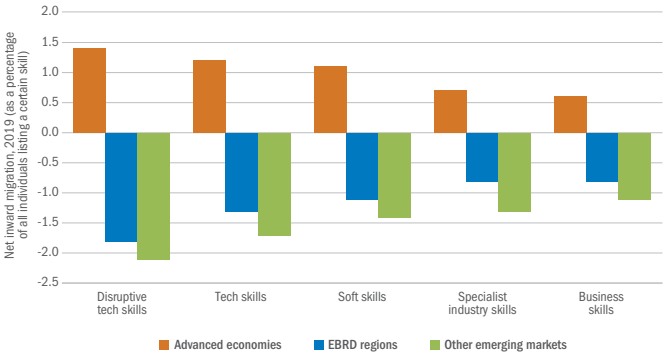
In order to examine that digital brain drain in greater detail, this section draws on a unique LinkedIn-World Bank

CHART 1.8. Many economies in the EBRD regions are training ICT specialists but not retaining them



Source: International Labour Organization (ILO), United Nations Educational, Scientific and Cultural Organization (UNESCO) UIS database and authors' calculations.
Note: Data for comparator economies are simple averages across 15 advanced economies and 6 emerging markets.

CHART 1.9. The EBRD regions are experiencing a digital brain drain



Source: LinkedIn-World Bank database and authors' calculations.
Note: Data are simple averages across 30 economies in the EBRD regions, 41 advanced economies and 48 other emerging markets. See Zhu et al. (2018) for descriptions of skill groups.

database, which uses information from members' profiles on LinkedIn, a leading social network connecting professionals and employers.[12] It looks at how skills listed on members' profiles are linked to their international moves, as well as the changing skill needs of various industries. While the database is unlikely to be representative of blue-collar occupations, for digital-intensive sectors and occupations it is a good approximation of data from labour surveys and administrative sources (such as the ILO).

The analysis in this section provides further evidence of a digital brain drain in the EBRD regions and other emerging markets (see Chart 1.9). Each LinkedIn profile indicates the skills of the member in question, as well as the location of their job. Using that information, cross-border job changes can be translated into net gains (or losses) in terms of members with a given skill working in a given economy.[13] Those net gains (or losses) are then divided by the total number of LinkedIn members with that skill in the country in question. The analysis in this section focuses on general technological skills (such as web development, data storage, graphic design and technical support, as well as general digital literacy) and disruptive technological skills (such as artificial intelligence (AI), data science, nanotechnology and robotics; see also Box 1.4 on the opportunities and risks presented by AI).

While advanced economies experience net inward migration across a range of skills, the net gains are strongest for disruptive technology and other technological skills, mirrored by significant net outward migration of professionals with technological skills in the EBRD regions and other emerging markets. On average, 1.5 per cent of people in the EBRD regions who listed some technological skills on their profile moved abroad in 2019. That brain drain was especially pronounced in economies in the SEMED region (particularly Lebanon, Morocco and Tunisia) and the Western Balkans (particularly Albania and Bosnia and Herzegovina). Although demand for such skills can be strong in emerging and developing economies, firms in advanced economies may offer significantly higher wages.[14]

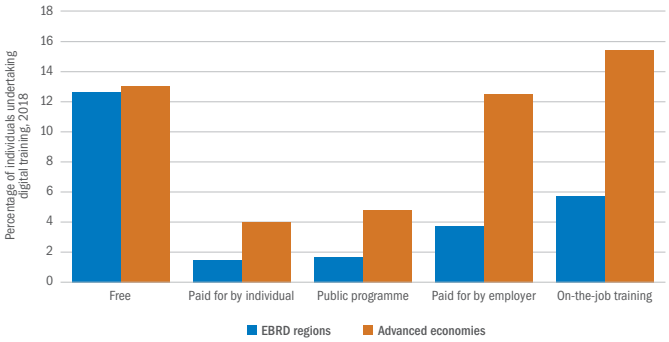
Limited digital training provided by employers

Economies in the EBRD regions also lag behind advanced economies in terms of digital training (see Chart 1.10). Survey data from Eurostat suggest that the EBRD regions are similar to advanced European economies in terms of the percentage of people undertaking free, independent training on the use of computers, software or applications (such as free online courses). However, differences are much more pronounced when looking at training that individuals have to pay for themselves or is provided free of charge by the public sector. Moreover, they are particularly large when it comes to training provided by employers and on-the-job training. For instance, while 12 per cent of survey respondents in advanced economies report having received training provided by their employer, that is true of just 4 per cent of respondents in the EBRD regions. Thus, there is a risk of a vicious cycle whereby brain drain discourages employers from investing in people's digital skills, and people with some digital skills then move abroad in search of better opportunities. Differences in the percentage of individuals who have received on-the-job digital training can explain about 60 per cent of total variation in the outward migration of people with technological skills.[15]

While digital training is somewhat less common in economies where manufacturing accounts for a larger percentage of employment, the EBRD regions continue to lag some way behind advanced economies even after differences in the structure of employment have been taken into account.

WHILE
12%
OF SURVEY RESPONDENTS IN ADVANCED ECONOMIES REPORT HAVING RECEIVED TRAINING PROVIDED BY THEIR EMPLOYER, THAT IS TRUE OF JUST
4%
OF RESPONDENTS IN THE EBRD REGIONS

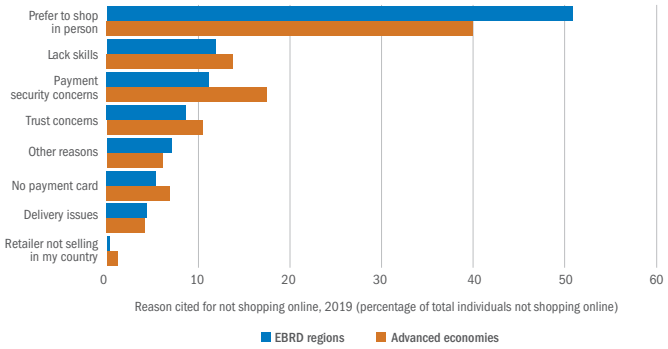
CHART 1.10. There is less digital training in the EBRD regions than in advanced economies



Source: Eurostat and authors' calculations.
Note: Data are simple averages across 19 economies in the EBRD regions (central and south-eastern Europe, plus Turkey) and 17 advanced European economies.

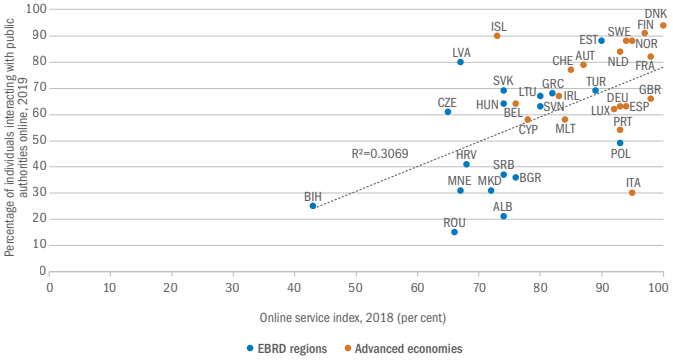
[12] See Zhu et al. (2018).
[13] International moves are identified on the basis of self-reported changes in location on LinkedIn profiles.
[14] See World Bank (2021a).
[15] Based on a sample of 17 economies in the EBRD regions.

CHART 1.11. In the EBRD regions, a lack of skills is the second most common reason for not shopping online



Source: Eurostat and authors' calculations.
Note: Data are simple averages across 18 economies in the EBRD regions (central and south-eastern Europe, plus Turkey) and 3 advanced economies (Germany, the Netherlands and Sweden).

CHART 1.12. Low levels of digital skills are impeding the use of e-government services



Source: Eurostat, UN and authors' calculations.

Finland, Iceland and Norway stand out as having high levels of employer-funded training, whereas in the Western Balkans such training is particularly scarce. For instance, the percentage of people receiving training paid for by their employer or on-the-job training is about six times higher in Norway than it is in Montenegro, despite the two economies having similar percentages of people undertaking free training.

Weak digital skills constrain people's use of digital technologies

Low levels of digital skills appear to be impeding people's use of digital technologies. A recent survey conducted by Eurostat asked those with no experience of ordering goods or services online in the past year why they did not do so. A lack of skills was the second most common reason, after a preference for shopping in person (see Chart 1.11). In advanced economy comparators, by contrast, concerns about payment security were the second most common reason, highlighting the importance of digital regulation and cybersecurity when rolling out digital services.

More generally, differences in digital skills can explain almost 80 per cent of the cross-country variation observed in households' use of digital technologies. A similar correlation is observed between ICT specialists' share of total employment and firms' use of digital technologies.

Low levels of digital skills appear to be impeding the use of digital technologies even where supporting infrastructure and digital government services are available (see Chart 1.12). For instance, while the Czech Republic and Romania are comparable in terms of the availability of e-government services (plotted on the horizontal axis), the percentage of individuals using them is around 46 percentage points

DIFFERENCES IN DIGITAL SKILLS CAN EXPLAIN ALMOST
80%
OF CROSS-COUNTRY VARIATION IN HOUSEHOLDS' USE OF DIGITAL TECHNOLOGIES

higher in the Czech Republic. More generally, differences in the availability of government services only explain around 30 per cent of the cross-country variation observed in their use, and the remainder is not meaningfully explained by differences in internet infrastructure.

However, there is a close correlation between the percentage of the population that use e-government services and the percentage of the population that have at least basic digital skills (see Chart 1.13), with differences in digital skills accounting for almost 70 per cent of the variation observed in households' use of digital technologies. For instance, the percentage of individuals with at least basic digital skills is about 31 percentage points higher in the Czech Republic than it is in Romania. More formally, a cross-country regression indicates that digital skills have a large and statistically significant effect on the number of people using e-government services (as a percentage of total internet users), even after controlling for the availability of e-government services.

Economies are shifting towards more digital-intensive sectors

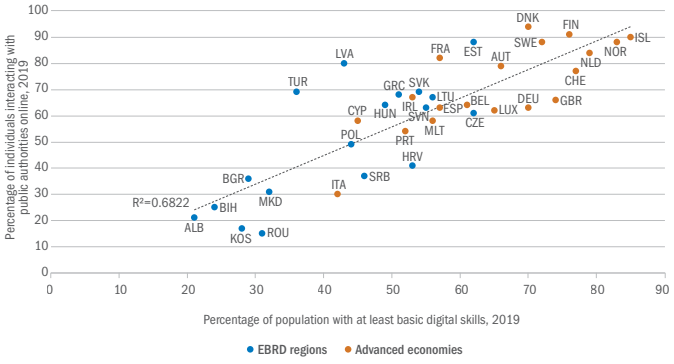
Low levels of digital skills are likely to become even more of a constraint in the future, as production structures are shifting towards more digital-intensive sectors. The analysis below draws on a rich ILO database and groups sectors together on the basis of their digital intensity using the classification in Calvino et al. (2018).[16] For example, sectors with low digital intensity include agriculture, construction, food products, and hotels and restaurants; medium-low sectors include textiles, basic metals and healthcare; medium-high sectors include machinery and equipment, wood and paper products and furniture, and public administration; and sectors with high digital intensity include information technology and telecommunications, as well as transport equipment, finance and insurance, and professional services.

Countries differ substantially in terms of the role played by digital-intensive sectors, with such sectors typically accounting for a larger share of employment in higher-income economies. In the CEB region, for example, sectors with high and medium-high digital intensity account for almost half of total employment. In Albania and Egypt, by contrast, sectors with low and medium-low digital intensity dominate, accounting for around 70 per cent of employment in 2019.

In the EBRD regions, employment in sectors with high and medium-high digital intensity grew three times faster than employment in less digital-intensive sectors in the period 2011-19 (see Chart 1.14). In some economies, such as Armenia, Bosnia and Herzegovina, Croatia and Romania, employment in less digital-intensive sectors shrank. Such structural shifts are increasing the digital intensity of overall employment, as more digital-intensive sectors are becoming more important employers.

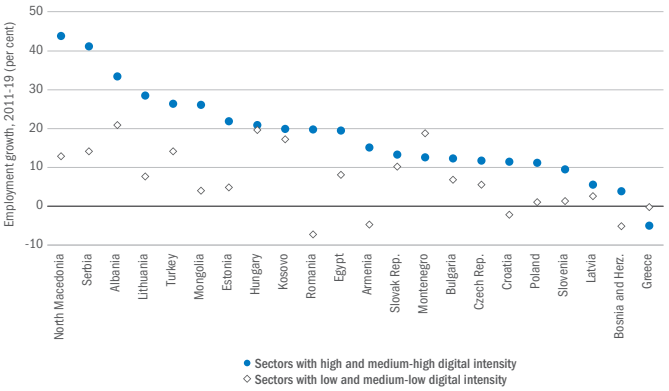
Similarly, employment in more digital-intensive occupations (defined as all occupations which involve the use of software – not just specialist ICT occupations) grew about twice as fast as employment in less digital-intensive occupations between 2011 and 2019 in the EBRD regions.

CHART 1.13. There is a close correlation between the percentage of the population that use e-government services and the percentage of the population that have at least basic digital skills



Source: Eurostat, UN and authors' calculations.

CHART 1.14. More digital-intensive sectors have seen stronger employment growth



Source: ILO, Organisation for Economic Co-operation and Development (OECD) and authors' calculations.
Note: Digital intensity is defined in accordance with ISIC Rev. 4 following the taxonomy in Calvino et al. (2018). Data for Armenia relate to the period 2011-17; data for Bosnia and Herzegovina and Kosovo cover the period 2012-19; and data for Albania relate to the period 2014-19.

[16] Sectors are classified on the basis of their digital intensity ("high", "medium-high", "medium-low" or "low") using a number of different factors (ICT investment and ICT intermediates; use of robots; online sales; and ICT specialists) and then grouped together by quartile.

Digital skills are becoming more important within sectors

Not only are economies shifting towards more digital-intensive sectors, but even *within* sectors, technological skills are becoming more important. The following analysis draws on the aforementioned LinkedIn-World Bank database, examining the skills that are most common in a given sector based on the skills listed in LinkedIn members' profiles and looking at how the skill needs of industries have changed over time. In this analysis, the importance of each group of skills is measured by the group's share of the top 30 skills associated with a given industry or occupation.

The importance of technological skills increased in almost three-quarters of industries globally between 2015 and 2019, including industries far removed from the ICT sector (such as food production, paper products and textiles). As production becomes increasingly automated, many repetitive tasks will be carried out by advanced robotic systems, with human involvement switching to the maintenance and supervision of machines.[17]

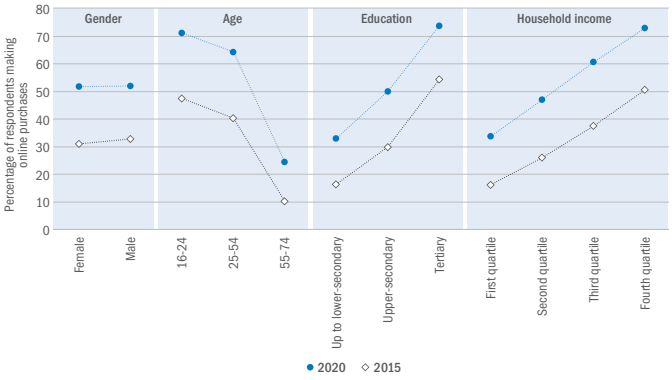
A similar picture can be observed for disruptive technological skills. While they remain less common than general technological skills, their prevalence has increased in 92 per cent of industries (including sectors as diverse as industrial automation and financial services).

More generally, the largest increases in the importance of technological skills have been seen in industries which in 2015 still had relatively low levels of digital intensity (such as the automotive sector, banking, chemicals, mining and metals, oil and energy, paper products and textiles). In contrast, their relative importance has declined in some industries which were already highly digital-intensive in 2015 (such as animation and graphic design).

With economies shifting towards more digital-intensive sectors and digital skills becoming more important within individual sectors, raising digital skill levels will become a greater policy priority in terms of maintaining and improving an economy's competitiveness.

THE IMPORTANCE OF TECHNOLOGICAL SKILLS INCREASED IN ALMOST THREE-QUARTERS OF INDUSTRIES GLOBALLY BETWEEN 2015 AND 2019

CHART 1.15. Younger, more educated and richer individuals are more likely to take advantage of digital technologies



Source: Eurostat and authors' calculations.
Note: Data are simple averages for Turkey and 13 economies in the EU and the Western Balkans.

Digital divides within economies

This section focuses on digital divides *within* economies, looking first at individuals and then at firms. Digital divides between urban and rural areas of countries are discussed in Box 1.5.

Younger, more educated and richer individuals are more likely to use digital technologies

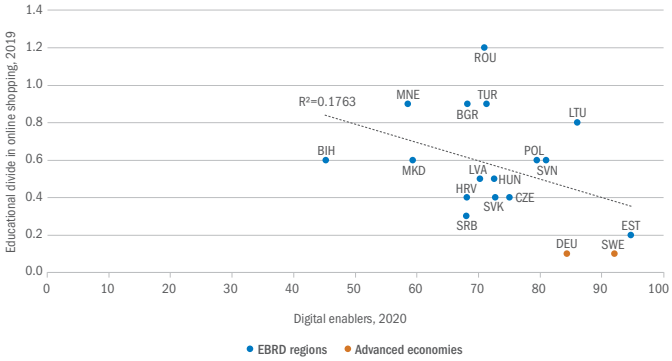
The results of a Eurostat survey of economies in the European Union (EU), the Western Balkans and Turkey suggest that younger, more educated and richer individuals are more likely to take advantage of digital technologies, with roughly equal uptake of digital technologies by men and women. This is true of the EBRD regions and advanced European economies alike and holds across a range of indicators: younger, better-educated and wealthier individuals are more likely to shop online (see Chart 1.15), more likely to use online banking (see Chapter 4) or e-government services, and more likely to have strong digital skills.

Digital divides are greater in economies with lower levels of digitalisation

Differences on the basis of age, education or income are typically larger in economies where digitalisation is less advanced (see Chart 1.16). In all economies, university-educated people are more likely to shop online, but economies with weaker digital enablers tend to have larger gaps between the shares of individuals with tertiary and upper-secondary education (with an even stronger correlation being observed for digital outcomes).

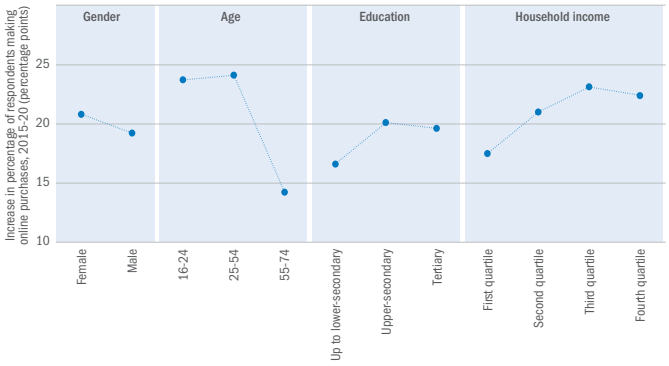
[17] See Akyazi et al. (2020).

CHART 1.16. Digital divides are greater in economies with lower levels of digitalisation



Source: Eurostat and authors' calculations.
Note: The educational divide in online shopping is calculated as the difference between the percentage of tertiary-educated respondents shopping online and the percentage of upper-secondary-educated respondents shopping online, divided by the percentage of total respondents shopping online.

CHART 1.17. People aged 25-54 and people with medium levels of education and income were most likely to start shopping online between 2015 and 2020



Source: Eurostat and authors' calculations.
Note: Data are simple averages for Turkey and 13 economies in the EU and the Western Balkans.

Some digital divides have narrowed, but other groups are falling behind

Some digital divides within economies appear to have narrowed between 2015 and 2020. As in the case of digital divides between countries, individuals making moderate use of digital technologies saw the largest gains. For instance, those aged 25-54, those with upper-secondary education and those with household income between the median and the 75th percentile were most likely to start shopping online between 2015 and 2020 (see Chart 1.17). Those aged 55 or over, those with lower secondary education or below and those in the bottom quartile for income saw the smallest gains in terms of the uptake of digital technologies, even as moderate users were catching up with the highest users.

There is a risk that those groups will fall further behind, entering a vicious cycle whereby digital divides amplify existing socio-economic divides, and then income inequality and inequality of opportunity, in turn, exacerbate digital divides.[18]

Digital divides are greater among older individuals

Next, this analysis looks at digital divides among individuals who are of similar age, but have differing levels of educational attainment. Digital divides among older cohorts (individuals aged 55-74) are stark, and more so in the EBRD regions than in advanced European economies. In this age group, around half of all tertiary-educated individuals in the EBRD regions have at least basic digital skills, compared with just 2 per cent of people who are only educated up to lower-secondary level. Reassuringly, economies in the EBRD

AMONG PEOPLE AGED 55-74, AROUND HALF OF TERTIARY-EDUCATED INDIVIDUALS IN THE EBRD REGIONS HAVE AT LEAST BASIC DIGITAL SKILLS, COMPARED WITH JUST 2% OF PEOPLE EDUCATED UP TO LOWER-SECONDARY LEVEL

[18] See also Duarte (2021) and World Bank (2021b).

regions look much more similar to advanced economies when it comes to the young, with between 72 and 91 per cent of 16-24 year olds having at least basic digital skills (see Chart 1.18).

Larger, better-managed and innovative firms are more likely to use digital technologies

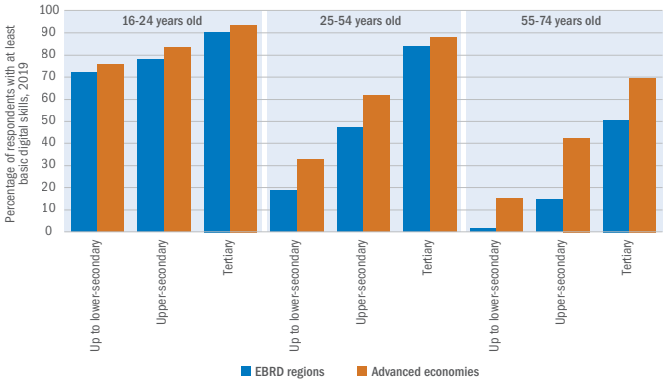
This section examines digital divides across firms, drawing on the results of the Enterprise Surveys – large representative face-to-face surveys of firms with at least five employees which have been conducted globally since 2006 by the World Bank in cooperation with the EBRD and the European Investment Bank (EIB). All survey respondents are either senior managers or owners of the firms in question.

The last standard survey round was carried out shortly before the onset of the Covid-19 crisis. However, some of those respondent firms have since been approached again with a special questionnaire looking at their experiences during the pandemic. Firm-level regression analysis based on these data looks at firm characteristics that are associated with a greater likelihood of (i) having a website (as a measure of the use of digital technologies before the Covid-19 crisis) and (ii) introducing or increasing remote working during the pandemic.

Analysis reveals that larger, better-managed and innovative firms and those with international links through trade or ownership were more likely to have a website in 2019 (see Chart 1.19). Those differences are sizeable and statistically significant. For instance, large firms (defined as firms with 100 employees or more) were about 1.5 times more likely to have a website than small firms (defined as firms with between 5 and 19 employees). Global value chain (GVC) participants were more than twice as likely to have a website as firms that do not actively trade across borders (with GVC participants being defined as firms that both (i) import and (ii) have exports accounting for at least 10 per cent of sales). Better-managed firms and those that reported having introduced a new product or process in the past three years were also more likely to have a website.

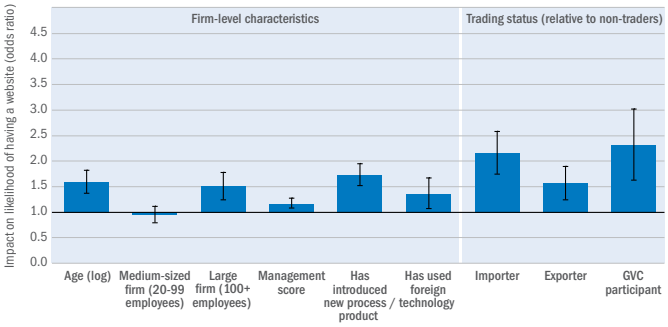
LARGE FIRMS IN THE EBRD REGIONS ARE ABOUT
1.5
TIMES MORE LIKELY
TO HAVE A WEBSITE THAN SMALL FIRMS

CHART 1.18. Within age-based cohorts, digital divides by level of education are smaller among the young than among the old



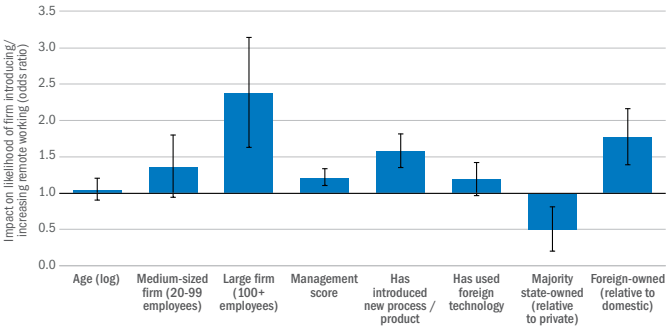
Source: Eurostat and authors' calculations.
Note: Data are simple averages across 13 economies in the EBRD regions (central and south-eastern Europe, plus Turkey) and 11 advanced economies in Europe.

CHART 1.19. Larger, better-managed and innovative firms and firms trading across borders are more likely to take advantage of digital technologies



Source: Enterprise Surveys and authors' calculations
Note: This chart shows coefficients derived from a logit model regressing a variable capturing the existence of a website on various firm-level characteristics for economies in the EBRD regions. Bars denote odds ratios, with a ratio higher than 1 indicating that a firm-level characteristic has a positive impact on the likelihood of having a website. The base group is made up of small firms (5-19 employees). Regressions control for average sales growth over the previous two years (log-difference), as well as sector and country fixed effects. The 95 per cent confidence intervals shown are based on standard errors clustered at country level.

CHART 1.20. Use of digital technologies is more likely to rise at larger, better-managed, innovative and foreign-owned firms



Source: Enterprise Surveys and authors' calculations.
Note: This chart shows coefficients derived from a logit model regressing a variable capturing the introduction of or increases in remote working during the Covid-19 crisis on various firm-level characteristics for economies in the EBRD regions. Bars denote odds ratios, with a ratio higher than 1 indicating that a firm-level characteristic has a positive impact on the likelihood of the firm introducing or increasing remote working. The base group is made up of small firms (5-19 employees). Regressions control for average sales growth over the previous two years (log-difference), participation in international trade, and sector and country fixed effects. The 95 per cent confidence intervals shown are based on standard errors clustered at country level.

ICT'S SHARE IN GREENFIELD FDI PROJECTS IN THE EBRD REGIONS ALMOST DOUBLED BETWEEN 2011 AND 2018, REACHING
8.4%

Firm-level digital divides may widen further

Moreover, larger, better-managed, innovative and foreign-owned firms are more likely to have *increased* their use of digital technologies during the Covid-19 crisis (see Chart 1.20) on the basis of similar regression analysis looking at the firm-level characteristics associated with the introduction of or increases in remote working during the Covid-19 crisis. Chapter 3 analyses these patterns in greater detail.

This analysis points to a widening of digital gaps between firms over time. While firms that take advantage of digital technologies expand their horizons further and benefit from access to larger markets and improved availability of finance (see Chapters 2 and 4), small, less well-managed, less innovative and domestically owned (particularly state-owned) firms risk missing out on the benefits of digitalisation.

Recent OECD research also points to a widening of digital divides between firms, reinforcing the idea of a winner-takes-all dynamic. For instance, industry concentration, mark-ups, and mergers and acquisitions have all increased more strongly in more digital-intensive sectors and sectors that are more reliant on the use of intangible assets (such as patents).[19] The productivity gap between the most productive firms globally and the rest has been widening, notably in digital-intensive sectors.[20] In turn, business dynamism (as captured by rates of entry for new firms) has declined more sharply in digital-intensive sectors.[21]

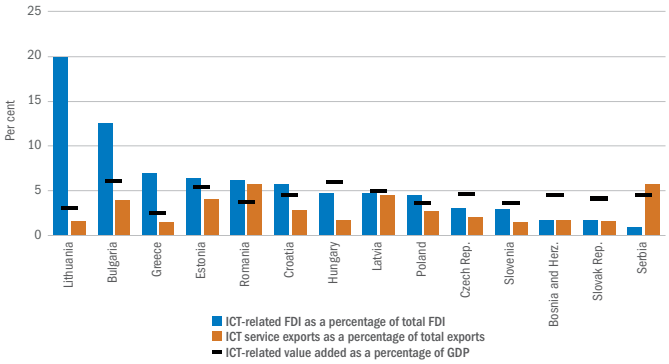
Even economies with low levels of digitalisation have the potential to develop digital niches

Motivated by the impact that trade and foreign ownership have on firms' use of digital technologies, this section looks at whether less digitally advanced economies may be able to develop pockets of digital excellence – for instance, by benefiting from foreign investment in digital-intensive sectors or developing export-oriented digital industries. This analysis looks at the structure of capital expenditure for foreign direct investment (FDI) projects, as reported in the Financial Times fDi Markets database, and compares it with the structure of production (GDP) and exports for each economy. The analysis is based on the total expected expenditure for each project, regardless of the degree of ownership by foreign investors.

A number of economies in the EBRD regions (such as Bulgaria, Greece and Lithuania) have seen substantial greenfield FDI inflows in ICT sectors, even where those sectors make a relatively modest contribution to overall value added in the domestic economy (see Chart 1.21). In Lithuania, for instance, ICT accounted for over a fifth of the total expenditure of greenfield FDI projects over the period 2009-18, while the sector's value added accounted for less than 3 per cent of GDP. ICT's share in greenfield FDI projects in the EBRD regions almost doubled between 2011 and 2018, reaching 8.4 per cent, with particularly sharp increases being seen in the Baltic states, Poland and Romania. More generally, the relative importance of the ICT sector in FDI inflows increased faster in countries with better digital skills.

[19] See Bajgar et al. (2021) and Calligaris et al. (2018).
[20] See Andrews et al. (2016).
[21] See Calvino and Criscuolo (2019).

CHART 1.21. Even in less digitally advanced economies, ICT-related FDI and exports of ICT services can sometimes be substantial



Source: Eurostat, Financial Times fDi Markets database, IMF, ITC Trade Map and authors' calculations.
Note: ICT-related FDI as a percentage of total FDI is based on the capital expenditure of greenfield FDI projects announced in the period 2009-18 (including announced, opened and completed projects). ICT service exports as a percentage of total exports of goods and services refer to 2019. ICT-related value added as a percentage of GDP refers to 2018 (with the exception of Bosnia and Herzegovina, for which data relate to 2016).

As a result, some economies (such as Belarus, Estonia, Serbia and Ukraine) have established strongly outward-oriented ICT sectors, with exports of ICT services accounting for around 3 per cent or more of GDP. Indeed, the average value of ICT service exports in the EBRD regions has increased in recent years, rising from 0.7 per cent of GDP in 2011 to 1.4 per cent in 2019, reflecting strong export growth in economies in eastern Europe and the Caucasus (EEC) and central and south-eastern Europe.[22] Export-orientation often supports the development of a broader ICT ecosystem and start-up scene, leveraging the economies of scale that the international market for ICT services can offer.[23]

Estonia, for example, is well known for its digital start-ups. Seven ICT unicorns (privately held companies with a valuation in excess of US$ 1 billion) have an Estonian connection (an Estonian founder, Estonian headquarters or a significant amount of research and development (R&D) operations in Estonia). Indeed, according to Startup Estonia, a government agency supporting young technology companies, Estonia leads the world in terms of unicorns per capita. Meanwhile, Estonia's virtual e-residency scheme (a government-run digital initiative which allows e-resident entrepreneurs from all over the world to set up an EU-based company and manage their business from anywhere, entirely online) aims to attract other businesses to the country.

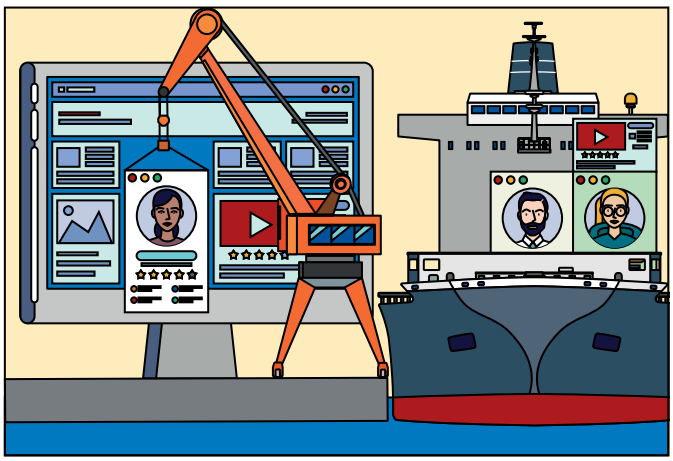
Serbia's ICT sector benefits from relatively low wages and a highly qualified workforce, as well as investment incentives of up to €10,000 per employee under a government-sponsored scheme. As well as being home to a number of fast-growing local start-ups, foreign firms such as Huawei, Kaspersky and Microsoft also have offices there.

Ukraine has about 200,000 ICT engineers who are capable of producing high-end solutions (such as software for mobile phone platforms, gaming, financial technology, healthcare programmes, artificial intelligence and e-commerce), making it the world's seventh-largest supplier of qualified freelance ICT specialists.[24] Ukraine is currently home to more than 110 R&D centres run by multinational companies (including centres belonging to the likes of Apple, Boeing, Google, Huawei, Samsung and Siemens, as well as Ubisoft – a French game developer).

Belarus, meanwhile, has a high-tech park hosting more than 1,000 technology companies (concentrated in business computer services, gaming and software development), which employ more than 70,000 workers.

Thus, ICT-specific foreign investment can support countries' structural and digital transformation. ICT's share of GDP has been increasing over time in the EBRD regions, somewhat faster than in advanced economies. In 2011, ICT-related manufacturing and services accounted for about 3.8 per cent of GDP in both the EBRD regions and advanced economies; by 2018, they accounted for 4.3 per cent in the EBRD regions and 4 per cent in advanced economies.

THE AVERAGE VALUE OF ICT SERVICE EXPORTS IN THE EBRD REGIONS STOOD AT 1.4% OF GDP IN 2019, UP FROM 0.7% IN 2011



[22] Based on ITC Trade Map data, with figures representing simple averages across 31 economies in the EBRD regions.
[23] See also EBRD (2022).
[24] See UNIT.City and Western NIS Enterprise Fund (2019).

Conclusions and policy implications

As this chapter has shown, there are large digital divides both across and within countries. While many economies in the EBRD regions (particularly those with medium levels of digitalisation) have made significant progress in recent years in terms of closing the digital gap relative to advanced economies, many economies with low levels of digitalisation have been falling further behind.

For economies with low levels of digitalisation (particularly in Central Asia and the SEMED region), investing in internet and other digital infrastructure remains a key policy priority. In a number of economies (including Russia and parts of Central Asia and the SEMED region), regulatory frameworks have been identified as a key constraint impeding the use of digital technologies, in some cases notwithstanding the large gains seen in recent years.

Many other economies have seen substantial improvements in terms of the quality and affordability of infrastructure and the provision of e-government services, and low levels of digital skills are now the key constraint impeding people's use of digital technologies in those countries. In such economies (particularly in central and south-eastern Europe), policies should focus on investment in digital skills. This could, for example, involve adapting school curriculums in line with changing skill requirements, providing digital training to teachers and introducing incentives to encourage more digital training by employers.

Investment in digital skills will become even more important over time. While many economies in the EBRD regions have so far relied on the comparative advantages afforded by the strength of their human capital, the quality of their education has showed signs of declining in recent years, and many graduates with strong digital skills are finding employment in advanced economies. Such weakening of economies' skill bases is particularly worrying in a context where digital skills are becoming more important as economies shift towards more digital-intensive sectors and the importance of digital skills is increasing in sectors that are not traditionally thought of as digital-intensive (such as food processing or paper and textiles).

At the same time, however, examples from across the EBRD regions confirm that even less digitally advanced economies have the potential to develop ICT hubs around export-oriented digital industries. Improved employment opportunities at home could also help to mitigate some of the digital brain drain that is being observed in emerging markets, with qualified ICT specialists moving abroad.

The Covid-19 crisis has exacerbated the issue of digital divides within countries. Such gaps, which are especially pronounced in less digitally advanced economies, risk amplifying pre-existing socio-economic divides, potentially triggering a vicious cycle that deepens inequality and worsens social tensions. For example, poor digital skills in people aged 55 or over may result in those workers being pushed out of the labour force as a consequence of increasing digitalisation, thereby aggravating labour market pressures (particularly in ageing societies).

Against that background, broad-based provision of digital infrastructure and digital training is crucial in order to prevent human capital from being wasted, as the skills of groups that make little use of digital technologies have the potential to become obsolete. Policies aimed at addressing such digital divides could, for example, include digital literacy programmes provided through public libraries (particularly in rural areas), support for reskilling, and programmes targeting older workers or the unemployed.

Individuals may sometimes require a nudge when it comes to increasing their use of digital technologies. For example, in order to receive support during the Covid-19 crisis, individuals may have needed to register or fill in forms online or provide bank details for digital payments. More generally, linking digital technologies to the provision of other services can increase uptake of digital tools. For instance, digital signature tools should ideally be provided to the general population as part of the roll-out of smart cards (cards with machine-readable chips that are used to confirm a person's digital identity). The use of digital signatures can also be boosted through cooperation with banks, telecommunication companies and utility providers (see Box 1.3).

Firms can be incentivised to invest in productivity-enhancing digital technologies via grants or tax credits for investing in certain digital products (such as enterprise resource planning, big data or cloud services) or, more generally, through support for R&D or training.[25] Tailored business advice and technology awareness campaigns can also target firms in specific sectors, or firms of a specific size or age (with smaller firms and state-owned enterprises arguably having particular scope to benefit from such programmes). More generally, facilitating access to finance can support investment in cutting edge digital technologies that are perceived to be high-risk. Thus, government interventions supporting digitalisation will be crucial in terms of boosting future growth.

[25] See OECD (2020).

BOX 1.1.

Growth accounting revisited: digital transition and sources of growth

This box updates the discussion on sources of growth in the *Transition Report 2017-18*. Following a growth accounting approach, this analysis links economic growth to changes in capital, labour and the residual, total factor productivity (which indicates the efficiency with which factors of production are combined, and can often be enhanced by the use of digital technologies).

This update draws on the latest, most detailed data, distinguishing between the quantity of labour and the quality of human capital.[26] In order to construct a quality-based measure of human capital, it extrapolates from data on quality-adjusted years of schooling (which are typically available for 2010 and the period 2017-19) using growth rates for conventional measures of human capital, implicitly assuming a constant quality of education.

This analysis also distinguishes between (i) capital that is highly digital-intensive in nature or can be enhanced through digitalisation (such as machinery and transport equipment, computers and communication equipment, software and intellectual property products) and (ii) other types of capital (such as residential buildings, commercial property and roads) that are less digital-intensive. That said, there is significant scope for enhancing the productivity of that second type of capital through the use of digital technologies. For instance, smart traffic light management systems can substantially increase the effective capacity of the existing stock of urban roads.

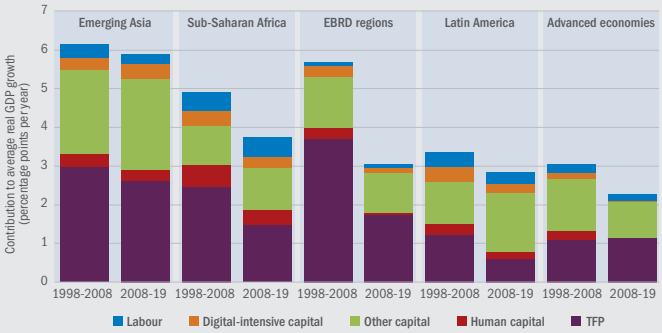
The updated data also focus on capital services, rather than the stock of capital (as used in the previous analysis). This adjustment takes account of the fact that digital-intensive capital (such as laptops) depreciates faster than buildings, implying that a greater percentage of their value is effectively utilised in production each year.[27] Following this adjustment, digital-intensive types of capital account for around 30 per cent of total capital services globally and around 28 per cent in the EBRD regions.

The analysis uses an augmented Cobb-Douglas framework, which assumes that all of these factors (the number of workers, the quality of human capital, digital-intensive capital services and other capital services) are complementary as far as the economy's total output is concerned, but can substitute for one another to some extent.

New measure of human capital underscores its role

A production function estimated for a panel of 122 economies over the period 2000-19 yields coefficients for human capital and labour that add up to around 0.55. This is consistent with earlier findings and the fact that the share of labour in national income averages around 55 per cent across major economies according to OECD data.

CHART 1.1.1. Differences in average growth rates are primarily due to differences in TFP growth



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Estimated by means of a Cobb-Douglas production function using log-changes, with factor coefficients of 0.35 for human capital, 0.2 for labour, 0.1 for digital-intensive capital and 0.35 for other capital.

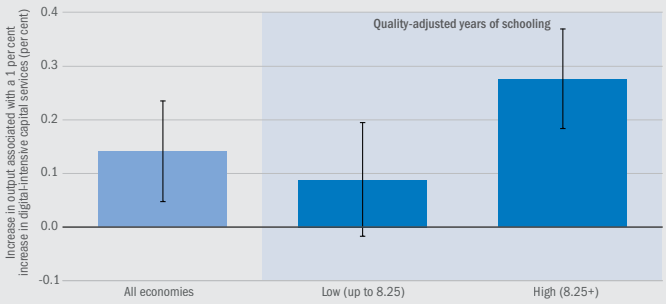
The analysis also underscores the importance of skills as a driver of growth in today's economies. Around two-thirds of labour's share in income is estimated to be attributable to human capital when a measure of quality-adjusted years of schooling is used. Traditional measures of human capital based on the quantity (rather than the quality) of schooling produce a much lower coefficient for human capital and a higher coefficient for the number of workers. The coefficients obtained in this analysis are, in turn, used to break average real GDP growth (in constant 2017 US dollars) down into components linked to changes in labour, human capital and types of physical capital (see Chart 1.1.1).

TFP making a rising contribution to growth

This analysis suggests that differences in average real GDP growth across regions and time largely reflect differences in TFP growth. TFP growth, in turn, is driven by technological progress and digitalisation, allowing more efficient use of factors of production within sectors and incentivising the relocation of resources across industries. In the EBRD regions, TFP growth was exceptionally strong in the 2000s, with market reforms enabling more efficient matching of physical and human capital (which had often been combined inefficiently under central planning). Since then, TFP growth has more than halved. However, it still accounts for more than half of all real GDP growth in the EBRD regions over the last decade, with its contribution exceeding those of capital, human capital and labour. In advanced economies, too, TFP growth has accounted for more than 50 per cent of total growth in real GDP since the 2008-09 global financial crisis, up from around a third between 1998 and 2008.

[26] See Filmer et al. (2018).
[27] See Feenstra et al. (2015) for a discussion of measures of capital in Penn World Tables.

CHART 1.1.2. Economies with stronger skills enjoy greater returns to digital capital



Source: Penn World Tables, IMF, World Bank and authors' calculations.
Note: Estimated by means of a Cobb-Douglas production function using log-changes. The cut-off value for the two subsamples represents median quality-adjusted years of schooling across all economies on the basis of the latest available data. The 95 per cent confidence intervals shown are based on standard errors clustered at country level.

Looking beyond TFP growth, strong capital accumulation has continued to make a marked contribution to growth in emerging Asia, while in advanced economies capital accumulation has slowed markedly. Labour force growth has decelerated across the board, and its contribution to growth has been downgraded as better data on the quality of human capital have become available. Lastly, while returns to human capital are high, few economies have recently managed to achieve significant improvements in levels of human capital, resulting in a modest contribution to overall growth.

Returns to digital capital are higher in economies with strong skills

The analysis also suggests that returns to digital-intensive capital tend to be significantly higher in economies with a strong skill base. In particular, in a subsample with above-median quality-adjusted years of schooling (which includes economies such as Estonia and Poland), a 1 per cent increase in digital-intensive capital is associated with a 0.28 per cent increase in output. In contrast, in a subsample with human capital below the median level (which includes, for instance, the Kyrgyz Republic and Morocco), the corresponding increase in output falls to 0.09 per cent (see Chart 1.1.2).

This implies that countries with greater stocks of human capital are better able to harness their investment in digital-intensive capital, which requires higher levels of skill to operate. When a single production function is used for all economies (as in Chart 1.1.1), the synergies between digital-intensive capital and skills manifest themselves as stronger growth in TFP.

BOX 1.2.

Digital regulation in the EBRD regions

In the past, governments often provided digital infrastructure directly (for example, by building fixed-line telecommunication networks and acting as their owners and operators). Increasingly, however, they are now playing more of an arm's-length role – acting as a regulator, establishing an environment that is supportive of private-sector investment while ensuring universal access to infrastructure.[28] At the same time, however, government intervention – whether through direct ownership or subsidies underpinning universal service obligations – remains crucial in order to ensure universal access to digital infrastructure. In 2016, the EBRD established the Accelerating Broadband Connectivity Initiative (referred to as the "ABC Initiative") to help design technical and financial models that would underpin the roll-out of digital network infrastructure in rural areas. Such areas would otherwise be at risk of being underserved, given the high cost of providing internet access in sparsely populated areas (see also Box 1.5).

In addition to public investment in digital infrastructure, government policies and regulation also play a crucial role in shaping the digital economy. For example, legal frameworks need to provide clarity and certainty as regards digital alternatives to paper documents/contracts and wet-ink signatures. Legal and regulatory frameworks need to adapt in order to allow firms to take advantage of new digital technologies (for instance, by digitalising dispute resolution mechanisms and broadening the use of digital technologies in the judicial system). In general, countries tend to pursue different approaches to developing legal frameworks for digitalisation, with no agreed best practices.

In order to take stock of the latest developments in terms of regulatory risk in the area of digital infrastructure, a group of more than a dozen multilateral and bilateral development banks and international organisations recently established the Digital Infrastructure Regulatory Risk Forum. That forum, which is chaired by the Asian Infrastructure Investment Bank, aims to support the convergence of standards and practices, making it easier for investors to deal with regulations. It allows technical experts to share non-confidential information on regulations at country level and facilitates exchanges of views on how to manage risks. It also helps to identify high-level principles underpinning regulatory frameworks for digital infrastructure and related institutions.

[28] See World Bank (2016).

BOX 1.3.

E-government services in the EBRD regions

Information and communication technologies can help to enhance the provision of public services to individuals and businesses. For instance, e-government services can simplify interaction between governments and citizens by allowing online access to government forms and processes, eliminating trips to government offices and reducing waiting times. Businesses can also register, obtain licences and pay taxes digitally, thereby benefiting from significantly reduced processing times and costs. The cost of wasting time can be significant.[29] Indeed, Estonia is estimated to have saved the equivalent of 2 per cent of its GDP by introducing digital signatures.[30]

Many governments in the EBRD regions have made increased digitalisation an explicit policy goal, establishing digitalisation strategies and setting up dedicated agencies. The challenges posed by the Covid-19 crisis have accelerated trends towards increased digitalisation in order to facilitate fast, secure and stable digital access to public services. For instance, the EBRD has helped to assess the degree of digitalisation for investment and business services in Tunisia (in collaboration with Estonia's e-Governance Academy) and Montenegro, paving the way for the development of e-payments and e-registration and the electronic delivery of legal acts from authorities to businesses and citizens.

Digital identification and digital signatures

A key building block in the provision of digital services is digital identification. In the physical world, a person's identity is usually confirmed using a document such as a passport. In the virtual world, however, digital identification is required in order to confirm someone's identity, allow online access or verify virtual transactions (such as government service requests, bank transactions or internet purchases). Smart cards with machine-readable chips are the most common way of confirming a person's digital identity. In addition to having visual information (such as a person's photo, name or date of birth) stamped on the card, the chip also contains a digital identity – a set of data and software that is protected by encryption and can be accessed using a card reader by entering a personal identification number (PIN). Mobile ID is an alternative solution, whereby mobile phones carry a digital identity, with an encrypted set of data and software (similar to that used in smart cards) being contained in the phone's SIM card. In that case, the phone's keyboard is used to enter the PIN number, which activates the digital transaction and identifies the user.[31]

Digital signatures are another key element of e-government. These are most likely to be used where there is a need to verify a transaction (for example, when approving a bank payment or signing a contract) and keep a record of it for the future (ensuring that a contract is signed by both parties, for instance). Unlike an electronic signature, which is simply a name entered in an electronic document, digital signatures are trusted by the government and protected by encryption. However, they are not limited to transactions with the government. In countries that use digital signatures, they are most commonly used for business-to-business transactions (signing contracts or delivery documents) or business to consumer transactions (sales or service contracts).[32]

Ideally, digital signature tools should be provided to the general population as part of the roll-out of smart cards. That way, everyone has access to a digital signature, but they have a choice as to whether or not they use it. If people have to apply separately for a digital signature, the additional financial and bureaucratic barriers may mitigate its advantages. The use of digital signatures can also be boosted through cooperation with banks, telecommunication companies and utility providers, as these entities have large client bases and considerable scope for using digital signatures, increasing their attractiveness as an alternative to wet-ink signatures.[33]

Thus, a legal framework that recognises digital identities on the basis of digital signatures and electronic systems that are capable of identifying individuals are both prerequisites for the effective provision of electronic services. Recently, for example, the Kyrgyz Republic and Uzbekistan developed remote identification systems for their banking sectors, with a strong focus on risk mitigation, protection of personal data and cryptographic security.

Secure management of digital data is crucial for the electronic provision of services. Governments use digital databases for various different purposes (such as maintaining an overview of the population, issuing identity documents, registering, taxing and monitoring business activities, and organising land and property ownership). Thus, the implementation of e-government is highly dependent on the quality of such digital databases.

When information is sent digitally, both the sender and the receiver need to ensure that it is properly dispatched and securely delivered. Against this background, Serbia has recently started to provide e-delivery services and electronic confirmation of receipt, allowing electronic delivery of acts and other documents between government agencies, businesses and citizens. In 2020, for example, a new service was introduced allowing e-delivery to be used in the registration of property rights. As a result, the use of e-services has increased substantially, with 117 cities and municipalities registering on electronic portals.

[29] See Deacon and Sonstelie (1985), Aguiar and Hurst (2007), Allon et al. (2011) and Garrido and Gutiérrez (2019).
[30] See Vassil (2016).
[31] See e-Governance Academy (2017).
[32] See e-Governance Academy (2017).
[33] See e-Governance Academy (2017).

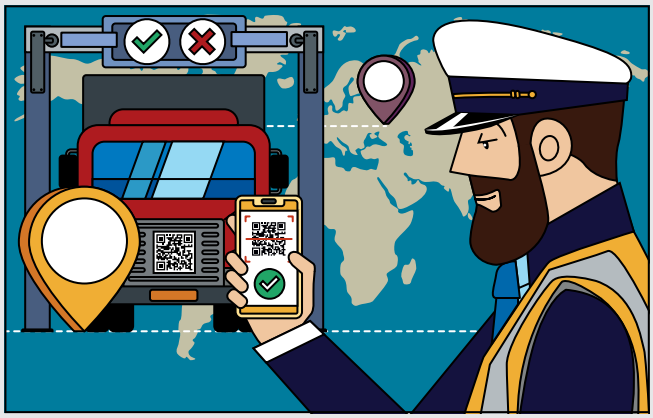
Publicly available databases

Digitalisation can also help to make information more accessible. Until recently, for instance, it was difficult for businesses in Montenegro to monitor changes to public levies and fees, as the country did not have a publicly available digital database containing such information. With assistance from the EBRD, an up-to-date public database of all public levies has been established, enabling users to access online information on fee types, required payment amounts and payment methods. Similarly, both the Kyrgyz Republic and Mongolia have recently developed national geoscience databases. Previously, valuable geoscientific information (such as geological data on metal and mineral resources) used to be fractured and spread across a number of different paper-based and digital databases. Now, however, comprehensive geoscience databases map all existing structures, bringing them together in a single coherent system to ensure that all information is accessible and consistent, which is a key step towards attracting investment.

More generally, digital solutions can facilitate more efficient interaction between firms and governments. To this end, a regional business registry portal (BIFIDEX) has recently been established in the Western Balkans. This system brings together business registration data (such as financial and statutory data) from all official business registries in Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia, covering 1.6 million business entities and 2.2 million natural persons. It offers comparative financial performance data and other services relating to businesses' performance at regional level. It also enables users to identify firms on the basis of financial criteria. Meanwhile, Serbia has digitalised its business inspection process by creating a digital information system called the "e-Inspector", while the Kyrgyz Republic has introduced e-licences for small and medium-sized enterprises (SMEs), e-registration of businesses and electronic notary services.

Digital solutions for customs

Digital solutions can support trade by streamlining customs processes, reducing processing times and costs, and facilitating digital access to certificates of origin for exporters. Moldova, for example, recently introduced an electronic customs clearance process that issues electronic certificates of preferential origin and ATA carnets (international customs documents that allow temporary entry of goods on a duty-free and tax-free basis). Such e-commerce solutions can simplify control procedures for certificates of origin, thus helping to reduce the time that is needed for re-verification. Similarly, Armenia now issues digital certificates of origin to exporters. An online one-stop shop now enables exporters to submit all relevant documents via a single online portal and receive their certificate of origin via that same portal within one working day. This removes all direct interaction between the applicant and the expert assessing the request. Meanwhile, with the EBRD's support, Georgia is exploring options for full digitalisation of the maritime transport chain to reduce congestion in its seaports. This electronic platform will connect various port management systems, facilitating the exchange of information between seaport stakeholders (both public and private) and improving the management of port logistics.



Other digital solutions

Digitalisation efforts often target SMEs. Albania, for example, has recently established a full digital inventory of financing schemes for SMEs, while Montenegro now has a single access point for information on all financial and non-financial support available to SMEs.

Digitalisation also provides an opportunity to simplify cumbersome processes and increase transparency, particularly as regards access to public services and projects involving public-private partnerships (PPPs) and concessions. For instance, e-procurement systems can substantially reduce the risk of corruption. Belarus, Jordan, Kazakhstan, Moldova, the Kyrgyz Republic, Tunisia and Ukraine have all been developing platforms for e-procurement, e-monitoring and e-reporting, in many cases with the EBRD's support. Such initiatives can have a significant impact. Indeed, the implementation of the Prozorro project in Ukraine is estimated to have saved US$ 3.8 billion in public funds in 2015-19 alone.

Digitalisation can also support the shift towards faster decarbonisation of the energy sector and accelerate the transition to a green economy (for instance, through the use of digital solutions in renewable power auctions, green digital procurement, the deployment of smart meters and e-mobility).

BOX 1.4.

Artificial intelligence

Over the last ten years, artificial intelligence has really entered the public consciousness. AI is defined as a "machine-based system that is capable of influencing the environment by making recommendations, predictions or decisions for a given set of objectives".[34] Broadly speaking, it refers to the aim of creating intelligent machines that emulate the full range of human cognition and can eventually exceed it. Increased digital connectivity, coupled with a rise in computing power and the ability to store a rapidly growing amount of data and use it to train algorithms, has given AI fresh impetus.

AI's potential applications include mitigating climate change, safeguarding biodiversity, making cities more resilient, automating business processes and facilitating personalised medicine and drug discovery.[35] According to some estimates, activities involving AI could account for as much as 14 per cent of global GDP by 2030.[36]

Thus far, large-scale investment in AI has been concentrated in the United States of America (which dominates the AI landscape in terms of research output, talent, investment and infrastructure) and China, with those two economies estimated to receive about 70 per cent of global gains from AI.[37] However, other economies are looking to catch up. The EU, for example, recently declared a desire to create, by 2030, a "single European data space"[38] – a single market for data, allowing information to flow freely across sectors within the EU while adhering to EU regulatory standards (including privacy and data protection rules). Meanwhile, a number of economies in the EBRD regions have recently adopted AI strategies (including Bulgaria, the Czech Republic, Egypt, Estonia, Latvia, Lithuania and Serbia). National AI strategies are also being developed in Croatia, Greece, Romania, Slovenia, Tunisia and Turkey.

At the same time, AI does involve certain risks. The fact that it is trained on the basis of past practices means that it can potentially perpetuate existing inequalities through bias in decision making algorithms (as regards recruitment, credit scoring and criminal justice, for instance). It can also raise privacy and safety concerns, for example when it comes to the use of facial recognition technology, which is currently allowed in about half of the world's economies.[39]

The increasing use of AI needs to be accompanied by new and evolving regulatory frameworks. Governing principles for AI have been put forward by a number of multilateral and industry organisations, with examples including the OECD Principles on Artificial Intelligence (which stipulate, for instance, that users of AI should (i) include appropriate safeguards – for example, enabling human intervention where necessary – to ensure a fair and just society and (ii) provide transparency and responsible disclosure around AI systems to ensure that people understand AI-based outcomes and can challenge them), a proposal for a European Artificial Intelligence Act (which seeks to establish a comprehensive regulatory framework for AI in the European Union) and proposals by the Global Partnership on Artificial Intelligence (GPAI).[40] Industry-wide initiatives such as IEEE's Global Initiative on Ethics of Autonomous and Intelligent Systems and efforts by the International Organization for Standardization (ISO) aim to further inform emerging regulatory frameworks at national level.

Thus, investment in AI is often accompanied by changes in cybersecurity and data governance (including as regards data-sharing infrastructure, data privacy and data portability). Member states of the European Union, for instance, are expected to be bound by the EU's proposed Artificial Intelligence Act, which will require "high-risk" systems (such as medical devices and recruitment applications) to be more heavily regulated (which will involve, for instance, human oversight). That category of systems will also be subject to specific transparency requirements (for example, as regards the labelling of "deep fakes"). The proposed legislation will also prohibit some AI systems, such as AI-based social scoring or biometric identification systems.

[34] See OECD (2019a).
[35] See Zhou et al. (2020) and Santosh (2020).
[36] See PwC (2018).
[37] See PwC (2020).
[38] See European Commission (2020a).
[39] See Benaich and Hogarth (2020).
[40] See OECD (2019a), European Commission (2021) and gpai.com.

BOX 1.5.

The urban-rural digital divide in the EBRD regions

Households in the EBRD regions have experienced significant improvements in the availability and quality of internet access over the last decade. However, rural and remote communities remain underserved compared with urban households.

As the provision of broadband internet is often expensive in sparsely populated and isolated areas, private providers may not enter these markets at all, or they may charge high fees for access in remote areas, resulting in only a few individuals being willing to pay for that service. Governments may then intervene, either arranging for services to be provided directly by the state, compensating service providers for any public service obligations that are imposed on them, or asking service providers to average the cost of provision across all consumers, thus cross-subsidising some users at the expense of others.[41]

In the EBRD regions, divides are particularly stark when comparing capital cities with the rest of the country. For instance, while 90 per cent of households in Belgrade have internet access at home, this compares with just 80 per cent for Serbia as a whole (with much lower shares in some areas).

More generally, the percentage of households with internet access is, on average, 13 percentage points higher in urban areas than it is in rural areas. For instance, while in Poland's urban centres of Warsaw, Łódz, Poznań and Trójmiasto over 90 per cent of households have access to fixed broadband, in rural areas such as the south-eastern Sandomiersko-jędrzejowski region fixed broadband coverage still remains below 70 per cent.[42]

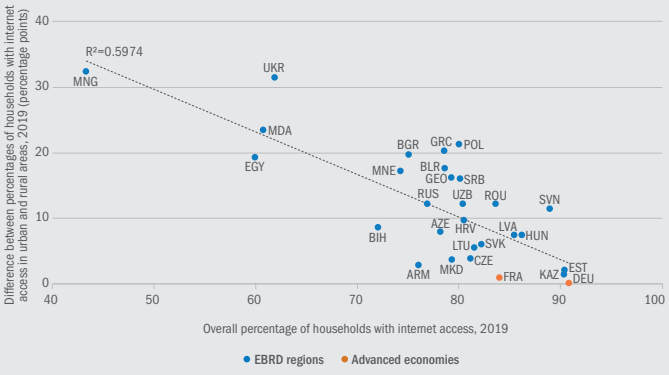
These unequal opportunities to participate in the digital economy exacerbate pre-existing inequalities. As documented elsewhere in this chapter, people living in rural areas are less likely to shop online or use e-government services and have worse digital skills than those living in urban areas.

Moreover, without adequate high-speed internet infrastructure, rural schools and their students risk falling behind their peers in urban areas.[43] Targeted interventions can be used to improve rural schools' access to broadband. In Serbia, for example, a recent EBRD-backed initiative connected around 600 rural schools to the country's broadband network, thereby increasing the proportion of schools with internet access to 32 per cent (an increase of 13 percentage points).

The digital divide between urban and rural areas is particularly pronounced in economies with lower overall internet penetration (see Chart 1.5.1). Strikingly, 58 per cent of Mongolia's urban population has internet access, compared with just 25 per cent of its rural population. Similarly, differences between a country's best-performing and worst-performing regions (normalised on the basis of the national average) are also larger in economies with less internet penetration.

However, such differences between best and worst-performing regions have declined in most economies. In some countries (such as the Czech Republic, Hungary and Serbia) they have fallen sharply, albeit from high levels. A similar pattern can be observed for urban-rural divides: these, too, have narrowed over time in most economies.

CHART 1.5.1. Digital divides are larger in economies with less internet penetration



Source: EBRD, European Commission, OECD, ITU and authors' calculations.
Note: Data for North Macedonia and Ukraine relate to 2018.

[41] See also EBRD (2020a).
[42] See European Commission (2020b).
[43] See EBRD (2021).

Annex 1.1. ICT in the EBRD regions: investors' perceptions

Introduction

In the past, the EBRD's Legal Transition Team (LTT) carried out regular assessments looking at the information and communication technology sectors of the economies where the EBRD invests. Those assessments considered the key characteristics of each market in terms of output metrics (looking, for example, at broadband penetration and world rankings for e-government and e-commerce), as well as comparing economies' legal and regulatory frameworks with best practices for the sector.

More recently, however, the LTT has adopted a new approach. Over the last two years, it has conducted a survey assessing investors' views on the factors in each country which contribute most to decisions on whether or not to invest. The results of that survey identify the countries that have the most attractive markets and the best policies fostering investment, particularly as regards digital infrastructure and broadband connectivity. The objective of the survey is to inform investors, policymakers and regulators, so that they can make decisions that will increase the impact and effectiveness of investment in the ICT sector, thereby improving the coverage, quality and capacity of digital infrastructure and broadband connectivity.

That 2020/21 survey covered selected economies in the EBRD regions – specifically, Egypt, Jordan, Lebanon, Morocco and Tunisia in the SEMED region, Albania, Bosnia and Herzegovina, Croatia,[44] Kosovo, Montenegro, North Macedonia and Serbia in the SEE region, and Armenia, Georgia, Moldova and Ukraine in the EEC region. The Central Asia region will be covered in a future survey round.

Methodology

In order to prepare for the survey, more than 50 face-to-face meetings were held with stakeholders regarded as having a direct interest in digital infrastructure and broadband connectivity, including government policymakers, sectoral regulators, network operators and service providers, financial institutions, representative bodies and consultants. Participants in the survey included operators of telecommunication infrastructure (both fixed and mobile networks) and providers of services (both retail and wholesale) delivered over those networks (voice, internet, data, media and broadband services) – both private and state-owned actors alike. The survey covered a number of different areas:

- The attractiveness of the market
- Risk factors for investment – including sectoral policies, legal and regulatory frameworks (as regards both the ICT sector and the economy as a whole), cooperation between the public and private sectors, the availability and quality of input resources (including spectrum, labour and rights of way), taxation, trade policies and political stability
- Potential in terms of best practices – that is to say, the level of confidence that investors have in the country adopting best practices for the sector.

The conclusions and recommendations derived from the survey results have been reported in detail on the EBRD's website in full survey reports, both at the level of individual countries and for the three regional groupings. This annex provides a summary of the conclusions and recommendations for the three regions.

Results for the SEMED region

Egypt, which is the SEMED region's largest market by population, is also forecast to be the fastest growing market for broadband services (albeit from the lowest base), according to Fitch Solutions (see Table A.1.1.1). Morocco, which is the second-largest market by population, is expected to see the second-fastest growth (also from a low base). All five countries have relatively low positions in the overall world rankings for ICT development, although Jordan and Lebanon appear to have made some progress in terms of improving their rankings.

Jordan and Lebanon are smaller markets, but perform fairly well in terms of internet usage. Jordan already has a high level of mobile broadband penetration, while its relatively expensive fixed broadband prices are contributing to relatively low fixed broadband penetration. Jordan's forecast for broadband growth is the lowest of the five countries. Relatively low speeds are recorded by fixed broadband subscribers in Tunisia and Lebanon.

Based on respondents' views, Egypt has the most attractive broadband market in the SEMED region and Lebanon has the least attractive. For this component, survey participants were asked to rate economies only in terms of pure market potential, disregarding any investment risk factors (which were subsequently taken into account in separate analysis, also based on the views expressed by survey respondents).

Jordan appears to be the fastest at adopting best practices aimed at lowering barriers to investment. Its legal and regulatory framework has followed the main

[44] Exceptionally, Croatia is regarded as part of the SEE region (rather than the CEB region) for the purposes of this survey.

TABLE A.1.1.1. Survey findings for the SEMED region

	Egypt	Jordan	Lebanon	Morocco	Tunisia
Survey results					
Broadband Market Attractiveness Index (0-100)	53.2	61.9	56.7	53.5	48.9
Best Practice Index (0-100)	66.7	56.7	53.3	52.0	43.3
Overall Broadband Investment Index (0-100)	43.3	66.7	60.0	53.3	53.3
Attractiveness of market					
Overall size of the market in population terms and relative spending power					
Growth potential of the market in terms of demand for broadband services					
Efficiency of the market in terms of fair competition					
Existence of a clear national ICT strategy with stated ambitions and goals					
Market headlines					
Penetration of fixed broadband (per 100 people)	5.4	4.7	21.0	3.9	8.8
Penetration of mobile broadband (per 100 people)	50.0	104.0	57.0	58.0	81.0
Percentage of population using the internet	45.0	67.0	78.0	65.0	64.0
Average download speed per fixed broadband user (Mbps)	26.5	50.5	8.1	18.5	9.1
Average download speed per mobile broadband user (Mbps)	16.9	17.7	46.7	33.6	25.3
Forecast overall broadband market growth up to 2024 (% per year)	17.0	3.4	5.8	13.0	6.0
Investment risk factors					
Legal and regulatory framework for broadband					
Certainty as regards construction permits or wayleaves					
Country's overall legal system, predictability and processes					
State participation in the sector					
Access to spectrum resources					
Taxation (both in general and for the ICT sector specifically)					
State assistance and funding schemes					
Trade barriers					

Source: EBRD, United Nations, ITU, Speedtest Global Index, Fitch Solutions.
Note: As regards the attractiveness of the market, green means good, orange means medium, and red means poor. In the case of investment risk factors, red means high priority, orange means medium priority, and green means low priority. In terms of the indices, a score of 0 indicates a perception that the broadband market has no attraction whatsoever, whereas a score of 100 indicates a perception that the market is perfect.

liberalising steps adopted by the EU. Examples of steps taken include the privatisation of state telecommunication assets, the liberalisation of licensing and the provision of state support for rural broadband development. Jordan is continuing to align itself with the EU's investor-friendly laws and regulations. Morocco and Tunisia have the same overall alignment goals, but are slower to implement the required measures. Lebanon, meanwhile, is currently deadlocked by policy and regulatory inaction. Egypt is the country where respondents have the least confidence in best practices being adopted for the ICT sector.

The results of the survey are summarised by the Overall Broadband Investment Index, which is a composite index reflecting (i) the perceived attractiveness of the market, (ii) investment risk factors and (iii) confidence in the adoption of best practices. In all SEMED economies, conditions are still a long way short of what respondents would ideally wish for (see Table A.1.1.1).

(Continued on page 38)

Results for the SEE region

Serbia is the largest market in the SEE region in population terms, but is also forecast to be the slowest growing market for broadband services. Croatia,[45] which is the second-largest market by population, is also expected to see only weak growth. The highest expected growth rates are in Albania and Kosovo. Croatia has the highest global ranking for ICT development in the SEE region, benefiting from its membership of the EU. Kosovo, Montenegro and North Macedonia are relatively small markets, but perform fairly well in terms of internet usage, as well as having some potential to grow their broadband markets.

Based on respondents' views, Montenegro has the most attractive broadband market in the SEE region and Bosnia and Herzegovina has the least attractive. All of the SEE markets surveyed have problems when it comes to the adoption of best practices (being characterised, for example, by time delays and inconsistent application of procedures), creating significant barriers to investment. The most common problem across the region is the difficulty that investors have in obtaining the relevant permits for civil infrastructure projects (which affects, for example, the building of mobile transmission towers, the laying of cables and ducts, the accessing of public and private properties, and the installation of specialist equipment). In many of those markets, there are bureaucratic delays, multiple levels of decision-making and inconsistent application of rules.

Ideally, it should be possible to submit all necessary applications online via a one-stop shop, with all layers of

TABLE A.1.1.2. Survey findings for the SEE region

	Albania	Bosnia and Herzegovina	Croatia	Kosovo	Montenegro	North Macedonia	Serbia
Survey results							
Broadband Market Attractiveness Index (0-100)	59.3	46.9	63.6	57.4	69.9	59.3	52.4
Best Practice Index (0-100)	73.3	53.3	56.7	44.3	75.0	66.7	66.7
Overall Broadband Investment Index (0-100)	50.0	33.3	83.3	66.7	66.7	50.0	33.3
Attractiveness of market							
Overall size of the market in population terms and relative spending power							
Growth potential of the market in terms of demand for broadband services							
Efficiency of the market in terms of fair competition							
Existence of a clear national ICT strategy with stated ambitions and goals							
Market headlines							
Penetration of fixed broadband (per 100 people)	16.0	22.0	34.0	38.0	25.0	22.0	26.0
Penetration of mobile broadband (per 100 people)	45.0	51.0	90.0	72.0	55.0	63.0	91.0
Percentage of population using the internet	72.0	70.0	73.0	77.0	72.0	79.0	73.0
Average download speed per fixed broadband user (Mbps)	33.2	32.1	35.7	46.2	30.3	46.4	50.0
Average download speed per mobile broadband user (Mbps)	49.6	33.6	61.5	28.8	49.3	41.3	43.4
Forecast overall broadband market growth up to 2024 (% per year)	6.2	1.5	0.9	6.8	2.6	1.1	0.8
Investment risk factors							
Legal and regulatory framework for broadband							
Certainty as regards construction permits or wayleaves							
Country's overall legal system, predictability and processes							
State participation in the sector							
Access to spectrum resources							
Taxation (both in general and for the ICT sector specifically)							
State assistance and funding schemes							

Source: EBRD, United Nations, ITU, Speedtest Global Index, Fitch Solutions.
Note: As regards the attractiveness of the market, green means good, orange means medium, and red means poor. In the case of investment risk factors, red means high priority, orange means medium priority, and green means low priority. In terms of the indices, a score of 0 indicates a perception that the broadband market has no attraction whatsoever, whereas a score of 100 indicates a perception that the market is perfect.

[45] See footnote 44.

approval following the same effective procedures and timescales. However, even in Albania, Croatia, North Macedonia and Serbia, where new approval procedures have been introduced, network operators are still experiencing significant problems.

Croatia is the market where there is the most confidence that best practices will be adopted in terms of policies, legislation and regulatory practices. This stems from its membership of the EU. In the other markets, levels of confidence vary, especially in terms of the way in which different municipalities apply the various legally defined procedures. The lowest levels of confidence can be found in Serbia, where private investors feel particularly disadvantaged when competing against the state-owned incumbent operator (see Box A.1.1.1 for further details of the situation in Serbia). In all of the SEE markets, investment conditions fall short of what respondents would ideally wish for (see Table A.1.1.2).

Results for the EEC region

Of the countries surveyed in the EEC region (see Table A.1.1.3), Ukraine is the largest market and is also forecast to be the fastest-growing market (mainly as a result of mobile broadband, having made a late start in launching 3G and 4G services). The slowest growth is expected to be seen in Moldova, where the mobile broadband market is saturating and fixed broadband growth remains sluggish.

(Continued on page 40)

TABLE A.1.1.3. Survey findings for the EEC region

	Armenia	Georgia	Moldova	Ukraine
Survey results				
Broadband Market Attractiveness Index (0-100)	62	53	50	52
Best Practice Index (0-100)	62	60	50	50
Overall Broadband Investment Index (0-100)	62	57	50	52
Attractiveness of market				
Overall size of the market in population terms and relative spending power				
Growth potential of the market in terms of demand for broadband services				
Efficiency of the market in terms of fair competition				
Existence of a clear national ICT strategy with stated ambitions and goals				
Market headlines				
Penetration of fixed broadband (per 100 people)	13	24	17	16
Penetration of mobile broadband (per 100 people)	83	80	59	47
Percentage of population using the internet	68	69	76	63
Average download speed per fixed broadband user (Mbps)	35	27	123	70
Average download speed per mobile broadband user (Mbps)	31	38	40	30
Forecast overall broadband market growth up to 2024 (% per year)	6.5	5.3	3.9	7.3
Investment risk factors				
Legal and regulatory framework for broadband				
Certainty as regards construction permits or wayleaves				
Country's overall legal system, predictability and processes				
State participation in the sector				
Access to spectrum resources				
Taxation (both in general and for the ICT sector specifically)				
State assistance and funding schemes				
Political stability, security, criminality and terrorism				
Availability of labour (especially as regards digital skills)				
Corruption (both in general and in the ICT sector specifically)				
Overall infrastructure				
Quality of databases and access to information				

Source: EBRD, United Nations, ITU, Speedtest Global Index, Fitch Solutions.
Note: As regards the attractiveness of the market, green means good, orange means medium, and red means poor. In the case of investment risk factors, red means high priority, orange means medium priority, and green means low priority. In terms of the indices, a score of 0 indicates a perception that the broadband market has no attraction whatsoever, whereas a score of 100 indicates a perception that the market is perfect.

(Continued from page 39)

Overall, respondents reported that markets in the EEC region had good potential, with strong consumer demand for high-speed broadband services. Markets are seeing continued investment in high-quality optical fibre for backbone and fixed access, plus more gradual introduction of higher quality 3G and 4G-based mobile broadband services.

Although a small market in population terms, Armenia has the highest overall index score, taking into account its market potential and the investment risks involved. Meanwhile, in Georgia (which is the closest economy to the EU in terms of its approach to market regulation) there are considerable risks associated with taxation and the granting of permission to install infrastructure. In Moldova and Ukraine, there are significant risks associated with political and legal uncertainty. Respondents also expressed the view that the full benefits of ICT markets were not currently being reaped in the region. In their view, the policies and regulatory frameworks in those markets do not reflect best practices.

Investment in the latest 5G-based broadband infrastructure has been weaker than that seen in more developed markets. Traditional networks and service operators have not yet explored the possibility of embarking on new, more cooperative ventures in partnership with a larger number of players. The precise nature of future business models remains unclear, with little coordinated consultation on joint investment at national level.

Respondents also highlighted a number of examples of separately owned infrastructure (ducting, fibre backbone networks and transmission masts, for example) where cost-saving joint investment or infrastructure-sharing opportunities had not yet been exploited. The main players in the EEC region's broadband markets do not yet appear to have found the optimal balance between competitive advantage on the one hand and cost efficiency on the other. Given the need for greater network reach and greater affordability, best practice cost-reduction measures (notably, infrastructure and spectrum sharing) should become a more prominent feature of future investment in broadband infrastructure.

Respondents in the EEC region concluded that a more collaborative approach – both within the sector and between network operators and other sectors – was the only way to ensure that the transformative economic and social impact of new 5G and fibre-based technologies was achieved.

Recommendations

Taken together, the views expressed by survey respondents point to a number of broad policy priorities when it comes to the development of the ICT sector.

First, they highlight the importance of having a business environment that incentivises private investment. Experience in other markets clearly shows that private participation in broadband infrastructure programmes makes any public funds go significantly further. Private involvement also helps to ensure that infrastructure is commercially sustainable in the long term and does not rely on large and sustained subsidies from the taxpayer.

The state's main task is to establish a clear policy framework for broadband infrastructure that boosts investors' confidence. It is worth noting, in this regard, that the development of e-government services for businesses and households and support for the development of e-commerce can, in turn, strengthen demand for broadband infrastructure.

Government intervention in the market may be required in order to ensure universal access to broadband in all geographical areas at affordable rates. Additional state funding may be provided where the private sector is not planning to invest in particular geographical areas within a reasonable timescale. At the same time, however, it is important to minimise any market distortion that is associated with using subsidies to foster universal coverage. The European Union, for instance, has specific state aid rules for broadband markets which provide that such state funding must not have an unwarranted distortionary effect on the broadband market.[46]

Governments need to address any excessive barriers to investment in broadband, including high charges for access to spectrum frequencies and other public resources. Tax policy needs to balance the twin objectives of raising revenue and leveraging private-sector participation in the provision of ICT infrastructure.

Investors often incur additional costs as a result of delays and uncertainty that they experience in obtaining construction permits and access to rights of way. The survey also points to significant wasted network expenditure on separate civil structures (primarily ducts and transmission masts). More cooperative models involving the sharing of networks and infrastructure, joint ventures and greater cooperation on civil works could be introduced in order to ensure that investment in broadband infrastructure maximises the effectiveness of the market, producing greater economic and social benefits.[47]

[46] See https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF (last accessed on 13 September 2021).
[47] For more details, see EBRD (2020b).

Developments during the Covid-19 crisis

Some of the analysis for this survey took place before the onset of the Covid-19 crisis, so accounting for the impact of the pandemic is difficult. The forecasts for fixed and mobile broadband growth are based on 2019 data and are likely to prove conservative, given the increase in demand for social and business-related networking during the Covid-19 crisis. Although the precise impact of Covid-19 is likely to vary from market to market, the differences between the various growth rates should remain broadly unchanged.

Broadband speeds appear to have changed during the Covid-19 crisis. In Albania, for example, average mobile broadband download speeds have fallen by 9 per cent, while fixed broadband speeds have increased by 1 per cent.[48] Similarly, fixed broadband speeds have increased markedly in Armenia, Jordan, Tunisia and Ukraine, while mobile broadband speeds have declined in Moldova, Morocco and Tunisia. While it is difficult to draw firm conclusions from these data, it is clear that the inconsistency of these changes adds further uncertainty to the investment climate.

Several SEMED countries have adopted specific measures in order to cope with the increasing demand for communication services during the Covid-19 crisis. In Egypt and Tunisia, for example, the government asked operators to provide free internet packages and offer free access to e-learning and healthcare platforms. In Egypt, the cost of the additional data packages and free browsing was covered by the state. In Jordan, meanwhile, the country's regulator gave telecoms operators temporary access to additional spectrum in order to increase network capacity.

The detailed recommendations in this annex are based on analysis of the views expressed by respondents before the onset of the Covid-19 crisis. However, it is clear that the case for further investment in broadband infrastructure has increased in the meantime, with an even greater need for more reliable and universal broadband services. At a policy and regulatory level, there also needs to be a greater focus on collaboration between public and private-sector investment. This is particularly relevant when it comes to policy consultation, the use of public funds, the achievement of universal broadband coverage, and the need for greater investment efficiency to achieve cost reductions and make networks more resilient.

BOX A.1.1.1.

Serbia's national broadband programme

A recent initiative in Serbia has allowed it to successfully address the absence of investment in broadband with a view to extending connectivity beyond urban centres to less-populated rural and semi-rural areas. The country's national broadband programme, which is supported by the EBRD, involves a PPP-type collaborative approach whereby the state installs telecommunication infrastructure to connect schools and municipal centres to existing operators' networks. Those operators can then bid for the right to use that new network free of charge, provided they commit to covering the cost of operating and maintaining it and construct, at their own expense, a "last-mile" network that connects the new network with unconnected rural households. This project allows the government to pursue its socio-economic objective of universal digital connectivity in a cost-effective way through a competitive bidding process, while at the same time increasing competition in the sector by requiring that competing operators have open access to the network.

[48] See www.speedtest.net/insights/blog/tracking-covid-19-impact-global-internet-performance/#/ (last accessed on 13 September 2021).

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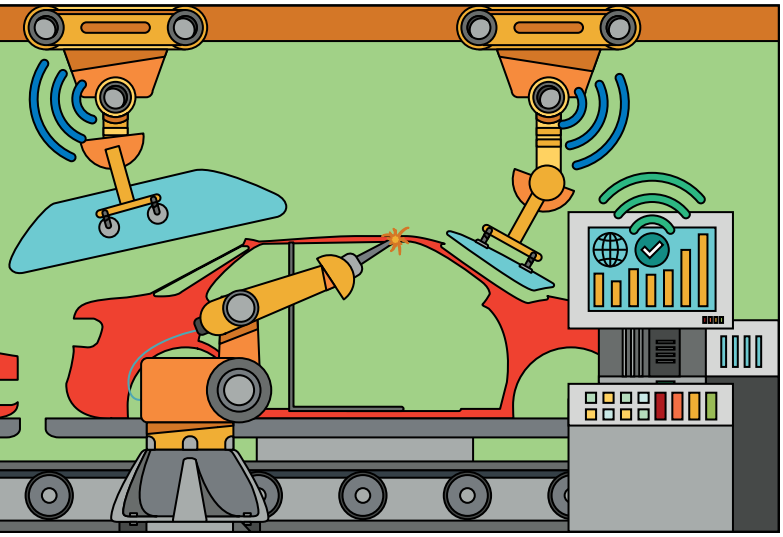
DIGITAL INFRASTRUCTURE AND FIRMS' PERFORMANCE
2
Mbps
3G
4G
5G
VACANCY
RÉSUMÉ



Internet connectivity affects how markets and firms function. The accessibility of fixed broadband and mobile internet has increased substantially in the EBRD regions over the last 15 years. Economies with higher income per capita and greater population density generally provide mobile internet to larger percentages of their populations. However, many economies in the EBRD regions still lag behind western European peers, especially when it comes to faster 4G technologies. Internet connectivity can boost firms' productivity: following the roll-out of high-speed broadband in Turkey, smaller manufacturing firms (especially those in ICT-intensive industries) increased exports of goods to distant markets. Similarly, the roll-out of 4G in Russia led to higher revenues and increased employment for the smallest firms in the service sector.

Introduction

The digitalisation of information and its dissemination via the internet can bring substantial benefits. In some industries, such as ICT services, the impact of improvements in digital infrastructure is direct and obvious. However, the economic impact of the internet extends much further than that. Internet connectivity can make it easier to find new products, improve the matching of workers to firms, reduce the time and effort required to learn new skills, and expand firms' market reach to encompass more remote locations. Far-reaching changes such as these affect firms of all sizes in all sectors and locations.

This chapter examines the impact that digitalisation and internet connectivity exert on firms in the EBRD regions. Internet coverage, access and speeds have all risen rapidly in the EBRD regions over the last two decades, as discussed in Chapter 1. However, people connect to the internet using a variety of technologies, and there are important differences between them: fixed broadband, for example, remains relatively limited in the EBRD regions, despite offering some of the fastest speeds, while mobile internet (which is relayed via cellular towers) offers slower data transfer rates but accounts for a much larger share of users.

By 2018, most economies in the EBRD regions had 3G networks covering more than 80 per cent of their populations (by place of residence). Many of those economies were approaching full coverage, on a par with most of western Europe, although several had coverage rates of less than 60 per cent (with some economies having rates as low as 40 per cent). The dispersion of coverage rates for 4G technology is noticeably higher. Although many economies are approaching full coverage, rates of between 20 and 80 per cent remain common. Countries with lower GDP per capita and lower population density tend to have lower levels of coverage. Like other forms of infrastructure, internet is easier to provide in more densely populated areas, as the fixed costs of installation can be spread across a larger number of consumers.

Disparities in terms of access matter, since – as this chapter shows – internet connectivity has a real impact on firms' outcomes.[1] While some effects may benefit firms, such as improvements in the pairing of workers with firms and increases in workers' productivity, other effects may prove challenging and require adaptation (for example, if the internet allows a firm's local customers to access competing firms in remote markets). Moreover, the impact on firms may differ depending on their sector and size. The data driven analysis in this chapter provides insight into these various effects in the EBRD regions.

[1] See also Hjort and Tian (2021).

IN BELARUS AND POLAND,
MORE THAN
20%
OF THE POPULATION HAVE FIXED BROADBAND

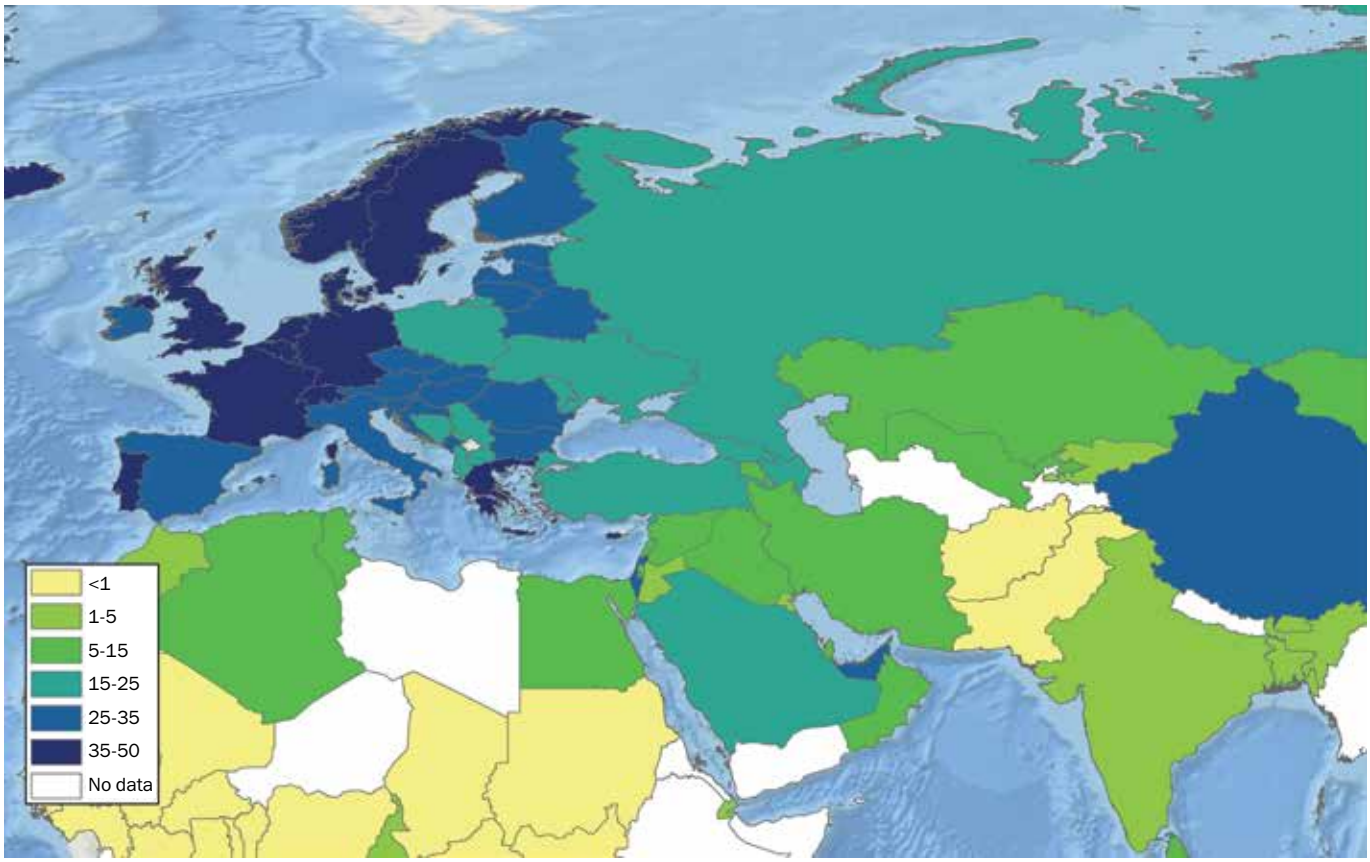
JUST 4%
OF MOROCCANS HAVE FIXED BROADBAND

This chapter also looks at access to high-speed broadband in Turkey, showing that firms with better connectivity are more likely to export and introduce new products. Small firms in the manufacturing sector are estimated to have benefited most from improvements in the country's broadband infrastructure, having started selling to new foreign markets.

Meanwhile, in Russia (the largest economy in the EBRD regions) smaller firms have, on average, increased their staff numbers by about 19 per cent on the back of the roll-out of 4G. The effect on hiring has proved to be especially strong for the smallest firms in the service sector. Those firms have also been more likely to introduce new products or processes on the back of their increased use of digital technologies.

Overall, empirical evidence suggests that improvements in digital infrastructure may be particularly beneficial for small firms and their workers, partially offsetting the negative impact that digitalisation may have on economic inclusion through other channels.

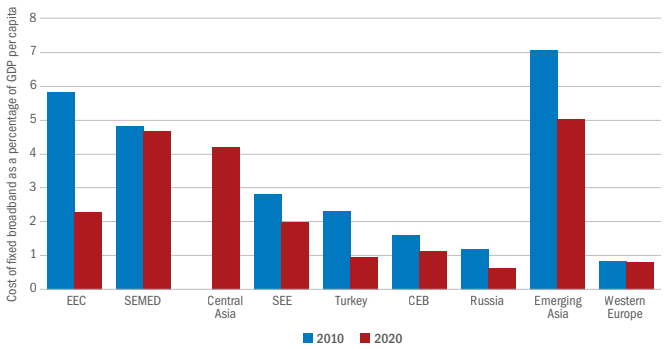
CHART 2.1. Fixed broadband penetration in the EBRD regions remains lower than in advanced European economies



Source: World Development Indicators[2] and Esri's World Ocean Basemap.[3]
Note: Colours indicate the number of fixed broadband subscriptions per 100 individuals in 2019. This map is used for data visualisation purposes only and does not imply any position on the legal status of any territory.

[2] See World Bank (2021).
[3] See Esri (2019).

CHART 2.2. The relative cost of fixed broadband has declined since 2010



Source: ITU, World Development Indicators and authors' calculations.
Note: This chart shows the cost of accessing 5 GB per month via fixed broadband relative to GDP per capita (based on constant 2010 US dollars).

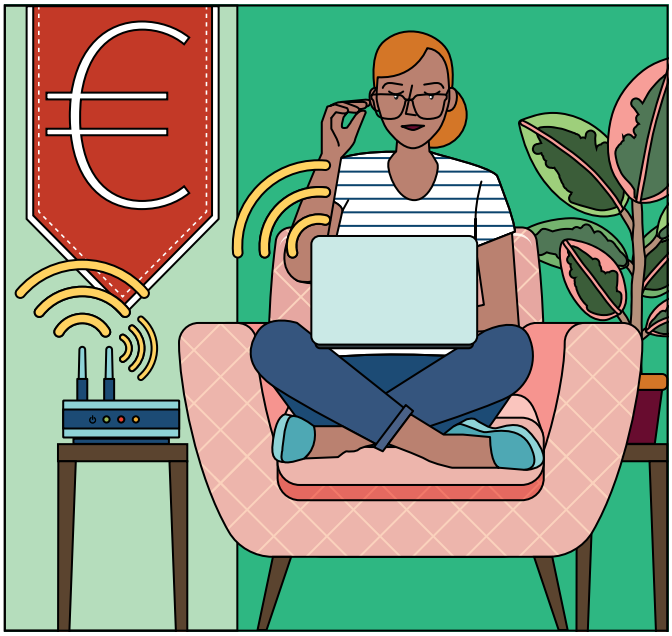
This chapter is structured as follows. The first section looks at internet connectivity across different technologies in the EBRD regions. That is followed by a short section discussing the channels through which connectivity may impact firms. The chapter then presents case studies focusing on Turkey and Russia, two of the largest economies in the EBRD regions, before ending with a number of concluding remarks.

Internet connectivity in the EBRD regions

Fixed broadband

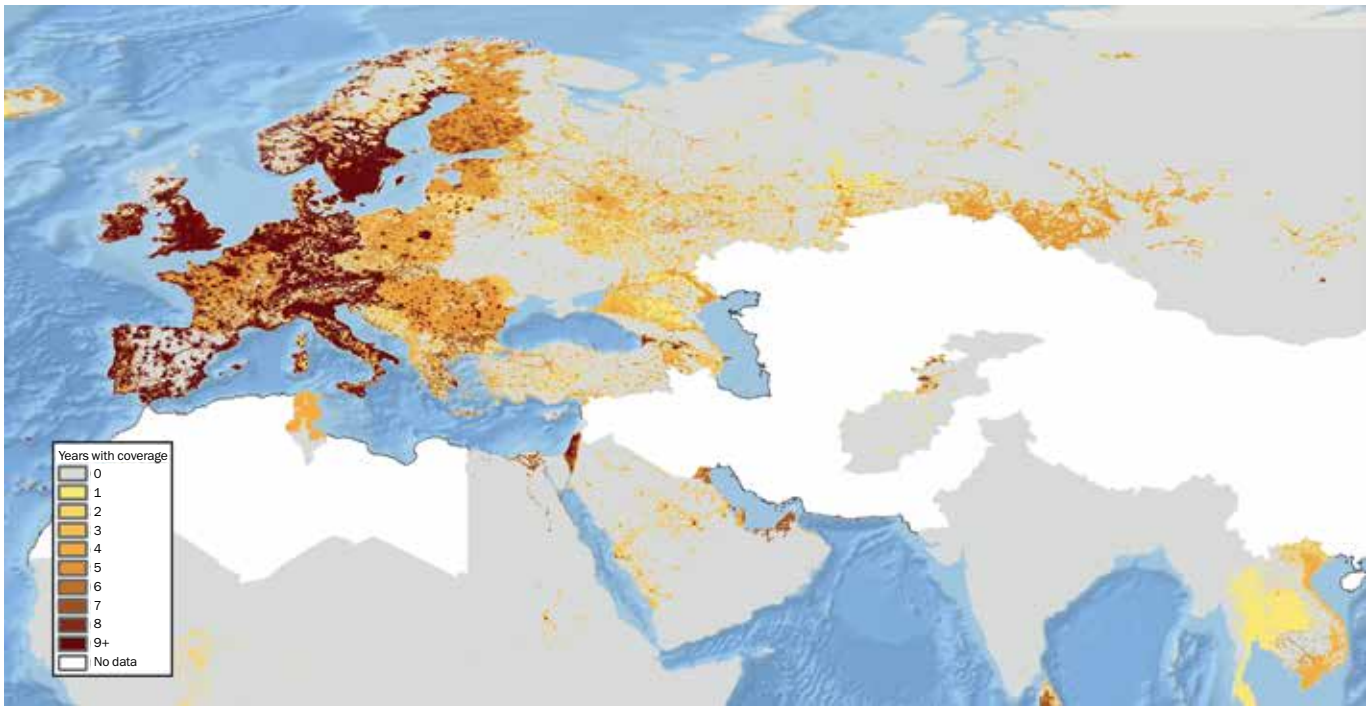
Households and firms can access the internet via fixed broadband cables or mobile networks. Adoption rates for fixed broadband remain relatively low in the EBRD regions compared with western Europe (see Chart 2.1). In 2019, the percentage of the population with fixed broadband ranged from 4 per cent in Morocco to more than 20 per cent in Belarus and Poland.

The lower adoption rates for fixed broadband in the EBRD regions may, in part, be explained by its higher cost (relative to average household income) compared with western Europe, notwithstanding the considerable decline seen in the relative cost of broadband in the period 2010-20 (see Chart 2.2). For example, while the relative cost of broadband services in eastern Europe and the Caucasus (EEC) fell by more than 50 per cent over that period, the cost of internet access remains about twice the level seen in western Europe. In the southern and eastern Mediterranean (SEMED) region, by contrast, the relative cost of broadband services declined only slightly.



THE RELATIVE COST OF BROADBAND HAS FALLEN BY MORE THAN 50% IN THE EEC REGION

CHART 2.3. Coverage by 3G and 4G networks has expanded over time



Source: Collins Bartholomew's Mobile Coverage Explorer, Esri's World Ocean Basemap and authors' calculations.
Note: Colours indicate the number of years with coverage by 3G, 4G or both in the period 2007-18. Areas with no data are shown in white. Data are not reported for every economy in every year, and all economies are missing data for 2010. The introduction years for 3G and 4G technologies have been confirmed using external sources. Where there are disparities regarding introduction years, economies have been dropped from this analysis. This map is used for data visualisation purposes only and does not imply any position on the legal status of any territory.

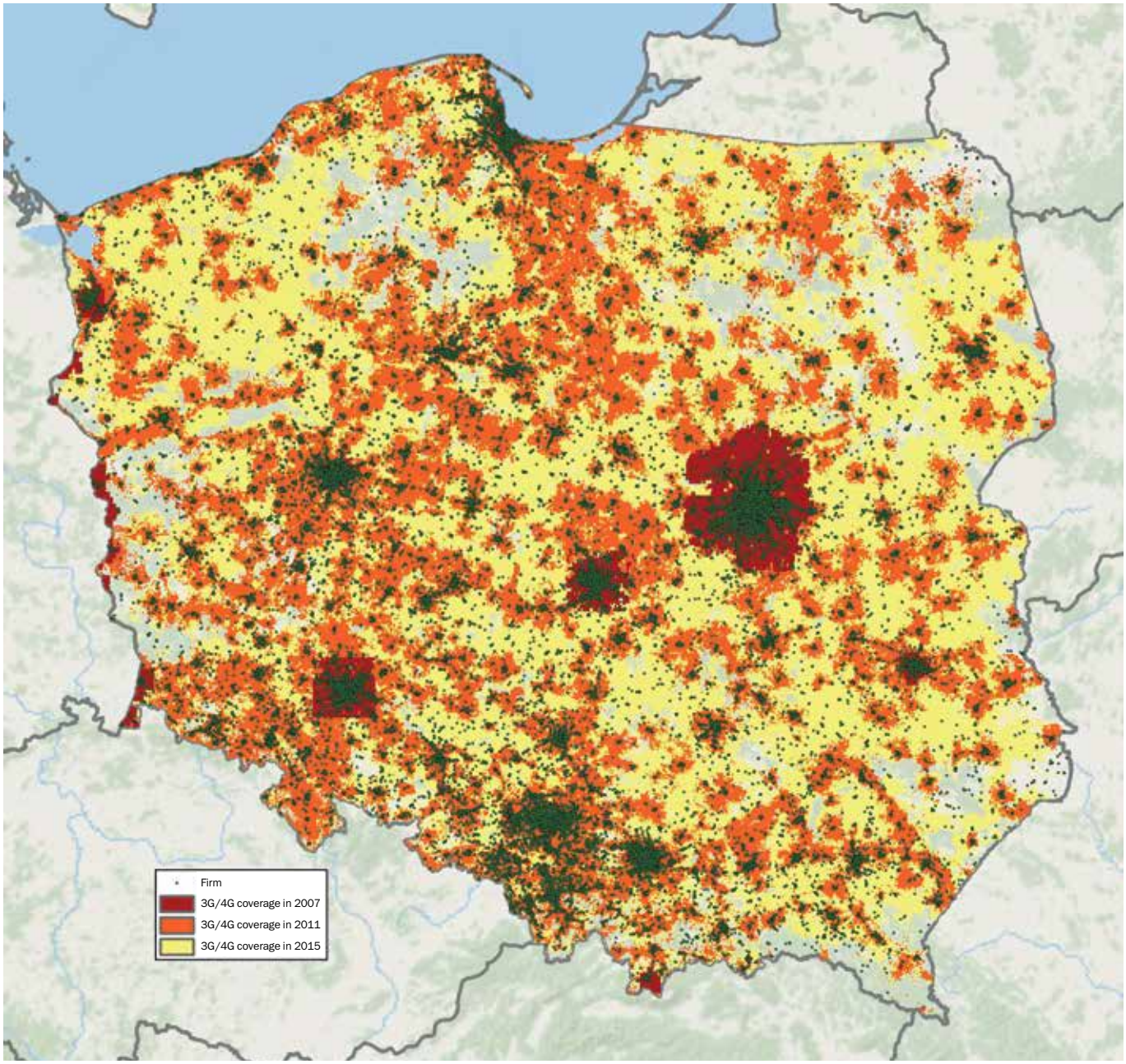
Mobile internet

Internet access via mobile devices on 3G and 4G networks offers a popular alternative to fixed broadband. The analysis below combines detailed data on mobile internet and economies' populations at 1 km^2 level, with data on mobile internet taken from Collins Bartholomew's Mobile Coverage Explorer and detailed population data obtained from the Gridded Population of the World dataset (version 4) managed by the Center for International Earth Science Information Network (CIESIN).[4] The resulting estimates of effective mobile internet coverage tend to be lower than the country-level statistics reported in Chapter 1. For instance, an individual may make extensive use of mobile data, but not have a stable connection at home. In that case, they may be recorded as being an active user of mobile internet in the country-level statistics, but be regarded as lacking effective coverage in the following analysis.

The vast majority of people living in the EBRD regions are now covered by 3G or 4G technology, albeit people in most geographical areas have had to wait longer than their counterparts in western Europe (see Chart 2.3). Urban centres such as Moscow, St Petersburg, Ulaanbaatar and Warsaw received coverage earlier than smaller cities and less densely populated areas (see Chart 2.4, for example, which shows the situation in Poland). Coverage in sparsely populated areas still varies, however. In Mongolia (the world's least densely populated country), for instance, there is still relatively little coverage outside Ulaanbaatar.

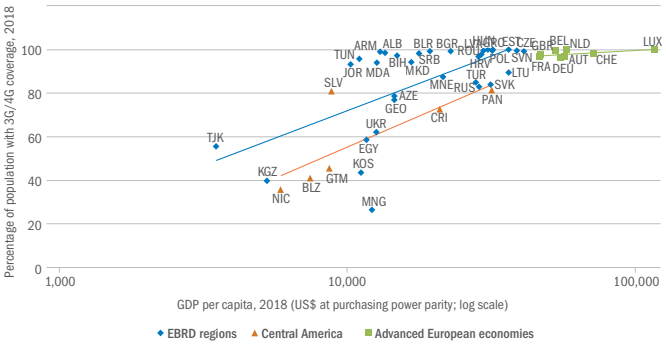
[4] See CIESIN (2020).

CHART 2.4. In Poland, urban centres received coverage earlier than smaller cities and less densely populated areas



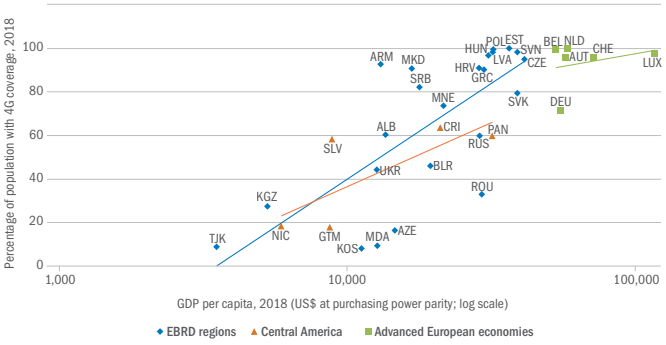
Source: Collins Bartholomew's Mobile Coverage Explorer, Orbis, Esri's World Ocean Basemap and authors' calculations.
Note: Dots indicate firms that were active in any year in the period 2007-15.

CHART 2.5. In economies with higher GDP per capita, larger percentages of the population tend to be covered by mobile internet



Source: Collins Bartholomew's Mobile Coverage Explorer, World Development Indicators, CIESIN's Gridded Population of the World dataset (version 4) and authors' calculations.

CHART 2.6. Many economies in the EBRD regions continue to lag behind advanced European comparators in terms of 4G coverage



Source: Collins Bartholomew's Mobile Coverage Explorer, World Development Indicators, CIESIN's Gridded Population of the World dataset (version 4) and authors' calculations.

In economies with higher GDP per capita, mobile internet networks tend to cover larger percentages of the population, both globally and within the EBRD regions (see Chart 2.5).

As with other forms of infrastructure and public goods, densely populated countries tend to have higher rates of coverage for 3G/4G. In densely populated areas, the fixed costs of infrastructure can be spread across more people, lowering the overall cost. For instance, Mongolia – which has the lowest population density in the world – also had the lowest coverage rate in the EBRD regions in 2018, at just 26 per cent. Meanwhile, Egypt, Kosovo, the Kyrgyz Republic and Tajikistan also had coverage rates of less than 60 per cent in that year.

Many economies in the EBRD regions continue to lag behind advanced European comparators in terms of 4G coverage (see Chart 2.6). 4G provides faster internet connections, enabling the use of more data intensive applications and websites. While many economies in the EBRD regions have coverage rates similar to those of richer western European comparators, there are several economies where more than 50 per cent of the population do not have coverage (see Chart 2.7). Indeed, there are four economies where less than 20 per cent of the population have 4G coverage.

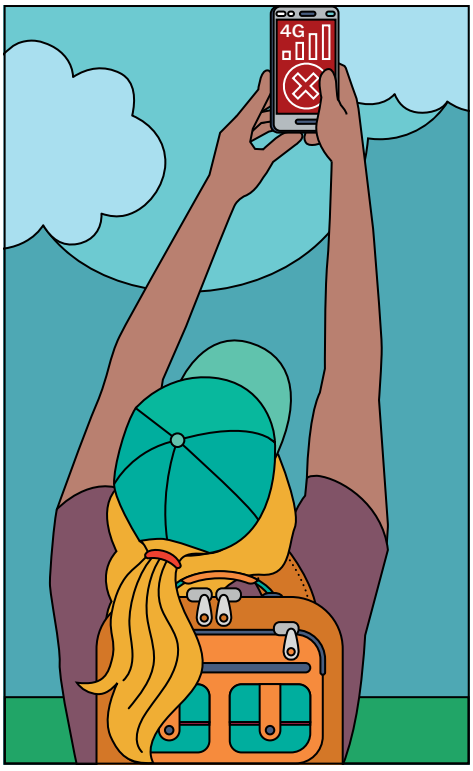
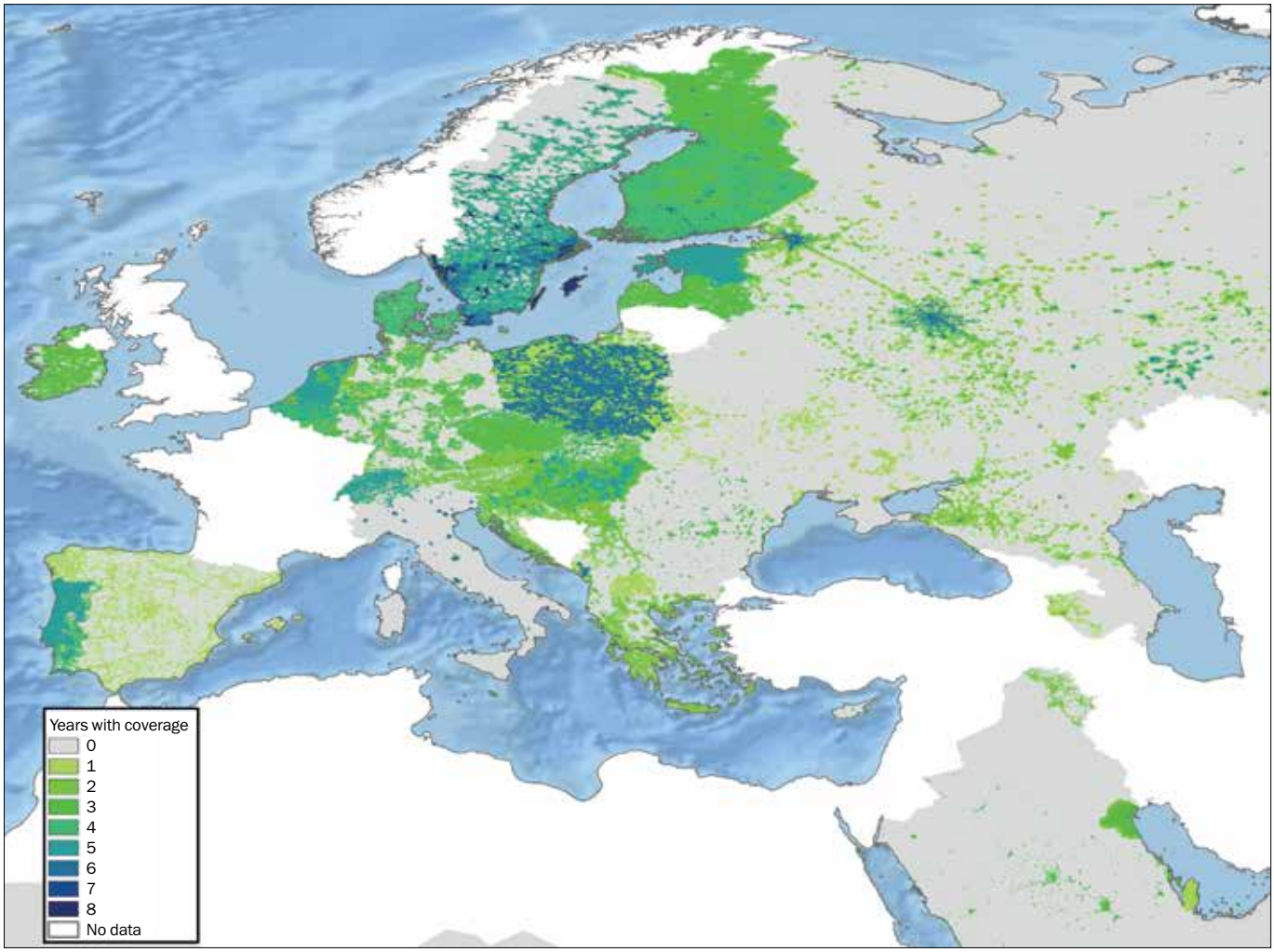


CHART 2.7. Urban centres were the first areas to be covered by 4G networks



Source: Collins Bartholomew's Mobile Coverage Explorer, Esri's World Ocean Basemap and authors' calculations.
Note: Colours indicate the number of years with 4G coverage in the period 2011-18. Areas with no data on 4G coverage are shown in white. This map is used for data visualisation purposes only and does not imply any position on the legal status of any territory.

ONLY 26%
OF MONGOLIA'S POPULATION HAVE MOBILE INTERNET COVERAGE

EGYPT, KOSOVO, THE KYRGYZ REPUBLIC AND TAJIKISTAN ALSO HAVE COVERAGE RATES OF
LESS THAN 60%

The impact of internet connectivity on firms

The digitalisation of information and its dissemination via the internet can bring substantial benefits. ICT intensive industries are particularly well placed to benefit from improved internet access. However, the economic impact of the internet extends much further than that, as illustrated by the roll-out of fixed broadband in Turkey, which is examined in detail below. Internet connectivity affects deep-seated features of markets that are common across all sectors, and it can impact firms through multiple channels.

How might internet access impact firms?

Internet connectivity affects both the demand for goods and services and firms' ability to supply them efficiently, as it results in more egalitarian access to the production and consumption of information.[5] On the supply side, for example, firms with high-quality internet may be better able to adopt new technologies. The firms' managers or owners could use the internet to learn about new production methods, ways of installing new machinery, or methods of improving coordination and communication across production lines or with customers.[6] The firms' workers, in turn, could see their productivity increase if internet access helps them to perform certain tasks more efficiently.

Increased posting of job vacancies online, greater opportunities to submit digital job applications and other information-sharing features can all make it easier to match workers to firms on the basis of workers' strengths and the skill requirements of jobs. For instance, access to online job boards could allow firms to reach applicants from across town (or beyond) who would not otherwise learn of their vacancies.

On the demand side, firms with internet connectivity are better able to access consumer markets in other geographical areas, and vice versa. What is more, they may gain access to new markets altogether. For example, without internet access it is virtually impossible to bid for public procurement projects. Meanwhile, introducing online sales might enable a firm to serve customers in other neighbourhoods. The internet also improves the quality of the information that is available to firms and their customers. For instance, the ability to read and share reviews of products or services online might increase consumers' confidence in an unfamiliar product.

We can see, therefore, that improvements in internet connectivity have the potential to affect firms' performance in a variety of different ways. Some new technologies may encourage firms to take on more workers (with multiple studies in sub-Saharan Africa finding that the roll-out of high-speed internet infrastructure fosters increases in employment),[7] while other technologies may result in human labour being replaced with software. The overall impact may depend on the size of the firm, the sector and the economy in question.

The availability of internet access across society as a whole may also matter when it comes to firms' performance, as consumers will presumably gain access at the same time as local firms. This may increase demand for local services (such as delivery of takeaway meals). On the other hand, just as firms will be able to reach new consumer markets thanks to their improved connectivity, they may face competition for their local customers from distant firms that are now able to reach their local markets. For example, in a randomised experiment looking at the expansion of e-commerce to rural households in China, Couture et al. (2021) found no effect on production or income. Instead, they found wealthier households benefiting from improved connectivity through reduced consumption costs. Firms may also face greater exposure to international competition. As internet coverage expands, firms may find their virtual market places becoming increasingly crowded. Such congestion can, ultimately, make it more difficult for consumers to search for firms.[8]

With that in mind, the next subsection examines the impact that the roll-out of fibre internet in Turkey has had on firms' performance using detailed data on firms' employment, balance sheets, income statements and customs records (which are derived, in part, from an ICT survey conducted by the Turkish Statistical Institute; see also Box 2.1).

[5] See Falck et al. (2014) and Hjort and Tian (2021).
[6] See DeStefano et al. (2018) and Akerman et al. (2015).
[7] See Hjort and Poulsen (2019).
[8] See Bai et al. (2020).

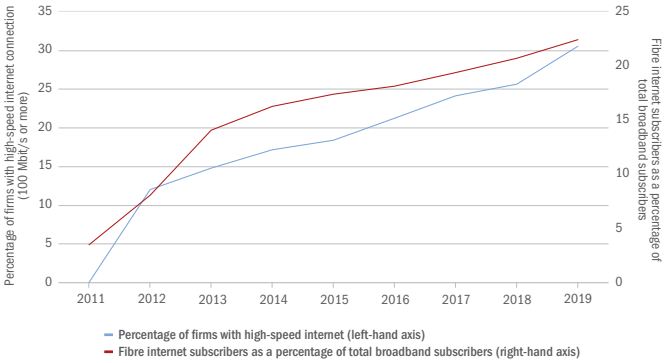
The roll-out of high-speed fixed broadband in Turkey

Until fairly recently, Turkey's internet infrastructure was large but had limited speed. Since the early 2010s, however, Turkey has been investing heavily in fibre internet, with a relatively high take-up rate. Both (i) the percentage of firms with a high-speed internet connection (defined as a download speed of 100 Mbit per second or more) and (ii) fibre internet subscribers as a percentage of total broadband subscribers have increased dramatically since 2011 (see Chart 2.8). In 2018, fibre internet connections accounted for 21 per cent of all fixed broadband connections in Turkey, close to the OECD average (26 per cent) and above the rates seen in France, Germany and the United States of America. The evidence from Turkey provides fresh insight into the considerable benefits that improvements in internet infrastructure can have for firms' growth and trade-related activities.

Analysis indicates that a 1 standard deviation increase in the density of high-speed internet cables (measured as cable length relative to the size of the local area) is associated with a 1.4 percentage point increase in the percentage of Turkish firms with high-speed internet access (see Box 2.1 for more details). That rise corresponds to a 7 per cent increase relative to average use of high-speed connections. Across sectors – that is to say, both in industries that use a lot of ICT services and in less ICT-intensive industries – Turkish firms of all sizes have made increased use of high-speed internet as high-speed broadband infrastructure has improved in the local area.

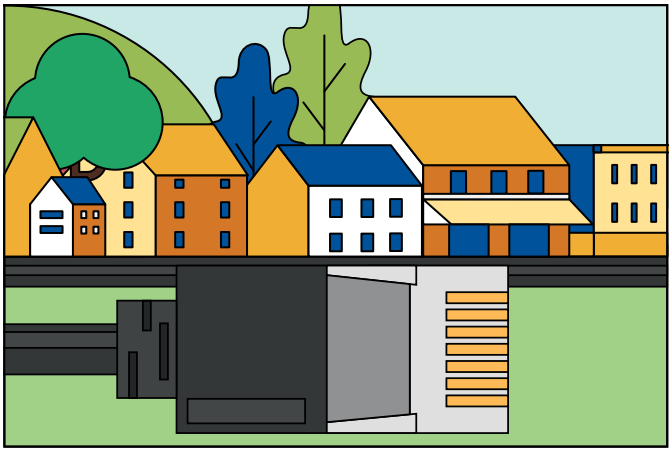
The increased availability of high-speed internet in a particular Turkish province is also associated with greater employment of ICT personnel. That effect is economically and statistically significant for firms employing at least 20 workers and is stronger for larger firms. The increase in ICT personnel in response to a 1 standard deviation increase in the availability of broadband is around 1 percentage point greater for ICT-intensive industries (such as publishing, programming and broadcasting activities, which are in the 95th percentile of the distribution of ICT intensity) than it is for less ICT-intensive industries (such as food, beverages and tobacco, which are in the 5th percentile of that distribution).

CHART 2.8. Turkey has been investing heavily in fibre internet, with a relatively high take-up rate



Source: Turkish Information and Communication Technologies Authority, Turkish Statistical Institute and authors' calculations.

IN 2018, FIBRE INTERNET ACCOUNTED FOR
21%
OF ALL FIXED BROADBAND CONNECTIONS IN TURKEY



High-speed internet benefits small manufacturing firms in ICT-intensive industries

The results also suggest that small manufacturing firms are big beneficiaries of the availability of high speed internet (see Chart 2.9). Small Turkish firms operating in more ICT-intensive manufacturing industries have increased employment and boosted their market shares as high-speed internet has been rolled out in their provinces. They have also started to pay higher average wages to their workers and have seen a decline in their marketing and distribution costs. These effects are sizeable. For instance, for small firms in a highly ICT-intensive industry, a 1 standard deviation increase in the density of high-speed internet cables is associated with a 2.7 percentage point increase in employment and a 0.7 percentage point increase in average wages. For small firms in industries with low levels of ICT intensity, the equivalent effects total 1.2 and 0.3 percentage points respectively.[9] While large firms have also benefited in terms of employment and sales, there are no statistically significant effects on other measures of their performance.

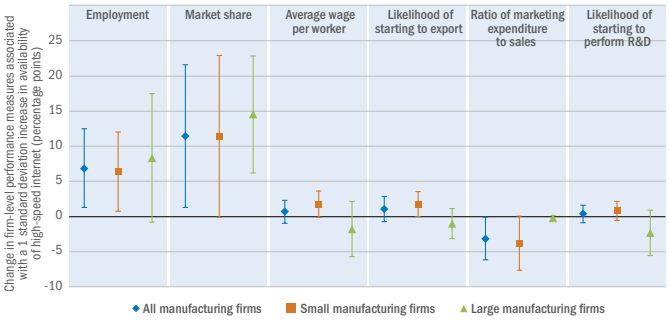
Firms that have benefited from the improvements in broadband infrastructure are also more likely to have started exporting by the end of the review period. In general, small manufacturing firms are less likely to export than large firms. Where they do export, they tend to export a smaller number of products to a smaller number of destination countries.

Following the roll-out of high-speed broadband, small Turkish manufacturing firms in more ICT-intensive industries have increased their exports, added more products and started exporting to new markets (particularly distant ones; see Chart 2.10). Indeed, for such firms, a 1 standard deviation increase in the industry-adjusted density of high-speed cables is associated with a 20 percentage point increase in the value of exports. This suggests that the impact of internet access in terms of lowering the fixed cost of acquiring information about new markets and ways of serving them has been particularly beneficial for small firms (which may have experienced prohibitively high costs in the past).

At the same time, the prioritisation of areas for the roll-out of broadband internet may not be random, giving rise to concerns that related factors may have influenced the improvements in firms' performance that have been attributed to better digital infrastructure. With that in mind, additional analysis has been carried out, examining potential determinants of the annual roll-out of fibre internet across provinces over the period 2012-19. Only population density has significant predictive power when it comes to explaining the sequencing of broadband upgrades, unlike gross regional product (GRP) per capita, the ratio of public expenditure to GRP, the percentage of firms operating in highly ICT-intensive industries or other indicators of the level or composition of business activity. Additional robustness checks included adding interaction terms combining the ICT intensity of industries with (i) changes in province-level public spending relative to GRP, (ii) bank loans per person and (iii) the quality of road infrastructure (as measured in terms of travel times between provinces).[10] These checks suggest that the reported differences in firms' performance are not driven by improvements in road infrastructure or other areas of public spending.

The next subsection turns to the link between mobile internet coverage (whether 3G or 4G) and the performance of firms.

CHART 2.9. Small manufacturing firms are big beneficiaries of the availability of high-speed internet



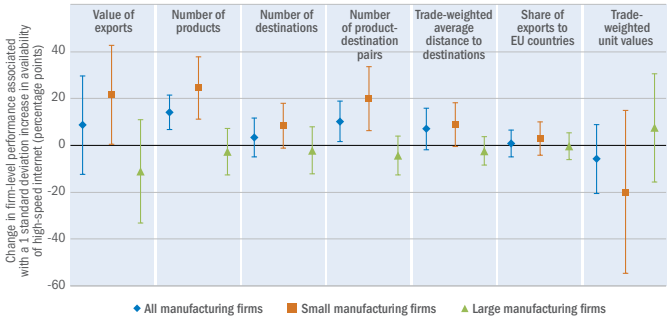
Source: Turkish Statistical Institute, EU KLEMS database and authors' calculations.
Note: These estimates are based on models regressing changes in measures of firms' performance in the period 2011-19 on the availability of high-speed internet at province level and various controls (see Box 2.1). They represent standardised coefficients, with data on all measures of performance being normalised such that estimates report percentage point changes for the purposes of comparison. 90 per cent confidence intervals are shown.

FOR SMALL FIRMS IN A HIGHLY ICT-INTENSIVE INDUSTRY, A
1 STANDARD DEVIATION
INCREASE IN THE DENSITY OF HIGH-SPEED INTERNET CABLES IS ASSOCIATED WITH A
2.7 PERCENTAGE POINT
INCREASE IN EMPLOYMENT

[9] Industries with high and low levels of ICT intensity are defined here as industries in the 90th and 10th percentiles of the distribution of the ratio of ICT capital to total capital across German manufacturing industries in 2011.

[10] See Cosar et al. (2021).

CHART 2.10. Small manufacturing firms in more ICT-intensive industries increase exports, add more products and start exporting to new markets when the availability of high-speed internet improves



Source: Turkish Statistical Institute, EU KLEMS database and authors' calculations.
Note: These firm-level estimates show long differences and relate to the period 2011-19. They represent standardised coefficients, with data on all measures of performance being normalised such that estimates report percentage point changes for the purposes of comparison. 90 per cent confidence intervals are shown.

A 1 STANDARD DEVIATION INCREASE IN THE INDUSTRY-ADJUSTED DENSITY OF HIGH-SPEED CABLES IS ALSO ASSOCIATED WITH A 20 PERCENTAGE POINT INCREASE IN THE VALUE OF EXPORTS

Mobile internet coverage and firms' performance

Identifying the effect that mobile internet has on firms' performance is challenging, as telecommunication firms tend to expand coverage on the basis of the location of potential customers and the strength of local economic activity – factors that also affect businesses directly. Indeed, 4G has (as was the case with 3G) generally tended to be rolled out in urban centres first of all (see Charts 2.3 and 2.7). In order to break the confounding links between the causal impact of internet coverage and other underlying advantages of firms and locations that might determine coverage, the analysis described below leverages differences in coverage across locations and over time.

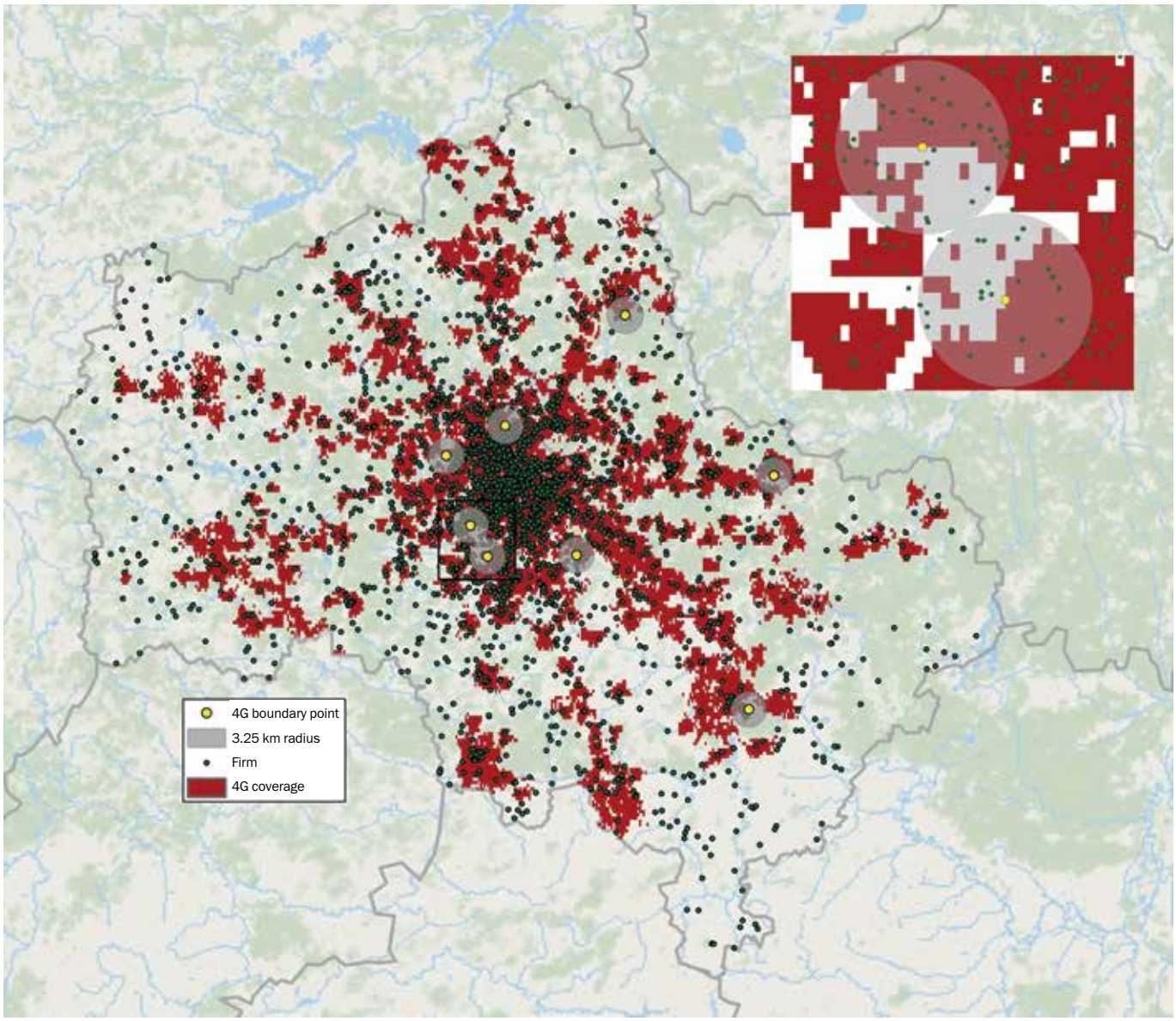
As before, the analysis draws on data from Collins Bartholomew's Mobile Coverage Explorer on 3G and 4G network coverage at 1 km^2 level, with data covering the period 2007-15.[11] The data reflect coverage reported to the GSMA by mobile operators. Firm-level data on capital, numbers of workers and revenue by year are taken from Bureau van Dijk's Orbis dataset. Geographical coordinates for firms' locations have been scraped using the OpenStreetMap API.[12] Combining firms' locations with annual coverage data provides the basis for the spatial regression discontinuity design analysis discussed in the following section.

Spatial regression discontinuity design analysis in Russia

In order to isolate the causal impact that internet coverage has on firms' performance, this analysis compares the performance of firms located either side of specific boundary lines in terms of mobile internet coverage (see also Box 2.2). Those boundary lines are determined by the reach of signals from mobile phone towers – which, in turn, is determined by many different factors, including the surrounding topography, the height of the towers and the strength of the boxes mounted on those towers. While core areas of coverage can be targeted by telecommunication firms, the exact reach of that coverage is determined by a number of factors that are not entirely within those firms' control. Thus, whether an individual firm falls just within or just outside an area of coverage can be regarded as being as good as random.

[11] See Guriev et al. (2019) for a detailed discussion of these data.
[12] Coordinates are assigned to blocks, with the typical block length being 400-800 metres. That level of precision is accurate enough in practice for the purposes of this analysis, although misclassification is possible at the outer edges of a network's coverage area.

CHART 2.11. When 4G was first introduced in Russia in 2013, coverage around Moscow was limited



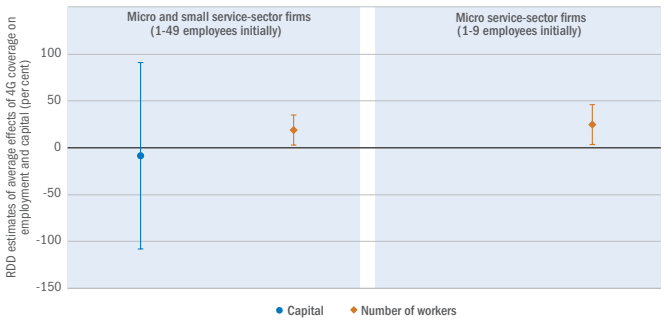
Source: Collins Bartholomew's Mobile Coverage Explorer, Orbis, Esri's World Ocean Basemap and authors' calculations.
Note: The window in the top-right corner provides a magnified view of two points on the 4G boundary.

IN RUSSIA, SERVICE-SECTOR FIRMS INCREASED STAFF NUMBERS BY AN AVERAGE OF

18%

ON GAINING ACCESS TO 4G, RELATIVE TO SIMILAR FIRMS WITHOUT 4G

CHART 2.12. Micro-firms in the service sector increased employment most following the roll-out of 4G



Source: Collins Bartholomew's Mobile Coverage Explorer, Orbis and authors' calculations.
Note: Estimates are based on RDD analysis. The 95 per cent confidence intervals shown are based on standard errors clustered by boundary point. Controls include the log of the population of the 1 km^2 area around the firm and fixed effects for boundary points.

An empirical methodology known as a regression discontinuity design (RDD) can be used to estimate the average causal effect of 4G internet. It leverages the fact that only a limited set of locations in Russia received 4G coverage when the technology was first introduced in 2013, leaving many firms without coverage (see Chart 2.11). Restricting the set of firms in the sample to those located close to the coverage boundary reduces the likelihood that other unobserved factors could be driving any differences between the performances of firms located within and outside the area of coverage (see the magnified window in the top-right corner of the chart, which zooms in on two points on the 4G boundary and firms falling within a 3.25 km radius of those points).

Micro-firms and small firms in Russia

This analysis focuses on smaller firms. Although firms of all sizes are located around the coverage boundaries, relatively few of them have 50 workers or more. For smaller firms in the service sector, the benefits of internet coverage can be expected to be particularly large when it comes to matching potential workers with firms. 4G coverage might also extend the market reach of firms providing services that can be performed remotely (such as delivery services). In addition, the service sector relies more on labour and less on machinery, so it can mobilise additional workers particularly quickly. At the same time, the numbers of larger firms in the vicinity of network coverage boundaries are not sufficient to run a robust RDD analysis for those firms alone.

Analysis suggests that the arrival of 4G internet coverage was associated with a 19 per cent increase in the number of people employed by service-sector firms with fewer than 50 employees (which comprise "micro-firms" with 1-9 workers and "small firms" with 10-49 workers; see Chart 2.12).[13] The greatest benefits were enjoyed by micro-firms, which hired, on average, two additional employees each relative to similar firms that fell just outside the coverage area (representing an average increase of 24 per cent in those firms' workforces).

IN RUSSIA, SERVICE-SECTOR FIRMS WITH FEWER THAN

50 EMPLOYEES

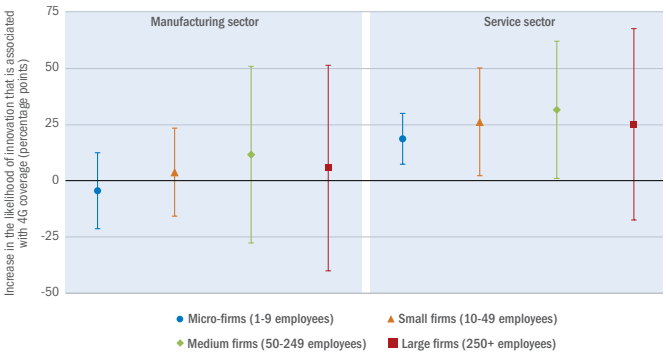
INCREASED STAFF NUMBERS BY AN AVERAGE OF

19%

ON GAINING ACCESS TO 4G, RELATIVE TO SIMILAR FIRMS WITHOUT 4G

[13] Considering firms of all sizes yields a very similar estimate of 18 per cent.

CHART 2.13. Firms in the service sector have become more innovative following the roll-out of 4G



Source: Collins Bartholomew's Mobile Coverage Explorer, Enterprise Surveys, CIESIN's Gridded Population of the World dataset (version 4) and authors' calculations.
Note: "Innovation" refers to the introduction of a product or service that is either entirely new or represents a significant improvement on an existing product or service. Estimates are based on regression analysis linking innovation to 4G coverage at a firm's location. The 95 per cent confidence intervals shown are based on robust standard errors. All specifications include country-year, sector-year, subnational region and industry fixed effects.

Access to mobile internet is associated with increased innovation by micro-firms

Data from the Enterprise Surveys conducted by the EBRD, the World Bank and the EIB can be used to shed further light on the impact that mobile internet has on innovation. That survey focuses on small firms (with the median firm having around 20 employees) and records detailed information about firms' locations, as well as new products and processes introduced by firms in the three years preceding the survey. Data are drawn from the last three waves of the survey, which were conducted between 2008 and 2020. The sample is much smaller than the Orbis sample and does not support spatial discontinuity analysis. Instead, a difference-in-differences analysis focuses on differential trends in innovation in areas with and without 4G coverage. The analysis controls for the population density of the area around the firm, whether the firm is an exporter, whether the firm is located in an urban area, the number of bank branches within a 5 km radius of the firm, whether the firm has a female owner and whether the firm has been in business for less than five years. Fixed effects at the subnational region level and the industry level (on the basis of two-digit ISIC industry codes) are also included, as are country-year and sector-year fixed effects.

That analysis indicates that smaller firms in the service sector are significantly more likely to introduce new or improved products or services once they have been given access to 4G. Indeed, they are between 19 and 26 percentage points more likely to innovate than similar firms without 4G coverage (see Chart 2.13). The effects for manufacturing firms and larger firms in the service sector are smaller and not statistically significant.

Policy implications

Investment in ICT infrastructure may provide an opportunity to foster growth across the board and may be particularly beneficial for smaller firms and their workers (particularly in the more labour-intensive service sector). This, in turn, may have a positive impact on economic inclusion and income equality, provided that such infrastructure has a broad geographical reach. This may help to partially offset any negative effects of digitalisation in terms of widening digital divides, as discussed in other chapters of the report.

A caveat is in order, however: the analysis in this chapter has largely focused on the early effects of improved digital infrastructure. As digital infrastructure continues to improve and expand, local firms may face stronger competition from larger firms and companies located further away (even across borders).[14] While this may result in efficiencies of scale and associated benefits for consumers, increased market concentration on account of network effects will present its own policy challenges.

Competition policy, in particular, will need to evolve and become fit for the digital age.[15] This will involve new approaches to defining local markets, new tests when it comes to improved consumer welfare and longer time horizons for the analysis of competition issues.

Requirements in terms of digital infrastructure will change constantly as technology develops. For example, Box 2.3 discusses the advantages of 5G technology, which provides for faster wireless data transmission and supports the "Internet of Things" – wireless communication across a variety of devices. Digital infrastructure can also help to make other infrastructure, from electricity grids to road networks, smarter, unleashing major benefits for businesses and consumers (see Box 2.4).

However, as major parts of the economy become more reliant on digital infrastructure, cybersecurity risks will rise. As a result, cybersecurity will increasingly become a priority area for public and private investment (see Box 2.5).

IN RUSSIA, SMALLER SERVICE-SECTOR FIRMS WITH ACCESS TO 4G ARE BETWEEN 19 AND 26 PERCENTAGE POINTS MORE LIKELY TO INNOVATE

[14] See Bai et al. (2020).
[15] See Crémer et al. (2019).

Conclusion

Despite substantial progress in terms of building internet infrastructure in the EBRD regions, high-speed fixed broadband remains expensive in many economies and adoption rates are still relatively low. Mobile internet coverage, on the other hand, has expanded significantly in the last 15 years. 3G and 4G networks tend to cover larger percentages of the population in economies with higher GDP per capita and greater population density. Several economies in the EBRD regions have relatively low levels of mobile internet coverage, with 3G networks covering less than 60 per cent of the population and 4G networks covering less than 20 per cent (on the basis of people's places of residence).

Gaps in internet coverage matter, as improvements in digital infrastructure bring benefits for firms and consumers alike. Internet connectivity assists firms with the adoption of new technologies and helps to match workers to job vacancies on the basis of the skills required. Digital connectivity can also help firms to access new, more distant markets or new suppliers. At the same time, consumers have greater product choice and find it easier to locate information about different goods and services (for example, on the basis of reviews provided by other consumers).

However, despite the advantages that the internet can provide, some firms may miss out on those benefits and face new challenges instead. Firms may become exposed to competition from firms in larger markets (including international firms), potentially concentrating market power in the hands of a small number of firms. At the same time, increased competition and congestion in the virtual marketplace may result in new information barriers for consumers.

Following the roll-out of broadband internet in Turkey, smaller manufacturing firms in ICT-intensive industries have significantly expanded their businesses. Those firms are now more likely to export and reach more distant markets than comparable firms that have not benefited from high-speed internet. Moreover, spatial regression discontinuity analysis finds that service-sector firms with fewer than 10 employees that have 4G mobile internet coverage have, on average, expanded their workforce by two to three workers more than similar firms in nearby areas without 4G coverage.

The benefits of digitalisation are far-reaching, also extending to core infrastructure such as electricity grids and road networks. However, increased digital connectivity will also come with increased risks relating to cybersecurity and the handling of sensitive personal data. This will require additional resources to be dedicated to the management of cybersecurity risks.

BOX 2.1.

Data on broadband internet in Turkey

Data on the roll-out of fibre internet in Turkey are available from the Turkish Information and Communication Technologies Authority. These are scaled by the amount of fibre cable in each province in each year.

In order to investigate whether firms located in provinces that benefit more from investment in fibre internet are more likely to use high-speed internet, the analysis in this chapter draws on an annual firm level survey on the use of ICT that is administered by the Turkish Statistical Institute. That ICT survey, which has been carried out every year since 2005, covers all firms with more than 250 employees and a representative sample of smaller firms, with a total sample of around 10,000 firms. Firms are recorded as using high-speed internet if their connection speed is 100 Mbit per second or more. The percentage of firms with high-speed internet access is calculated for each province and year.

The ICT survey is also linked to a large-scale business survey, which reports firm-level information such as employment, wages, material input purchases, industry of operation at the four-digit level of disaggregation using NACE (the Statistical Classification of Economic Activities in the European Community), the year of establishment and the province where the firm is located.

Empirical analysis investigates the effect that the availability of high-speed internet has on various firm level outcomes, such as employment, sales and exports. To this end, several firm-level administrative datasets maintained by the Turkish Statistical Institute are merged. Those data cover all formal firms in Turkey in the period 2011-19, with each dataset using the same unique firm identifiers. The firm level balance sheet and income statement data contain detailed information on annual revenue and expenditure (with a breakdown including items such as financing, marketing and taxes), as well as details of firms' assets and liabilities (including items such as bank loans, accounts receivable, accounts payable and cash holdings). Moreover, customs data provide information about the annual value and physical volumes of firms' exports, broken down by destination country and product group (at the eight-digit level of the Harmonised System).

The variable that captures the degree of reliance on ICT technologies at industry level comes from the EU KLEMS database. It is calculated as ICT-related capital's share of the total capital stock of an industry for Germany and the United States of America in 2011. Industries where this measure exceeds the median (for the manufacturing or service sector, as applicable) are categorised as ICT-intensive.

The analysis links the differences between the average outcomes for each firm (in terms of exports, for example) in 2018-19 and 2011-12 with the availability of high-speed broadband, as well as various firm level characteristics. Specifications control for the log of initial firm-level employment and an interaction term combining the province's population density in 2011 with the industry's ICT intensity. Province and industry fixed effects also capture changes in location-specific or industry-specific factors affecting demand and supply.

BOX 2.2.

Spatial regression discontinuity design analysis

The large number of firms in the Orbis dataset and the highly granular data on 4G coverage support a spatial regression discontinuity design approach based on Keele and Titiunik (2015). In this analysis, firms' locations are matched to a grid capturing network coverage at 1 km^2 level. Straight-line distances are calculated from the location of each firm to a set of points along the boundaries of network coverage.[16] The analysis focuses on the boundaries between areas with and without network coverage.

Discontinuities at the points on the coverage boundary are estimated for the primary outcomes of interest for firms: the inverse hyperbolic sine of the number of workers, the nominal value of capital, and operating revenue (expressed in euros). The differences between the outcomes of firms just inside the coverage area and those of similar firms just outside that area indicate the average impact of coverage. Specifications control for the population at the firm's location, boundary point fixed effects, the firm's industry (manufacturing or services), and the firm's size bracket (micro, small, medium or large) as determined in its first year in the sample.

Estimation and the choice of boundary points

The RDD is estimated using a local linear regression with a triangular kernel. This approach helps to estimate the discontinuity in outcomes that occur right at the boundary. The bandwidth determining how far away from boundary points firms can sit and still be included in the estimation is selected by the default optimal bandwidth algorithm in the "rdrobust" package and is typically less than 3 km. The estimated discontinuity is bias-corrected using a second-order polynomial with a separate optimal bandwidth. Robust standard errors are clustered by boundary point. This methodology leads to conservative estimates of any causal effects.

A discrete set of boundary points (211 in total for 2013) are placed along the coverage boundaries at 25 km intervals. All firms within a 50 km radius of each boundary point are included in the analysis and feed into the optimal bandwidth calculations. Boundary points are then selected on the basis of the number of firms on each side of the boundary within a 5 km radius, so many boundary points are excluded since they do not have enough firms on one side or the other for reliable discontinuity estimations. The boundary points with the most firms and the best balance between coverage and non-coverage areas (23 in this case) are retained and used in the analysis. Each boundary point essentially produces its own discontinuity estimate, with the final estimate being a weighted average of those discontinuities.

One reason to screen boundary points is the large number of firms that are needed around each point in order to run estimates with boundary point fixed effects. This ensures that outcomes are compared for firms that are all geographically close to one another, and not simply close to a boundary. Large numbers of observations are also needed in order to conduct the analysis for subgroups of firms based on industry and firm size.

RDD validity testing

The RDD analysis provides strong evidence that faster internet connections benefit smaller firms in the service sector. The validity of these results can be tested indirectly to confirm their soundness. Other factors that could conceivably influence firms' outcomes – such as population density at the start of the period, economic activity (as proxied by night light data)[17] and employment in the service sector in 2011-12 (the years prior to the roll-out of 4G mobile networks) – exhibit no obvious discontinuities around the coverage boundary.

[16] Firms located in areas without 4G coverage in 2013 are assigned a negative distance, while firms in areas with 4G coverage in that year are assigned positive values.

[17] See NOAA (2014).

BOX 2.3.

The roll-out of 5G: early lessons from Poland

5G technology aims to deliver improved connectivity, with speeds high enough to support new applications connecting not only mobile devices, but also machines, buildings and other objects. The speed of 5G is a significant benefit, with connections up to 20 times faster than 4G. 5G technology also supports 10 times more devices per square kilometre, leading to greater reliability and faster data transfer (with waiting times for transfers up to 25 times shorter than with 4G).[18]

Mobile network operators in more advanced economies in the EBRD regions have already started preparing for 5G, with auctions for spectrum rights taking place in the Czech Republic, Estonia, Greece, Hungary, the Slovak Republic and Slovenia.

Most importantly, 5G provides the backbone that is necessary to support the expansion of the Internet of Things – a network of internet-connected devices that can collect and exchange data from their respective environments. Driverless cars, for example, might be able to communicate not only with each other, but also with traffic lights and buildings, while difficult medical procedures could be carried out remotely in the future. The Internet of Things is expected to yield significant economic benefits, with a study commissioned by the European Commission estimating that an investment of €57 billion in 5G could yield benefits totalling €113 billion per year and generate 2.3 million jobs by 2025.

Within the EBRD regions, one economy where preparations for 5G are among the most advanced is Poland. Many Polish operators are upgrading their networks in preparation for 5G. Country-wide coverage in terms of 5G will be of particular importance in Poland, where more than 70 per cent of the population do not live in major cities. Consequently, fixed broadband penetration remains relatively low across much of the country, with many households heavily reliant on mobile networks. This box details some early lessons from Poland, which may provide useful insights in terms of the challenges that other economies may experience when rolling out 5G.

Uncertainty relating to spectrum auctions. In April 2020, the Polish regulator UKE (like the authorities of many other European countries) cancelled its spectrum auction on account of uncertainties relating to the Covid-19 pandemic, as well as cybersecurity concerns. UKE has decided to repeat the entire procedure for auctioning 5G spectrum bands, with the exact date of the auction yet to be announced.

Hesitant customers. Mobile subscribers in Poland have been hesitant about upgrading their plans to include 5G, given certain device-related requirements and associated costs, as well as uncertainty about the need for 5G services on a day-to-day basis. While the benefits of the Internet of Things are obvious in specialist industries, their applications have not yet reached the average mobile subscriber, so demand remains limited. Uncertainty is also being amplified by confusing messages about the availability of 5G. While the 5G spectrum auction has not yet taken place in Poland, operators are already offering 5G packages on alternative spectrum bands.

Limited pricing upsides. As a result of customer hesitancy, operators are concerned that they may not be able to significantly increase their average revenue per user by offering 5G services. However, demand for enterprise-specific 5G networks appears to be on the rise, with some firms using them to meet security needs and others using them to speed up the automation of production processes.

Significant capital expenditure. Network operators will need to spend substantial amounts of money on spectrum fees, the upgrading of their network equipment and backbones, and increasing the density and coverage of mobile towers. This is because 5G uses shorter wavelengths than 4G, which enables it to carry more data than 4G, but results in a reduced signal range. Lastly, owing to increasing security concerns/rules about suppliers of 5G equipment, operators risk potentially having to replace equipment that has already been put in place, leading to significant additional investment. Because of this capital expenditure, the operation of mobile towers is, in many European countries, increasingly being outsourced to specialist tower companies, thereby reducing the investment needs of individual mobile operators.

In light of these diverse challenges, the availability of long-term financing will be crucial in order to enable mobile operators to meet their 5G investment needs. Importantly, investing in 5G also remains central to the transition to a greener economy. 5G is categorised as "best in class" by the EU Sustainable Finance Taxonomy in terms of the environmental and energy-efficiency standards set by the European Telecommunications Standards Institute (ETSI), with significantly lower energy consumption per data unit transferred.

[18] See Ghosh (2020).

[19] See www.ebrdgreencities.com (last accessed on 3 June 2021).
[20] See Goderdzishvili et al. (2018).
[21] See OECD (2019).
[22] See City of Cape Town (2020).
[23] See https://e-estonia.com/solutions/interoperability-services/x-road (last accessed on 3 June 2021).
[24] See European Data Portal (2020).

BOX 2.4.

Building blocks for smart urban development

Digital innovations such as the Internet of Things, big data, AI and cloud computing are consistently improving our means of assessing and managing urban challenges. From water and waste management and street lighting to public transport and district heating, digital technologies are helping policymakers to address citizens' needs with much greater speed and effectiveness, thanks to information that is being collected more frequently, more accurately and more cheaply than ever before.

For many cities across the EBRD regions, digitalisation is likely to play an integral role in their future development. Several cities (such as Moscow and the Bulgarian city of Burgas) have already adopted international best practices in specific areas, such as intelligent transport.[19] Other cities, such as the Georgian capital Tbilisi, are right at the frontier in that regard. Tbilisi, for example, is on track to become one of the first cities in the world to pilot a digitised and immutable property register using blockchain technology.[20]

For the majority of the cities in the EBRD regions, however, "digital readiness" continues to lag behind that of EU comparators and other countries in the developed world. In many cases, post-socialist countries have inherited outdated and often paper-based record management systems, and some economies in the SEMED region and Central Asia are yet to make foundational investments in digital infrastructure. In such circumstances, a key policy question is how local and national decision-makers can make the most of costly investments in "smart city" technology with the ultimate aim of improving well-being. This box discusses some of the key building blocks of such investments.

Digital city strategies

A key starting point for any smart city initiative is a comprehensive digital strategy. Cities are interdependent systems, with policy actions in one area potentially having a profound impact on all others. Regular consultation across government, the private sector and civil society is thus vital in order to ensure a coordinated and viable smart city agenda. While approaches are likely to vary depending on the local context, experience from successful smart city initiatives in London, Singapore and Amsterdam suggests that strong leadership – for example, through a dedicated chief digital officer or a steering committee – is critical.

For instance, the Latvian capital Riga has been incorporating a comprehensive digital strategy into its urban planning since 2006, when the government first established its Information Society Development Guidelines (INFPO). Those guidelines are embedded in the municipality's five-year economic strategy and have been devised jointly by representatives of government, industry and academia to ensure a diverse range of viewpoints and expertise. Since those guidelines were established, Riga has achieved numerous targets relating to internet access and e-government, as well as drawing up new laws and regulations on data privacy, standards and cybersecurity.[21]

In addition to prioritising new investments, digital strategies can also help governments to identify "quick wins" in terms of improving policy management through better use of existing resources. City governments often have access to a wealth of untapped data resources, which can be hugely valuable in terms of designing and optimising the delivery of services when they are properly digitised and shared. Reforms such as government-led data inventories – which pull together information on the data that the city already has available, who controls them, and how they can be put to better use – can be carried out as part of a wider digital strategy. Over the last few years, for example, Cape Town in South Africa has made concerted efforts to digitise and share all water-related data records, having recently experienced some of the worst droughts in the city's history. In so doing, the city has vastly improved its water management and leak detection, reducing total water consumption by 45 per cent in just three years.[22]

More and better data

Thus, gathering more data is just one part of the answer. Ensuring that data are well governed, standardised and interoperable for multiple stakeholders is just as important for any smart city development. Establishing interoperability frameworks requires both regulatory oversight and the support of digital infrastructure. For instance, the Estonian capital Tallinn introduced a data exchange platform named X-Road in 2011 to allow various different information systems to communicate and exchange data. Today, X-Road is used at national level, connecting more than 900 organisations, public registries and databases across Estonia.[23]

Open data initiatives

Having large amounts of standardised data will not create value unless those data can be used, reused and redistributed without restrictions. With that in mind, open data initiatives have been adopted by a growing number of city governments around the world. Open data helps to improve public services, ensure transparency and stimulate innovation by enabling citizens, businesses and governments to collaborate in new ways. Warsaw, for example, has an open data portal containing more than 200 databases on subjects as diverse as ecology, transport and social projects. The portal, which was established in 2014, can be easily accessed by anyone, and it processes around 1 million queries a day. Importantly, dozens of applications have been developed by start-ups and other companies using Warsaw's open data, some of which have already achieved commercial success.[24]

Lastly, effective implementation of digital strategies also requires sound change management and sufficient digital skills. The introduction of a data-driven approach may change organisations' operational procedures, while interpreting and utilising large amounts of data requires additional skills and human resources. To facilitate that transition, cities could start with widespread capacity-building and awareness raising campaigns on the value of data and how to navigate the switch to a "smart city".

BOX 2.5.

Sustainable infrastructure and cybersecurity

Cybersecurity is an essential part of the digitalisation process, as it helps to prevent malicious or accidental data loss and manipulation. Such data loss can reduce the functionality of digital infrastructure and may involve significant financial losses for individuals and corporations. The digitalisation of infrastructure increases the potential for attacks, which may be motivated by a desire for financial gain (as in the case of ransomware attacks on water and energy systems) or a simple desire to incapacitate critical infrastructure (as in the case of terrorist attacks). It is for this reason that many infrastructure and energy projects are often considered to be "critical national infrastructure" in terms of cybersecurity. The interconnectedness of systems across institutions and firms with subsidiaries – even across international borders – amplifies the threat from cyberattacks. Indeed, successful cyberattacks can affect millions of people.[25]

Many public and private-sector organisations successfully defend themselves against cyberattacks by implementing encryption-based cybersecurity and firewalls and keeping up to date with the latest malicious threats. The concept of "cyberhygiene" (which includes raising awareness, securely configuring equipment and networks, updating software, not giving unnecessary system privileges or data access rights to staff and users, and training) is also critical in this regard. A third element of cybersecurity is "security by design" – the incorporation of security objectives and standards as a core part of the technology design process.

Infrastructure projects need to consider cybersecurity risks from the very start, as part of their preparatory phase. A risk assessment will need to be carried out at an early stage, while national data protection rules (such as the General Data Protection Regulations in the case of EU member states) will need to be looked at in detail. Where national standards are outdated, of poor quality or non-existent, countries will need to decide which international standards are most appropriate. Before launching operations, organisations should simulate cyberattack scenarios to check for vulnerabilities and then address any weaknesses.

In recent years, digital technologies across the infrastructure and energy sectors have benefited from internet connectivity. However, such connectivity opens up many more pathways for cyberattacks. Multi-factor authentication, authorisation protocols and data integrity checks can all mitigate the risk of malicious attacks. Commercial off-the-shelf proprietary digital platform solutions can also expose operating systems to increased risk, and pairing such systems with widely available and low-cost internet protocol-based communications can be especially risky. Where there is a high risk of cyberattacks, bespoke digital solutions armed with fit-for-purpose cyber-resilience measures should be applied.

Ideally, cybersecurity should be integrated into broader infrastructure investments and upgrades. Such projects may involve a review of the organisation's current IT security infrastructure, including gap analysis against best practices in information security in the given sector. On the basis of those assessments, phased work plans can be prepared, detailing step-by-step measures to enhance IT security systems. Those recommendations can be accompanied by tender specifications, helping the organisation to procure the services it needs to implement the measures identified. Lastly, penetration tests should be conducted in order to ascertain the reliability of the new or upgraded IT security infrastructure.

[25] See Crosignani et al. (2021).

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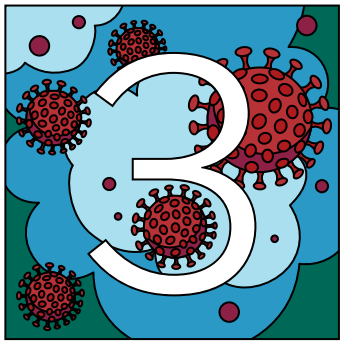
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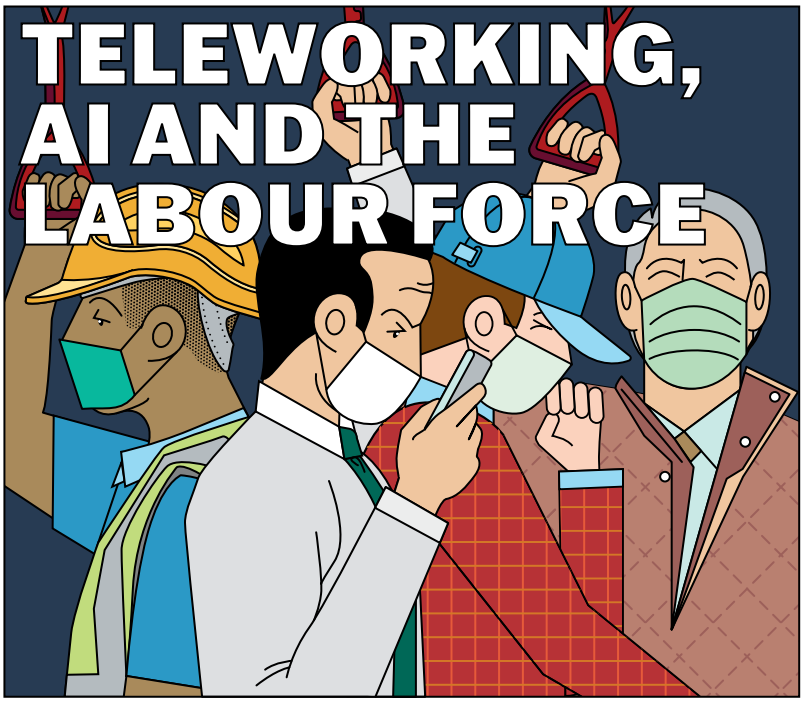
TELEWORKING, AI AND THE LABOUR FORCE


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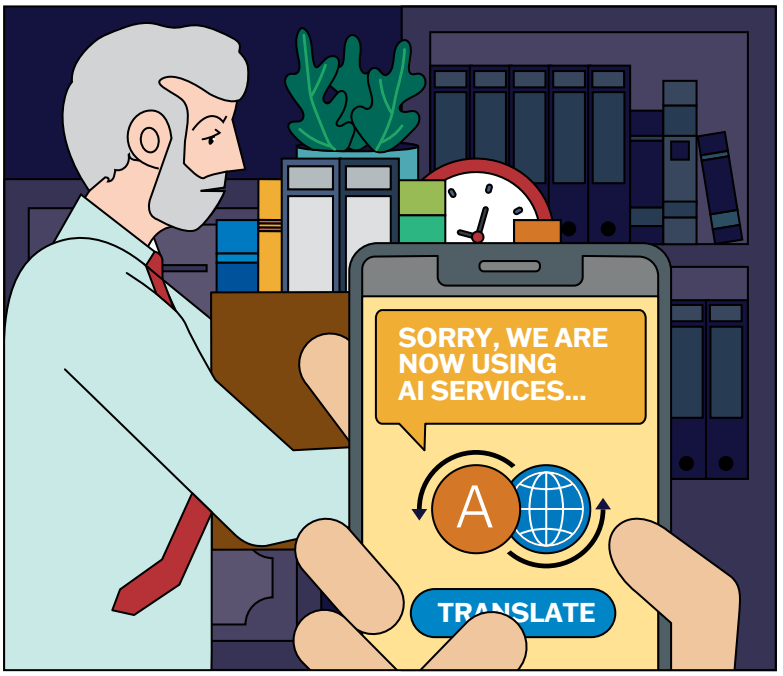
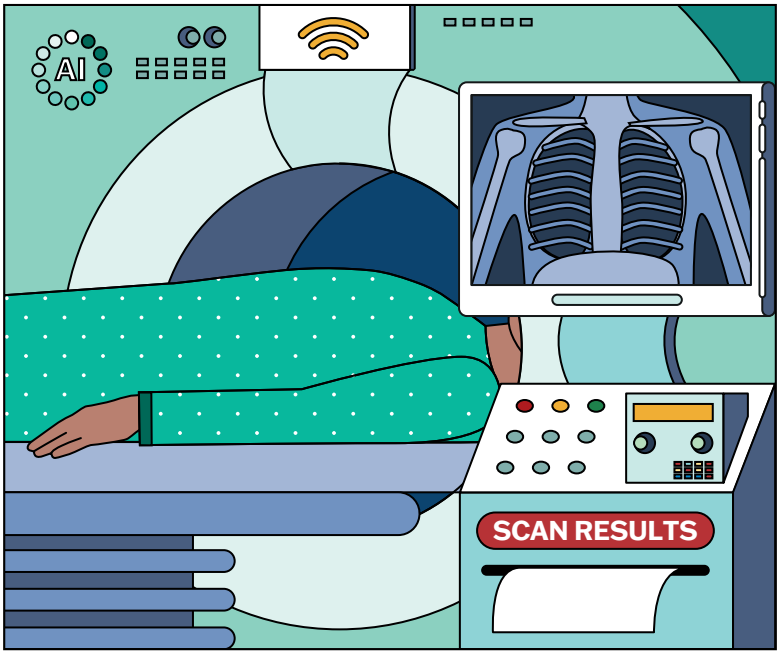

SORRY, WE ARE NOW USING AI SERVICES...
A
TRANSLATE

This chapter provides an overview of "teleworkability" – the extent to which all tasks relating to an occupation can be performed remotely – and people's changing attitudes towards working from home. There is considerable variation in teleworkability, both across and within the EBRD regions, with young people and women more likely to have teleworkable occupations than older cohorts and men. On average, workers plan to work from home two days a week after the Covid-19 pandemic, with many people feeling that they work more efficiently at home. This chapter also explores the impact that artificial intelligence is having on the labour market, showing that, while the effect is limited, occupations which are more exposed to automation have seen greater job losses.



Introduction

Digitalisation of the workplace has taken a leap forward during the Covid-19 pandemic and is changing the ways in which people work and the jobs that they do. In particular, use of digital technologies that are complementary to human effort (especially when working from home) has increased. Cloud computing, online contracting and digital payment systems are all prime examples of this. Evidence from advanced economies indicates that highly skilled, high-income workers tend to benefit most from remote-working arrangements.[1] This chapter starts, therefore, by looking at how "teleworkability" – a measure capturing the extent to which all tasks relating to an occupation can be performed remotely – is distributed in terms of geography, gender, age and educational attainment in the EBRD regions (see Box 3.1 for details of the construction of that measure).[2] While the measure in question does not indicate whether tasks are *actually* performed remotely, this chapter complements that teleworkability analysis by looking at de facto remote-working patterns.

The analysis reveals that teleworkability is spread unevenly across the EBRD regions. Young people and women are more likely to have teleworkable occupations than older cohorts and men, while people with a tertiary qualification are up to three times more likely to have a teleworkable occupation than those with lower levels of education.

There is also substantial variation across countries in terms of actual remote-working patterns. Overall, there is only a weak correlation between teleworkability and actual remote working. This chapter finds that, beyond the availability of digital infrastructure necessary for working from home, the extent to which the former translates into the latter also depends on other factors, such as the degree of trust.

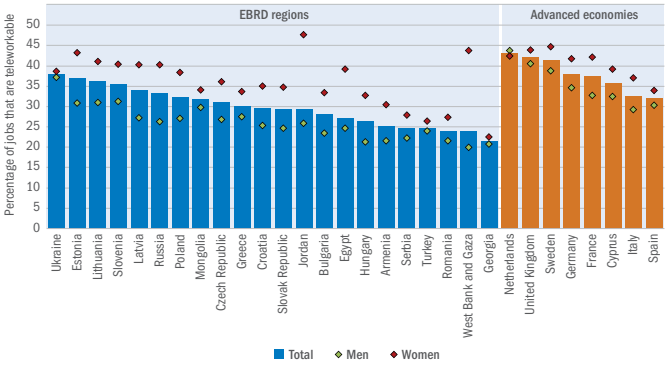
The second section of the chapter examines changing attitudes towards remote working, using data from a novel household survey conducted in 15 countries in 2021. Recent shifts in attitudes towards remote working could be an indication of more permanent changes.[3] The survey shows that workers across the EBRD regions prefer more flexible approaches to work and generally feel more efficient when working from home. However, they believe that employers will not embrace frequent remote working. If that is borne out in reality, it may point to a slower digital transformation of the workforce in the EBRD regions relative to more advanced economies (see also Box 3.3 on the way in which digitalisation shapes intentions to migrate).

[1] See Adams-Prassl et al. (2020) and Angelucci et al. (2020).
[2] See also Dingel and Neiman (2020).
[3] See also Barrero et al. (2021) on the United States of America.

A third section explores the impact that advances in artificial intelligence are having on employment.[4] AI technologies are computer programs that solve problems and achieve goals that normally require human intelligence. Unlike the routine manual tasks that robots replace, AI technologies can perform routine cognitive tasks, such as the categorisation of images. The Covid-19 pandemic could accelerate the adoption of such technologies. Many firms have struggled to operate remotely during lockdowns as a result of non-teleworkable processes, and such firms may now seek to replace human workers with AI-based machines that are not susceptible to illness. While the effect that large-scale adoption of AI will have on overall employment is unknown at present, highly skilled workers specialising in non-routine cognitive tasks are likely to benefit most.

In order to explore these issues in the EBRD regions, this chapter analyses the extent to which AI technologies can perform occupational tasks as well as – or better than – humans (which is referred to as "AI exposure"). AI exposure does not capture actual adoption of specific AI technologies, but instead captures the technical *potential* for adoption. The analysis finds that, over the last decade, AI exposure has had a very limited impact on employment growth for individual occupations, as very few jobs have high levels of AI exposure at present. The effect that AI exposure has on employment growth will, however, probably increase in the future.

CHART 3.1. Teleworkability is typically higher for women than for men



Source: Dingel and Neiman (2020), labour force surveys (2016-19) and authors' calculations.

Teleworkability: transforming how people work

People's recent experience with teleworking, the associated investments made and the protracted nature of the pandemic will probably mean that remote working remains popular in many economies in the near future, potentially increasing further over time. Increased teleworking could have a considerable impact on labour markets in the EBRD regions.

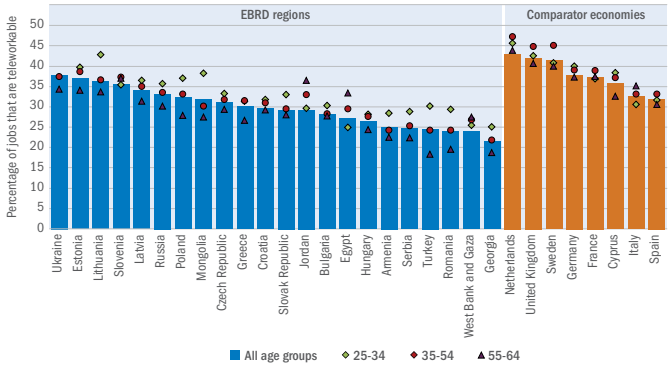
First, well-managed teleworking has the potential to benefit both firms and workers. Pre-pandemic evidence from China, Italy and the United States of America shows that remote working can increase productivity across industries and skill levels.[5] Firms can gain from the reduced need for full-time desks, helping them to save on office space and related expenditure (such as the cost of electricity). While these costs are instead shifted onto workers, who may end up paying for production inputs such as working space, heating and electricity, many workers may find such costs are outweighed by the benefits of working from home, such as reduced commuting time.[6]

Second, detaching workers from the office has important implications for cities. Labour demand is generally a more important driver of urban migration than urban amenities.[7] Because teleworking reduces the need to live in cities, people who have less of a preference for urban living or are seeking more affordable housing may decide to leave. This could boost the economies of smaller population centres. Indeed, recent research estimates that cities with high levels of inward commuting will see a 5-10 per cent drop in local spending.[8] While peripheral areas may benefit from some reallocation of spending, higher demand for housing, goods and services may increase the cost of living there. Moreover, de-urbanisation may also weaken economies of agglomeration. And while recent developments in online labour markets and videoconferencing have created opportunities for digital labour market pooling and knowledge spillovers, it remains to be seen whether these can truly replace physical proximity in practice.[9]

Third, increased teleworking may also affect labour markets beyond national borders. In particular, detaching workers from the office may increase offshoring from more advanced economies. Teleworking relies on digital communication and coordination and may therefore make it easier for firms to maintain a globally distributed workforce. Here, economies in the EBRD regions may stand to gain from offshored teleworking jobs, given their highly skilled labour forces and relatively reliable legal environments. Such shifts may also alter demand for skills in those host countries: on the positive side, they could encourage upskilling; however, they could also increase the take-up of jobs that will eventually be lost to automation.

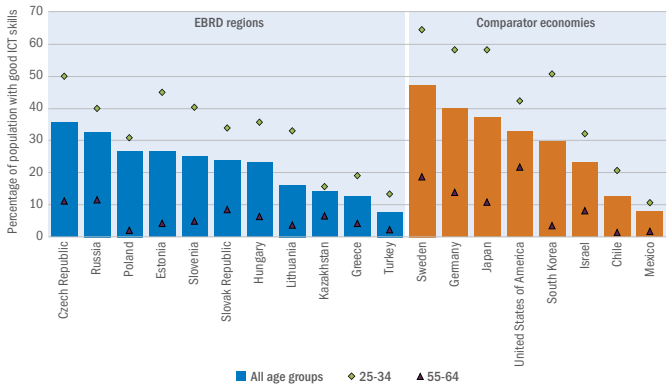
[4] The Oxford Living Dictionary defines AI as "the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages".
[5] See Angelici and Profeta (2020), Bloom et al. (2015) and Choudhury et al. (2021).
[6] See Mas and Pallais (2017).
[7] See Moretti (2013).
[8] See Barrero et al. (2021).
[9] See Rosenthal and Strange (2020) and Wheaton and Lewis (2002).

CHART 3.2. In the EBRD regions, young people are most likely to have a teleworkable job



Source: Dingel and Neiman (2020), labour force surveys (2014-19) and authors' calculations.

CHART 3.3. Young people have better ICT skills than older cohorts



Source: PIAAC and authors' calculations.
Note: "Good ICT skills" refers to an average score of more than 290 across the 10 plausible values for problem solving in a technology-rich environment. See also Chapter 2 of EBRD (2018).

IN MOST ECONOMIES IN THE EBRD REGIONS, YOUNG ARE MOST LIKELY TO HAVE TELEWORKABLE JOBS, FOLLOWED BY THE MIDDLE-AGED AND OLDER WORKERS

Who is most likely to have a teleworkable job?

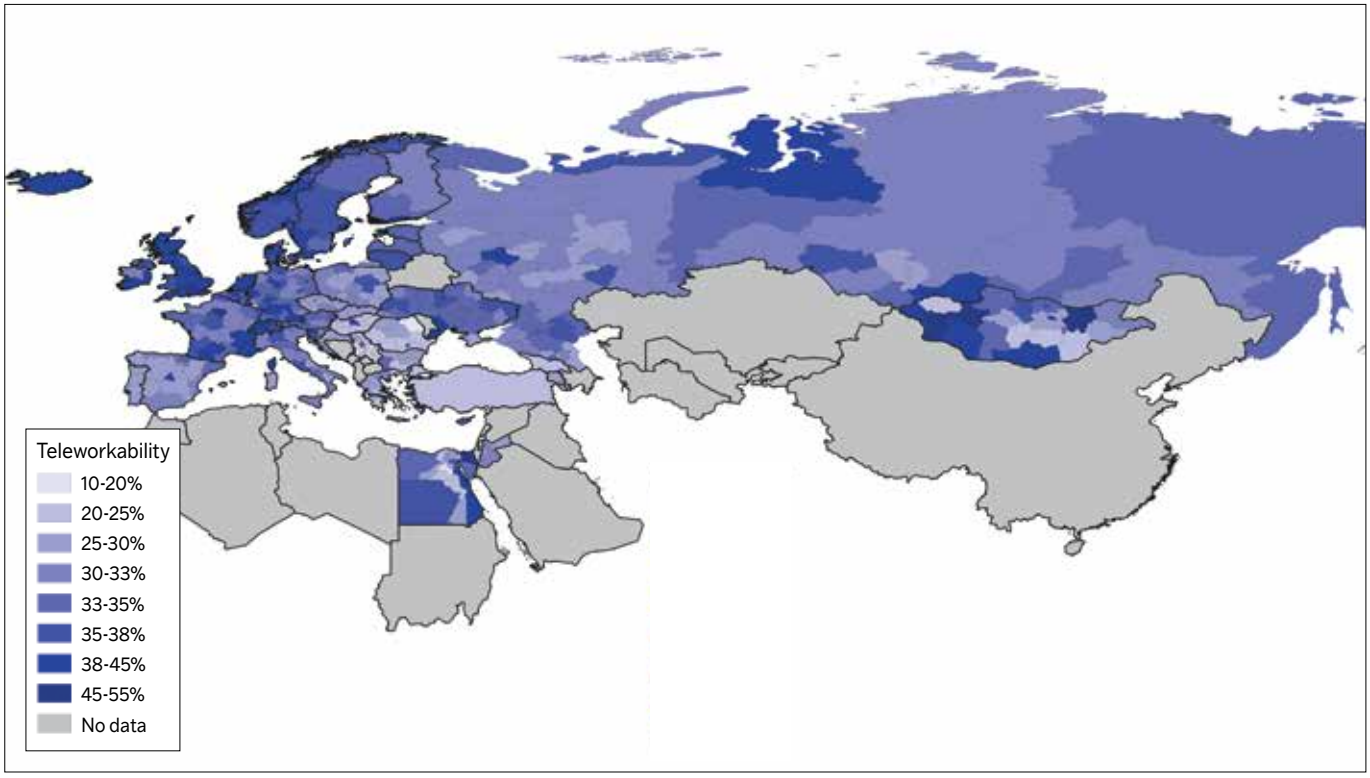
While the pandemic has led to unprecedented adoption of new technologies and processes in order to accommodate remote working, it has also reinforced pre-existing trends.[10] In order to better understand the ways in which digitalisation may transform labour markets across the EBRD regions, this chapter first analyses the pre-Covid-19 status quo in terms of both teleworkability (as a measure of *potential* remote working) and *actual* remote working. It does so by looking at various labour force surveys covering the European Union (including 14 economies in the EBRD regions), Armenia, Egypt, Georgia, Jordan, Mongolia, Russia, Serbia, Ukraine, and the West Bank and Gaza.

We can see from those data that women are more likely to have teleworkable jobs than men (see Chart 3.1). Furthermore, that female-male teleworkability gap is typically larger in the EBRD regions than in advanced comparator economies. This is driven mainly by women's greater representation in the service sector (although women are, in fact, under-represented in the *most* teleworkable occupations, such as management positions). In contrast, men are clustered in industries in the lowest quintile of the teleworkability distribution (such as agriculture, construction, manufacturing and mining).

In most economies in the EBRD regions, young people (aged 25-34) are most likely to have teleworkable jobs, followed by the middle-aged (35-54) and then older workers (55-64; see Chart 3.2). In more advanced economies, by contrast, middle-aged people are most likely to have teleworkable jobs, with no clear pattern for younger and older workers. In some EBRD regions, this could be explained by a combination of fast-growing digital-intensive sectors and weak ICT skills among older workers (see also Chapter 1). Between 2006 and 2016, for example, 40 per cent of all new jobs in OECD countries were created in highly digital-intensive sectors.[11] Meanwhile, data from the OECD's Programme for the International Assessment of Adult Competencies (PIAAC) – an assessment of adult skills – show that the percentage of older people in EBRD economies who have good ICT skills is between 5 and 14 percentage points lower than the average for advanced economies (see Chart 3.3). ICT skills are generally stronger among the young, although even younger cohorts in the EBRD regions lag behind their counterparts in advanced economies.

[10] See Mas and Pallais (2020).
[11] See OECD (2020). Digital intensity is measured as a combined average of sector-specific rankings for five indicators: ICT investment as a percentage of total investment; purchases of intermediate ICT goods and services relative to output; the stock of robots per employee; ICT specialists as a percentage of total employment; and propensity to engage in e-commerce sales. "Low", "medium" and "high" digital intensity refer to the bottom 25 per cent, the middle 50 per cent and the top 25 per cent of the distribution of average scores respectively (see Calvino et al., 2018).

CHART 3.4. Some economies have significant regional variation in the percentage of jobs that are teleworkable



Source: Dingel and Neiman (2020), labour force surveys (2016-19) and authors' calculations.
Note: This map is used for data visualisation purposes only and does not imply any position on the legal status of any territory.

Cities typically have a higher percentage of teleworkable jobs than rural areas. However, this pattern is more pronounced in some economies than others (see Chart 3.4). A number of economies (including most advanced European economies, as well as Ukraine) have relatively high average teleworkability, with limited variation across subnational regions.[12] In contrast, many others (including most economies in the EBRD regions) are characterised by significant intra-economy variation, with up to 55 per cent of jobs being teleworkable in a single metropolitan area, compared with only around 10 to 30 per cent in most other regions. This imbalance is suggestive of strong economies of agglomeration – and, conversely, limited economic development in more peripheral regions. (Turkey, where detailed regional data are unavailable, has low overall teleworkability – fewer than 30 per cent of people have teleworkable occupations.)[13]

IN MANY ECONOMIES, UP TO 55% OF JOBS ARE TELEWORKABLE IN A SINGLE METROPOLITAN AREA, COMPARED WITH AROUND 10-30% IN MOST OTHER REGIONS

[12] Comparator economies include Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom.
[13] All figures for Armenia and Turkey in this chapter have been calculated using one-digit ISCO codes.

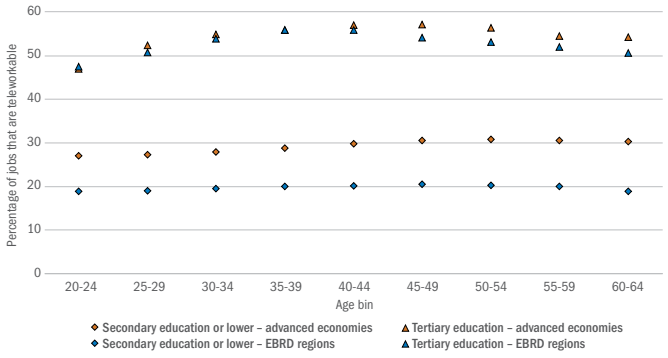
In the EBRD regions, workers with lower levels of education are the least likely to have teleworkable jobs. They are also much less likely to have teleworkable jobs than peers in the same age cohort in advanced economies (see Chart 3.5). In contrast, the EBRD regions are very similar to advanced economies when it comes to the percentage of highly educated workers with teleworkable jobs. The more pronounced differences among the less educated are probably partly due to occupational structures and partly due to a skills gap. For example, in economies outside the EBRD regions, people without tertiary qualifications do medium-skill and even high-skill jobs: in those economies, around 10 per cent of people without such qualifications are managers or professionals, compared with 5 per cent in the EBRD regions.[14]

Teleworkability among young, highly educated workers in the EBRD regions is similar to that of their peers in other economies. This is in stark contrast with the situation observed for older highly educated workers, where economies in the EBRD regions are lagging behind (see also Chapter 1). The difference between the two could reflect the long-term impact of transition. Middle-aged and older workers will have received their tertiary qualifications prior to 1990 and may have struggled to transfer their skills to jobs in the new market economy. This could have resulted in highly educated workers ending up in low-skill careers. In the EBRD regions, for example, 5 per cent of people with a tertiary education are employed in elementary occupations, with another 5 per cent working as plant and machine operators.

As one might expect, working from home is indeed more prevalent in more teleworkable occupations. However, the relationship between the two is weak in the EBRD regions (see Chart 3.6). The percentage of jobs that are teleworkable in theory ranges from 23 per cent in Romania to 36 per cent in Lithuania. These levels are comparable to those seen in advanced economies such as Austria and France (though a long way short of the 49 per cent seen in the economy with the highest rate – Luxembourg). However, the EBRD regions have much smaller percentages of people who actually report working from home. Indeed, in all but three of the EBRD economies in the sample, less than 10 per cent of the labour force sometimes work from home. And even in the other three – Estonia, Poland and Slovenia – less than 20 per cent of people sometimes work from home.

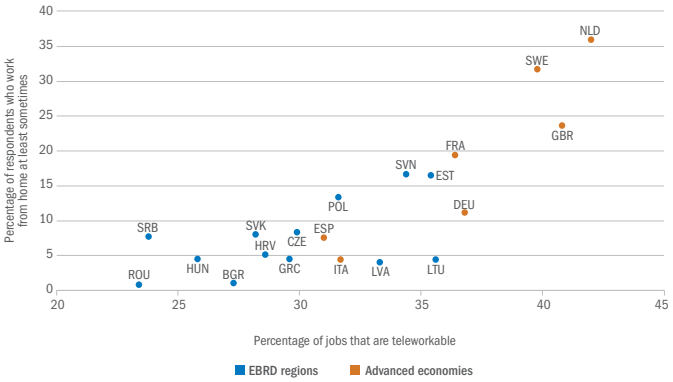
5%
OF TERTIARY-EDUCATED WORKERS IN THE EBRD REGIONS HAVE ELEMENTARY OCCUPATIONS, WITH ANOTHER
5%
WORKING AS PLANT AND MACHINE OPERATORS

CHART 3.5. The difference between the EBRD regions and advanced economies in terms of teleworkability is driven by people with lower levels of education



Source: Dingel and Neiman (2020), labour force surveys (2016-19) and authors' calculations.

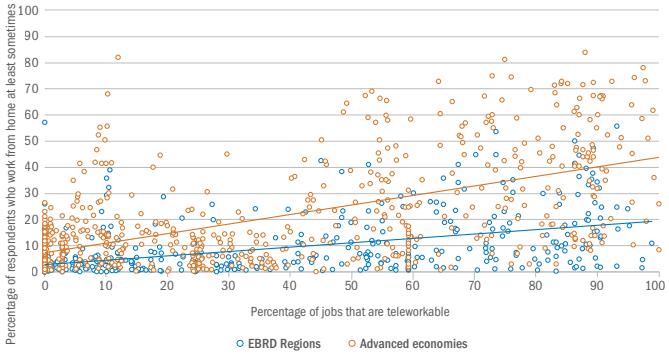
CHART 3.6. Teleworkability is a predictor of actual remote working, but this correlation is weaker in the EBRD regions



Source: Dingel and Neiman (2020), labour force surveys (2016-19) and authors' calculations.

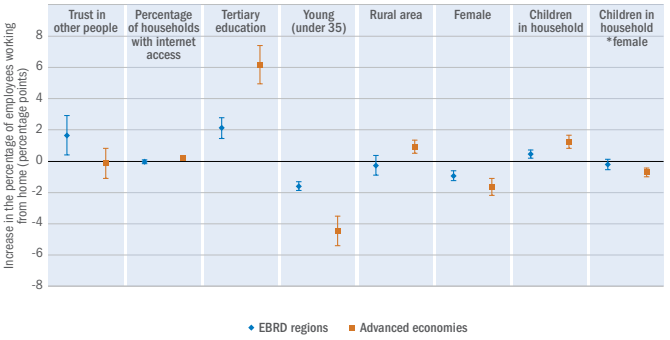
[14] In this analysis, "high-skill" occupations comprise managers, professionals, technicians and associate professionals. "Medium skill" occupations comprise clerical support workers, service and sales workers, skilled agricultural, forestry and fishery workers, and crafts and related trades. "Low-skill" occupations comprise plant and machine operators, assemblers and elementary occupations.

CHART 3.7. Levels of remote working are low in the EBRD regions, even taking into account differences in countries' occupational structures



Source: Dingel and Neiman (2020), labour force surveys (2016-19) and authors' calculations.

CHART 3.8. Interpersonal trust is strongly associated with working from home in the EBRD regions



Source: European Social Survey (2008-16), labour force surveys (2016-19) and authors' calculations.
Note: This chart plots the marginal increase in the percentage of employees working from home "at least sometimes" that is associated with a one unit increase in the different variables. The trust variable is standardised, so the point estimate gives the marginal increase in the percentage of people working from home that is associated with a 1 standard deviation improvement in trust in other people. Square brackets indicate 95 per cent confidence intervals. See Box 3.2 for further details.

Even in economies where a high percentage of jobs could potentially be done from home, actual remote working is limited in the EBRD regions. This remains the case even when taking account of differences in countries' occupational structures (see Chart 3.7, which shows the same correlation as Chart 3.6, but disaggregated by occupation). As in advanced economies, there is substantial variation in the teleworkability of country-occupation pairs in the EBRD regions. However, while some economies in the EBRD regions have teleworkability rates similar to those seen in advanced economies, actual use of that capacity is consistently low.

Low levels of remote working may reflect factors beyond the availability of the necessary digital infrastructure. Thus, the following analysis looks at whether trust – which, through its link with social capital, is associated with better-functioning local governments and stronger economic growth[15] – could also influence levels of remote working.[16] Low trust can inhibit teleworkability if it prevents employers from giving (or employees from accepting) permission to work with less supervision. Recent research also shows that interpersonal trust is relatively low in the EBRD regions.[17]

Regression analysis indicates that living in a subnational region with high levels of interpersonal trust is indeed important in explaining remote working in the EBRD regions, even when controlling for the availability of internet infrastructure (see Chart 3.8 and Box 3.2). The identified effects also control for individual demographic characteristics (gender, level of education and whether there are children in the home) and both country and occupation-industry fixed effects.

An individual living in a region where trust is 1 standard deviation higher is 1.7 percentage points more likely to work from home at least sometimes. This is a sizeable effect, as the average percentage of people working from home at least sometimes was just 5.7 per cent in the EBRD regions prior to the pandemic. Thus, trust barriers may limit the gains from teleworkability relative to more advanced economies.

In advanced economies, there is a significant correlation between internet coverage and working from home. In regions with high-quality digital infrastructure, even rural residents with teleworkable jobs can work from home,

PRE-PANDEMIC, THE AVERAGE PERCENTAGE OF PEOPLE WORKING FROM HOME AT LEAST SOMETIMES WAS JUST
5.7%
IN THE EBRD REGIONS

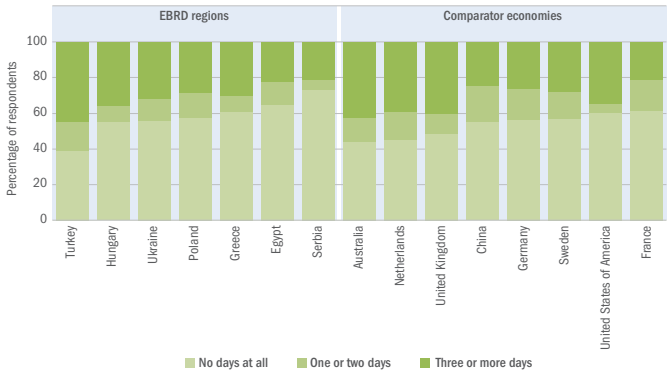
[15] See Beugelsdijk et al. (2004) and Putnam (1993).
[16] See De Leede and Kraijenbrink (2014).
[17] See EBRD (2011).

saving on commuting time. In the EBRD regions, by contrast, there is no significant correlation between internet coverage and working from home once regional development indicators have been controlled for, suggesting that workers may not be able to work from home even in regions that have high-quality digital infrastructure.

People with a tertiary education are more likely to work from home than people with lower levels of education. This probably reflects both (i) the fact that they are more likely to choose occupations that are teleworkable in theory and (ii) the fact that they are more likely to have good digital skills. However, the correlation is significantly higher in advanced economies. Since this analysis controls for income and place of residence, the differences between the effects of tertiary education in the EBRD regions and advanced economies are likely to be driven by skill mismatches. For example, the percentage of tertiary-educated employees holding jobs in manufacturing or mining is higher in the EBRD regions than it is in advanced economies.

The analysis also shows that, within occupations, women and young people are the least likely to work from home. Parents are more likely to work from home, and in the EBRD regions mothers are no more likely to work from home than fathers. This could mask a selection effect, whereby women who would prefer to work remotely opt out of the labour force when such options are limited. Thus, new trends in teleworking may open up new opportunities for mothers to work full time. This also underlines the importance of childcare and early childhood development programmes in terms of supporting working parents.

CHART 3.9. A substantial proportion of respondents worked from home in August 2021



Source: EBRD-ifo survey (2021) and authors' calculations.
Note: This chart shows the percentage of respondents aged 20-59 who worked from home (i) one or two days, (ii) three or more days, or (iii) no days at all in the survey week, broken down by country. The survey question was: "How many full paid working days are you working from home this week?"

Working from home: attitudes and expectations

The sudden closure of workplaces during the pandemic ushered in a new era of remote working for millions of employees and triggered a significant shift in the attitudes and expectations surrounding remote working. This section draws on the results of a new large-scale online survey that the EBRD and the ifo Institute recently conducted in 15 countries (including 7 economies in the EBRD regions), the respondents for which were representative of the working-age population in terms of age, gender and educational attainment. The purpose of the survey was to understand employees' experiences with working from home (in terms of time allocation, efficiency and future preferences) and employers' post-pandemic plans as regards remote working. While the survey provides early insights into such patterns and preferences, the limitations of online surveys should be borne in mind when considering the analysis that follows. In particular, online surveys may suffer from sampling bias, as certain sections of the population (such as elderly and rural residents) are less likely to have internet access and respond to online questionnaires, whereas the young, those living in cities, and those with higher levels of education and better digital skills are more likely to respond.

This survey points to a considerable Covid-induced shift towards remote working across the EBRD regions. The percentage of people who work remotely at least sometimes has increased from 8 to 44 per cent in Hungary, from 14 to 41 per cent in Poland, from 5 to 39 per cent in Greece and from 8 to 27 per cent in Serbia. More than 44 per cent of respondents spent at least one day working from home in the survey week (42 per cent in the EBRD regions, 47 per cent in high-income countries and 44 per cent in China; see Chart 3.9). In the EBRD regions, Turkey, Hungary and Ukraine had the highest levels of remote working, with 60, 45 and 44 per cent of respondents respectively saying that they worked from home at least one day that week. Levels of remote working in the EBRD regions are generally somewhat lower than in advanced European economies, but similar to China.

Respondents were also asked about their preferences as regards remote working after the pandemic. In order to inform possible future trends, respondents were asked the following questions:

- "After Covid, in 2022 and later, how often would you like to work from home (that is, have paid workdays at home)?"
- "After Covid, in 2022 and later, how often is your employer planning for you to work full days at home?"

Respondents with a tertiary education, those who previously commuted long distances (in 2019), those who use computers at work and those with children in the household all reported stronger preferences for working from home.

More generally, however, there is a gap between what employees desire and what they believe their employer is planning for the future (see Chart 3.10). Employees, for example, have a very strong preference for working from home in all countries: on average, they would like to do about two full working days per week at home once the pandemic is over.

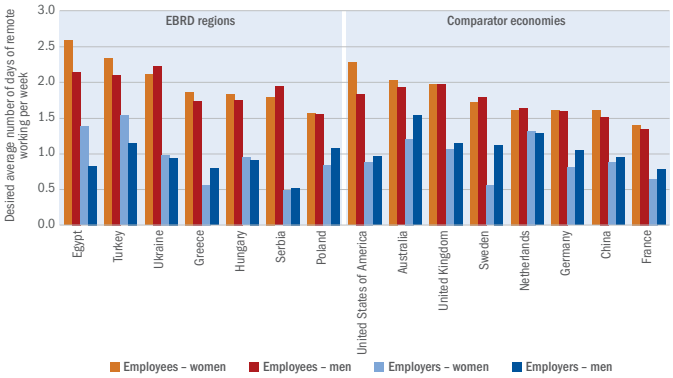
Respondents generally reported favourable experiences with working from home. In the EBRD regions, 40 per cent of respondents reported that working from home had turned out better than they had expected pre-Covid, whereas only 14 per cent reported that it had turned out worse than expected. Indeed, respondents would, on average, even be willing to forgo 5 to 10 per cent of their monthly income in exchange for the option of working from home two or three days per week after the pandemic.

In contrast, employers plan, on average, to allow one full day of remote working per employee per week. That is consistent with recent research in this area, which has found that business leaders often mention concerns around workplace culture, motivation and innovation as important reasons for bringing workers onsite three or more days per week.[18]

There are notable gender-based differences in preferences for remote working. In Egypt, Turkey and Ukraine, for example, preferences for remote working are considerably higher among women. In Greece and Poland, meanwhile, women have a stronger desire to work from home than men, but are less likely than men to believe that their employer will allow it. More generally, regression analysis controlling for earnings, the industry in question and the composition of the occupation shows that women are 5 percentage points less likely than men to believe that their employer plans to allow them to work from home at least one day a week after the pandemic.

In line with previous research, the results of this survey also suggest that the pandemic-induced shift towards working from home might increase efficiency.[19] About a third of respondents report that they have been more efficient working from home during the pandemic than they were working on the firm's premises before the pandemic (see Chart 3.11). On average, workers in the banking, finance, insurance and ICT service sectors report that they are over 7 per cent more efficient, whereas people working in education report efficiency gains of less than 1 per cent. In the EBRD regions, Turkey has the highest percentage of respondents perceiving themselves to be more efficient (more than 40 per cent), followed by Greece and Poland. At the other end of the spectrum, the lowest percentage of respondents experiencing efficiency gains is in Ukraine (25 per cent). Additional analysis indicates that while 39 per cent of respondents aged 45 to 59 in comparator economies report increased efficiency, the same is true of only 26 per cent of respondents in that age group in the EBRD regions. For respondents below the age of 45, the equivalent figures are 42 and 36 per cent respectively. Overall, self-reported efficiency gains in the EBRD regions are lower than in advanced economies, but higher than in China.

CHART 3.10. There is a gap between the views of employees and employers as regards working from home



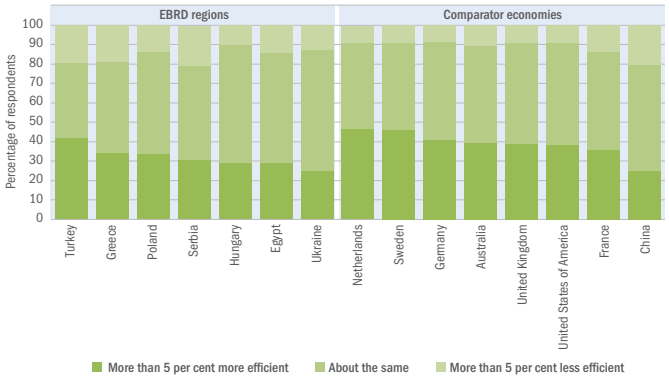
Source: EBRD-ifo survey (2021) and authors' calculations.
Note: Respondents who were unaware of their employer's plans (19 per cent of respondents) and those who did not have an employer at the time of the survey (4 per cent) have been omitted from this analysis.

The pandemic has also improved attitudes towards working from home in all countries (see Chart 3.12). About 65 per cent of respondents report improvements in this regard, ranging from 78 per cent in Turkey to 49 per cent in Poland. Less than 10 per cent report a deterioration.

Improved perceptions about remote working, coupled with lingering fears about being around other people, are likely to sustain people's desire to work from home. Only about a third of respondents say that they will fully return to pre-Covid-19 activities once most of the population has been vaccinated. The vast majority of respondents report that they will continue to avoid crowded lifts, travelling on underground trains and dining indoors at restaurants.

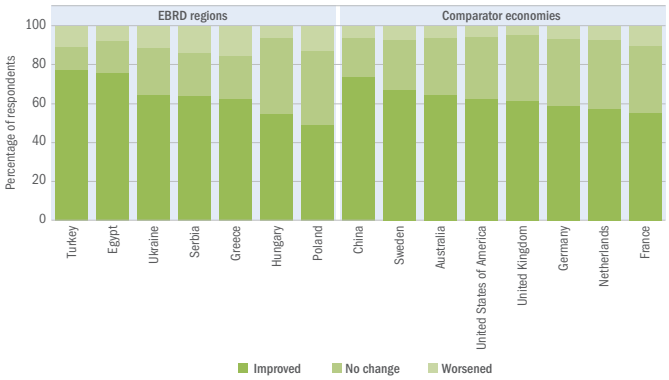
[18] See Barrero et al. (2021) and Altig et al. (2020).
[19] See Barrero et al. (2021).

CHART 3.11. About a third of respondents believe they are more efficient when working from home



Source: EBRD-ifo survey (2021) and authors' calculations.
Note: The survey question was: "How does your efficiency working from home during the Covid-19 pandemic compare to your efficiency working on business premises before the pandemic?"

CHART 3.12. Perceptions about working from home have improved in most economies



Source: EBRD-ifo survey (2021) and authors' calculations.
Note: The survey question was: "Since the Covid pandemic began, how have perceptions about working from home changed among people you know?"

ABOUT A THIRD OF WORKERS SAY THAT THEY HAVE BEEN MORE EFFICIENT WORKING FROM HOME DURING THE PANDEMIC

Advances in AI: transforming the jobs that people do

AI technologies can perform tasks that humans would otherwise do. Such tools can be both labour saving and labour-augmenting, so they have the potential to both displace and create jobs.

On the one hand, AI technologies can generate digital dividends through increases in the marginal productivity of labour. This, in turn, can increase labour demand, for both pre-existing and previously non existent occupations. As with the first wave of digitalisation (which was characterised by widespread adoption of the personal computer) and with robotisation, one can expect labour productivity to increase as a result of the adoption of AI.[20] This will happen in occupations where AI is complementary to human effort. Such occupations tend to be non-manual and include a combination of both routine and non-routine work. Rather than complete routine tasks themselves, workers can use AI. Already, advances in AI have delivered impressive results in the fields of translation, text generation and legal research. The time saved can then be used for more creative or interpersonal aspects of production.[21]

On the other hand, AI can also be used to replace human workers. Such job displacement occurs when the new technology performs tasks just as well as – or better than – humans, such that the technology can be substituted for human labour. AI is advancing rapidly in this regard. For example, machine learning models are now better at detecting lung cancer from CT scans than experienced radiologists.[22]

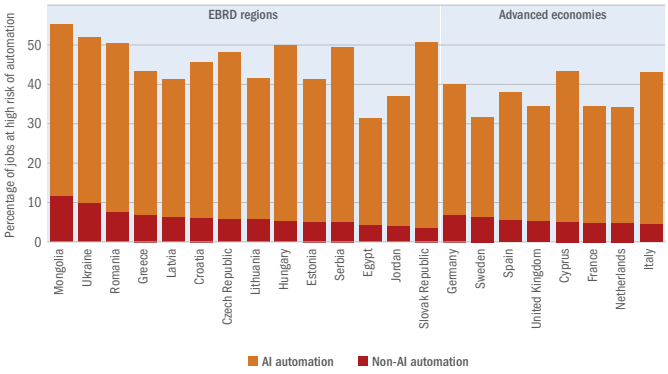
[20] See Cardona et al. (2013), Brynjolfsson and Hitt (2003) and Graetz and Michaels (2018).
[21] See Damioli et al. (2021) for evidence of increases in productivity at firms patenting AI.
[22] See Ardila et al. (2019).

This section assesses AI exposure, looking at how it is distributed across countries, regions, gender and age cohorts (see also Box 3.4 on the ways in which industrial robots affect the gender pay gap). AI exposure is measured as a weighted share of the abilities that AI technologies can perform in a given occupation (see Box 3.1 for details).[23] While greater AI exposure does not automatically mean greater displacement (as automation may not be profitable), jobs with very high levels of AI exposure will be more vulnerable to displacement.

This section also compares the percentages of jobs that are at risk of displacement by AI and non-AI automation.[24] Non-AI automation involves the use of computer controlled equipment such as industrial robots, which has been at the heart of recent debates about digitalisation and job losses.

Lastly, this section estimates changes in employment that are due to advances in AI (see Box 3.6 for a discussion of the wider implications for the labour market). A decline in employment in highly exposed occupations would point to a net displacement of labour, while an increase would be indicative of a net productivity effect. Employment effects for tertiary and non-tertiary-educated workers are evaluated separately. This analysis of changes in employment does not seek to predict productivity growth or job creation. Nonetheless, assessing the net impact of AI so far, and the areas that are vulnerable to displacement, can provide an indication of the ways in which AI may affect labour markets.

CHART 3.13. Fewer jobs are at high risk of displacement by AI automation than non-AI automation



Source: Felten et al. (2018), Frey and Osborne (2017), labour force surveys (2016-19) and authors' calculations.
Note: An occupation has a high level of exposure to non-AI automation if the probability of computerisation, as defined by Frey and Osborne (2017), exceeds 0.7. Similarly, an occupation has high exposure to AI automation if its normalised AI exposure exceeds 0.7. See Box 3.1 for details.

THE 10% OF OCCUPATIONS WITH THE HIGHEST AI EXPOSURE ACCOUNT FOR JUST 6.3% OF JOBS IN THE EBRD REGIONS (RANGING FROM 3.6% IN THE SLOVAK REPUBLIC TO 11.8% IN MONGOLIA)

Jobs that can be done by AI

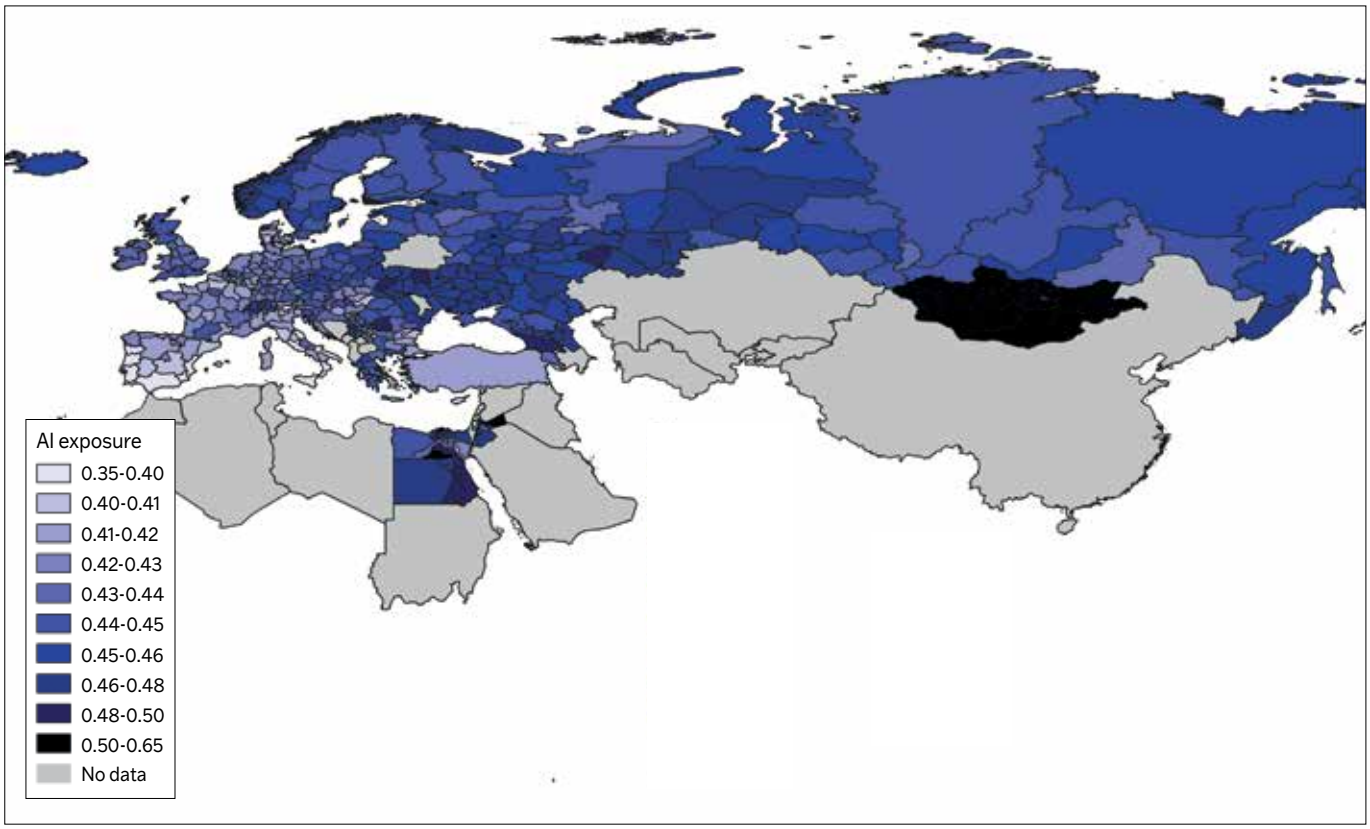
The 10 per cent of occupations with the highest AI exposure scores account for only 6.3 per cent of jobs in the EBRD regions (with that percentage ranging from 3.6 per cent in the Slovak Republic to 11.8 per cent in Mongolia; see Chart 3.13). Thus, AI technologies threaten substantially fewer jobs than non-AI automation.

Many economies in the EBRD regions have higher levels of AI exposure than advanced European economies (see Chart 3.14). Previously, demand for AI-related skills was confined almost exclusively to the ICT sector, but that is no longer the case.[25] For instance, Mongolia's high AI exposure is driven by the fact that agricultural workers – an occupation with a high level of exposure to AI – make up a large percentage of the country's labour force. In advanced European economies, by contrast, many such jobs with high exposure to AI are already in decline as a result of new production technologies (including AI-based methods).[26]

AI exposure varies more across occupations than across countries. Highly exposed occupations typically involve a variety of abilities that AI technologies can perform reasonably well, such as vision related, communication and cognitive abilities. In contrast, occupations that rely mostly on manual dexterity have low levels of AI exposure. The people with the least exposed occupations are cleaners and domestic helpers, while health professionals (including both

[23] See also Felten et al. (2018).
[24] See Frey and Osborne (2017).
[25] See Alekseeva et al. (2021) and Chapter 1 of this report.
[26] See also Cedefop (2016).

CHART 3.14. The EBRD regions have higher levels of AI exposure than advanced European economies

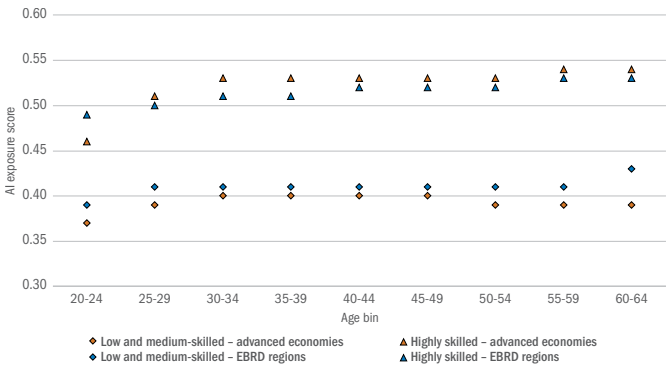


Source: Felten et al. (2018), labour force surveys (2016-19) and authors' calculations.
Note: This map is used for data visualisation purposes only and does not imply any position on the legal status of any territory.

nurses and surgeons) are among the most highly exposed since AI is adept at performing vision-related tasks and can quickly combine and organise information. High-skill jobs in the field of science, such as physicists, also have high levels of AI exposure owing to AI's proficiency in inferring rules from information and combining information to deduce formal rules.

While the occupations of highly skilled workers are 25 to 40 per cent more exposed to AI than those of low-skilled workers (see Chart 3.15), highly skilled workers may still benefit more from advances in AI in the long run (see also Box 3.5 for a discussion on promoting equal opportunities in the context of digitalisation). One reason for this is that high-skill jobs often require a combination of tasks, involving both pattern-recognition tasks (which are very well suited to AI) and interpersonal tasks (which are less suitable for AI).

CHART 3.15. Differences in AI exposure on the basis of skill levels are smaller in the EBRD regions than in advanced economies



Source: Felten et al. (2018), labour force surveys (2016-19) and authors' calculations.

MEN ARE MORE LIKELY TO HAVE OCCUPATIONS WITH A HIGH LEVEL OF AI EXPOSURE

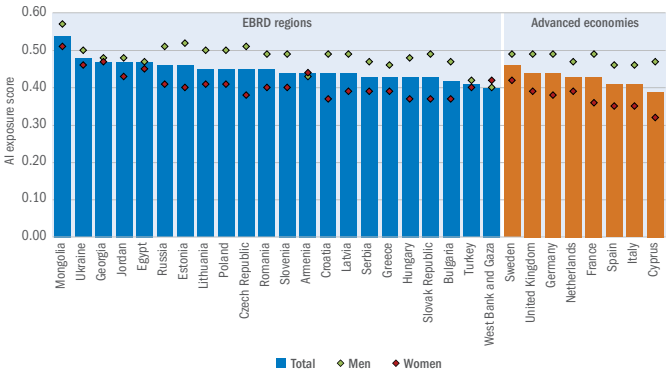
The highly exposed jobs performed by highly skilled workers (such as medical doctors, physical and earth science professionals, engineering professionals and life science professionals) have high levels of AI exposure because of their pattern-recognition tasks, which AI does well. Thus, while it may be unwise to completely automate patient-facing healthcare occupations, for example, it is entirely possible for AI to perform large percentages of the diagnostic tasks associated with such jobs.

Men are more likely to have occupations with a high level of AI exposure (see Chart 3.16). Highly exposed occupations commonly held by men include jobs in the electrical and electronic sector and jobs in the protective services sector.

In order to assess the net effect that advances in AI have on employment, this chapter analyses changes in each occupation's share of national employment between 2011 and 2019 that could be linked to AI exposure (controlling for factors that could influence both AI exposure and employment growth). The ICT industry is omitted (see Box 3.2 for details). The results indicate that, although the effect is not statistically significant, occupations with higher levels of AI exposure have seen a decline in their share of national employment. The effect is larger for highly skilled workers (see Chart 3.17). At industry level, however, the correlation is positive and statistically significant. A 1 standard deviation increase in an industry's AI exposure is associated with a 3 per cent increase in its share of employment, with an additional 4.6 per cent increase for tertiary-educated workers. By way of comparison, tertiary educated workers' share of overall employment rose by over 30 per cent more than that of non-tertiary-educated workers in the same period.

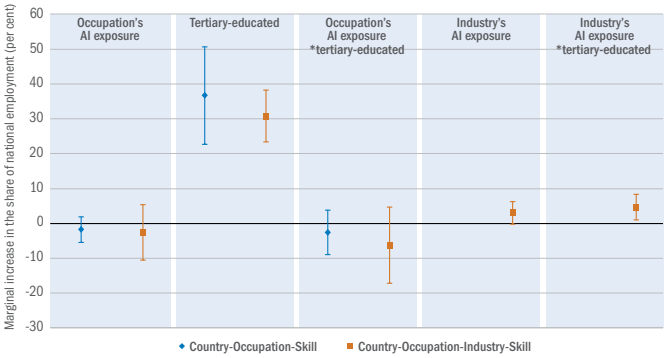
Thus far, advances in AI have not yet had a strong impact on employment,[27] but as AI becomes more sophisticated, the level of AI exposure will increase for many occupations. This analysis does not seek to predict which new jobs will be created as a result of future AI technologies or which jobs will be made redundant. Indeed, the measure of exposure does not capture the most recent advances in AI, such as those seen in the field of natural language processing. Nonetheless, the analysis presented here points to a complex impact on the labour market, with highly educated people benefiting relative to less-educated workers.

CHART 3.16. In almost all economies, men's jobs have higher levels of AI exposure



Source: Felten et al. (2018), labour force surveys (2016-19) and authors' calculations.

CHART 3.17. Exposure to AI is associated with a limited decline in the share of employment at occupation level



Source: Dingel and Neiman (2020), EU labour force surveys (2011 and 2019), Felten et al. (2018), Goos et al. (2014), Webb (2019) and authors' calculations.
Note: This chart plots the marginal increase in the share of national employment that is associated with a 1 standard deviation increase in the different variables, broken down by industry and occupation. Square brackets indicate 95 per cent confidence intervals. See Box 3.2 for details of the regression.

[27] A separate analysis using the European Social Survey fails to find any impact on wages over the period 2010-14 as a result of exposure to AI. Thus, any productivity effects are not reflected in wages.

Conclusion

The digitalisation of the workforce is changing the ways in which people work and the jobs that they do. Covid-19 has accelerated pre-existing trends, particularly by bringing forward some workers' geographical separation from the office. Across the EBRD regions, women are more likely to have teleworkable occupations than men. However, they are also less likely to work from home in practice. And while highly educated workers in the EBRD regions are up to three times more likely to have a teleworkable occupation than workers with lower levels of education, the rate at which they work from home is far lower than that of their peers in more advanced economies. Some of that is to do with trust, since people in regions with lower levels of interpersonal trust are less likely to work from home, even after controlling for occupational characteristics.

Low levels of digital skills are probably also a barrier to increases in remote working, especially among older workers. Unlike in advanced economies, older cohorts in the EBRD regions are less likely to have teleworkable occupations. However, even young people in the EBRD regions have weaker ICT skills than their peers in more advanced economies.

When it comes to actual remote working, workers have proven that they can be productive outside of the workplace, and acceptance of remote working has increased. Survey respondents have indicated that they want to keep working from home after the pandemic ends, planning to work about two full days per week from home. These results suggest that, broadly speaking, working from home is likely to become more acceptable in the longer term.

The pandemic may also be accelerating firms' adoption of AI technologies. Workers who perform routine cognitive tasks may start to see many of those tasks being executed by AI. While occupations with the highest exposure to AI account for only a small percentage of overall employment, some sectors may be dramatically affected, including sectors not traditionally thought of as digital-intensive. The impact of AI can be expected to increase over time. Thus far, the effect of high AI exposure on employment growth at occupation level has been negative but not statistically significant. Meanwhile, the impact has been marginally greater for highly skilled workers in highly exposed industries, pointing to possible productivity effects.

These findings have several policy implications. First, increases in teleworking may lead to de-urbanisation.[28] Regions with high levels of teleworkability may then lose low and medium-skill jobs that serve the commuting population. The resulting reduction in the tax base could also weigh on local spending on infrastructure, maintenance and other public goods. Monetary support for cities undergoing such a transition will be important – for example, so that local governments can help to match remaining residents to appropriate jobs.

Second, the upgrading of skills will be essential for economies in the EBRD regions. Private sector-led digital training programmes can send clear signals about demand for skills, while also increasing supply. Moreover, closing the gap in terms of ICT-related skills will help the EBRD regions to leverage the benefits of future technological change while minimising any disruptive impact that digitalisation has on the labour market. At the same time, this may potentially make economies in the EBRD regions more attractive as destinations for teleworkable jobs offshored from advanced economies.

Third, although AI technologies have not yet had a significant impact on employment at occupation level, job vacancies advertised by highly exposed firms are showing increased demand for skills that complement AI, implying an intention to make greater use of AI moving forward.[29] This suggests that policymakers should be aware of the potential for job displacement – not only for low and medium-skill occupations, but also for some highly exposed, high-skill occupations. Specific suggestions in this regard include: (i) providing child support payments to displaced parents, in order to mitigate the intergenerational impact of job losses; (ii) encouraging collaboration among private-sector partners with a view to helping workers to find new employment; (iii) helping people to deal with the psychological impact of job displacement, for example by raising awareness of and increasing support for displaced people within their communities; and (iv) broadening eligibility for wage support payments, for instance by making them available to part-time employees.

[28] See also Federal Reserve Bank of Dallas (2020).
[29] See Acemoğlu et al. (2020a).

BOX 3.1.

Constructing measures of teleworkability and exposure to AI

This box explains the measures of teleworkability and AI exposure that are used in this chapter, which are constructed in line with Dingel and Neiman (2020) and Felten et al. (2018) respectively. In this analysis, each occupation is defined as a finite collection of core tasks, which require specific skills. For example, a chief executive carries out a broad range of tasks, such as "making decisions and solving problems" and "developing and building teams".

Teleworkability

An occupation is considered to be teleworkable if all of the relevant tasks can be performed remotely. Occupations that are not teleworkable involve at least one task that cannot be carried out remotely. The task content of occupations is sourced from the "work content" and "work activities" modules of the O*NET database. That database contains data on 1,000 occupations in the United States of America (disaggregated at the level of six-digit SOC codes). Data are collected by surveying randomly sampled workers, as well as occupation experts. A median of 25 workers are surveyed per occupation.

All occupations are assessed on the basis of the same 15 tasks. For example, if the majority of survey respondents spend the majority of their time at work walking or running, the occupation as a whole is not considered to be teleworkable. Teleworkability scores for six-digit SOC codes are mapped to two and three-digit ISCO occupational codes using employment weights. However, a number of caveats apply. Partially teleworkable occupations (which account for around 10 per cent of workers) are considered to be non-teleworkable in this analysis. Moreover, estimates based on a US survey may not be an entirely accurate reflection of an occupation's task content at a global level (although they should provide a useful approximation).

AI exposure

The measure of AI exposure relies on data on the ability requirements of each occupation, based on 52 distinct abilities recorded in O*NET. Examples of abilities include spatial orientation, fluency of ideas and reaction time. In addition, each AI technology is characterised by the speed of its progress between 2010 and 2015, using data from the Electronic Frontier Foundation (EFF) and the methodology in Felten et al. (2018).

Each technology is mapped to 16 categories of AI (such as image recognition, speech recognition or machine translation), and they, in turn, are mapped to the abilities in O*NET. This generates a weighted measure of AI performance for each ability. The AI exposure score for an occupation aggregates the AI performance scores of the relevant abilities. AI exposure scores at six digit SOC level are then mapped to two and three-digit ISCO occupations. The final score is normalised such that it lies between 0 and 1.

The main caveat with this measure is that it relies on published data on the progress of AI, which could exclude private development efforts and understate actual progress for some technologies. A second caveat is that the abilities which are needed to carry out more complex tasks may be harder to quantify. Lastly, the relationship between advances in AI and their commercial use may be non-linear. Whereas some tasks, such as autonomous driving, require very robust levels of performance, for other tasks (such as recognition of handwritten addresses) the bar may be much lower.

BOX 3.2.

Regression analysis

Trust and propensity to work from home

In the analysis of the importance of trust for the propensity to work from home, working from home for at least one hour per week is linked to the average level of trust in a person's region of residence, the percentage of households with broadband internet and individual level characteristics (including occupation (at three-digit level), industry of employment (at one digit level) and country of residence).

The average level of trust in other people is measured at NUTS-2 level using an average of waves 4 to 8 of the European Social Survey. The percentage of households with broadband internet at NUTS-2 level is obtained from Eurostat.

NUTS-2-level control variables include the European Quality of Government Index produced by the University of Gothenburg, trust in police (derived from the European Social Survey) and population density (taken from Eurostat). In addition, several individual-level variables are included in the analysis: dummy variables indicating whether a person is tertiary-educated, lives in a rural administrative unit, is male or female, is under 35 years of age, has children in their household (for men and women separately) or works part time. The analysis also includes occupation-industry fixed effects. The sample includes all respondents participating in EU labour force surveys in the period 2016-19 who were aged between 18 and 64 and part of the workforce. Bulgaria, Malta, Poland and Slovenia are excluded, since detailed data on occupations are not available. The regressions are run separately for the EBRD regions and comparator economies.

Changes in employment and exposure to AI

Linear probability model regressions relate (i) relative changes in employment between 2011 and 2019 in a bin comprising a given occupation, level of educational attainment and country (as a percentage of total employment) to (ii) the measure of AI exposure for a given occupation. A similar specification is used to relate (i) changes in employment at country-industry-occupation-education level to (ii) AI exposure at both industry and occupation level. Another key coefficient of interest is that of a binary dummy for tertiary education. Interaction terms combining AI exposure and tertiary education are included to assess the differential impact that AI has on low and high-skilled workers.

Additional control variables include measures of exposure to software and exposure to robotisation derived from Webb (2019), a measure of the ease with which production can be moved offshore – which is calculated for the same occupations and industries as AI exposure, building on Goos et al. (2014) – and country fixed effects. Occupations are at three-digit ISCO level, industries are at one-digit NACE level, and educational attainment indicates whether or not people are tertiary-educated.

Changes in employment shares are calculated on the basis of responses to labour force surveys conducted in 2011 and 2019, using the associated weights. (As before, Bulgaria, Malta, Poland and Slovenia are excluded.) ICT-related sectors are omitted, in order to focus on the effects in industries not closely involved in the development of AI. Standard errors are clustered at the level of measures of AI exposure.

BOX 3.3.

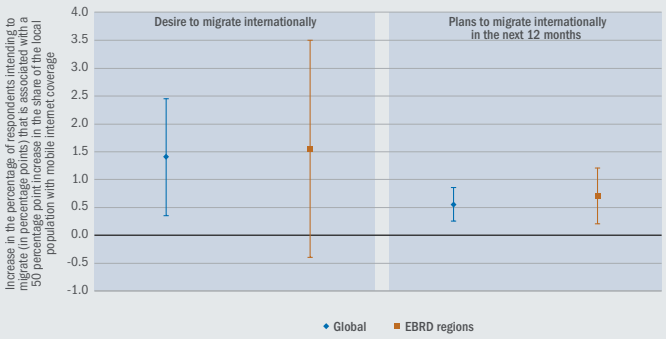
The expansion of mobile internet and increases in the desire to migrate

Digital technologies – particularly broadband internet, mobile phones and other means of sharing information digitally – have profoundly changed the ways in which people connect, meet and exchange information. This rapid technological progress has also led to increased interest in the socio-economic and political impact of widespread access to the internet, with the number of internet users worldwide rising from 413 million in 2000 to nearly 4.1 billion in 2019.[30]

The rapid expansion of mobile internet around the world means that people are increasingly gaining access to detailed information about living standards in other countries. Indeed, progress in terms of digital technologies has coincided with increases in cross-border migration: in 2017, almost 10 per cent of people living in the EBRD regions were not in their country of birth or citizenship – up from 8 per cent in 1990.[31]

This box looks at how the roll-out of mobile (3G) internet is shaping intentions to migrate abroad, both globally and in the EBRD regions. It combines data on intentions to migrate (as reported by more than 600,000 respondents surveyed as part of the Gallup World Polls across 2,105 subnational regions in 110 countries in the period 2006-18) with data on the roll-out of mobile internet derived from Collins Bartholomew's Mobile Coverage Explorer.

CHART 3.3.1. The expansion of 3G internet coverage is associated with increases in people's desire to migrate



Source: Gallup World Poll and authors' calculations.
Note: This chart reports estimated coefficients from a linear probability model regressing stated intentions to migrate on the percentage of the local population that has access to mobile internet. Controls include (i) gender, (ii) age, (iii) age squared, (iv) marital status, (v) the presence of children in the household, (vi) whether the respondent lives in an urban area, (vii) educational attainment, (viii) whether the respondent was born in the country, (ix) satisfaction with housing, health care, education, roads, transport, the city and life in general, (x) other attitudes, experiences and beliefs, (xi) the log of average per capita income in the region, (xii) the log of per capita income in the respondent's household, (xiii) the Polity 2 score and (xiv) the percentage of respondents under the age of 30. The 95 per cent confidence intervals shown are based on standard errors with two-way clustering at country-year and region level. The unit of analysis is at individual level.

The regression analysis relates intentions to migrate to the penetration of 3G mobile internet in a subnational region in a given year, while accounting for subnational region and year fixed effects, linear region-level time trends, and various characteristics at individual, region and country level.[32]

The results of the analysis indicate that increasing 3G coverage in a given locality in the EBRD regions from 0 to 50 per cent of the local population is associated with an increase of 1.5 percentage points in the likelihood of having a desire to migrate, and an increase of 0.7 percentage points in the likelihood of having plans to migrate in the next 12 months. These are sizeable effects, given that an average of 21 per cent of respondents report a desire to migrate in principle and an average of 1.3 per cent report having plans to do so in the near future. These effects are similar to those estimated for the global sample – and, if anything, somewhat larger (see Chart 3.3.1).

Additional analysis reveals that the effects are stronger for unemployed respondents and those with less than tertiary education. What is more, the results are driven mainly by middle and higher income countries. As migration tends, at first, to increase as incomes rise (only falling at much higher income levels),[33] digitalisation can further accelerate this trend by increasing the quality of information about life abroad. In order to address the resulting labour shortages in their domestic economies, governments can work with firms to establish training programmes with a view to fostering skills that are widely sought after in domestic labour markets. Policies aimed at attracting highly qualified migrants from abroad can also help to address specific labour market shortages in the short term.

[30] See Guriev et al. (2021) and ITU (2019).
[31] See EBRD (2018).
[32] See Adema et al. (2021) for details.
[33] See Clemens and Mendola (2020).

BOX 3.4.

Could automation exacerbate the gender pay gap?

Building on Aksoy et al. (2021), this box provides large-scale evidence on the impact that the adoption of robots has on the gender pay gap, studying 20 European countries over the period 2006-14. Specifically, the box looks at how robotisation (as measured by increases in the number of robots per 10,000 workers between survey years) affects the gender gap in the monthly earnings of workers in sectors that commonly employ robots (manufacturing of vehicles, plastics and chemicals, metals, food and beverages, electrical equipment, wood and paper, and textiles, as well as other manufacturing, mining, education and research, construction and utilities).

The analysis is motivated by the fast-moving changes seen in the frontier between activities performed by humans and activities performed by machines, which have been transforming the world of work.[34] The impact of automation is likely to be different for men and women. For instance, Brussevich et al. (2019) construct a gender-specific index of routine task intensity (RTI) using the OECD's PIAAC database. The RTI index quantifies the extent to which tasks performed as part of a job can be codified, indicating that a worker is engaged in more routine activities. In occupations with higher levels of RTI (such as hand packing), workers are easier to replace with machines.

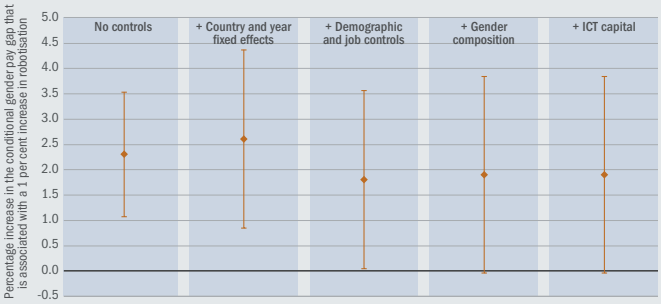
Using the RTI index, Brussevich et al. (2019) find that female workers are, on average, more exposed to automation risk. The gender gap in RTI is driven by female workers performing fewer tasks that require analytical or interpersonal skills or physical labour, and more tasks that are characterised by a lack of flexibility, little on-the-job learning and higher levels of repetition. The analysis in this box complements that study by looking at the evolution of wages by gender in response to robotisation.

Findings

This box estimates a conditional gender pay gap – defined as the difference between the earnings of men and women of a similar age residing in the same country who work within the same occupational category and industry and in firms of a similar size – which is calculated on the basis of data from Eurostat's Structure of Earnings Survey. Thus, the conditional pay gap takes account of many factors that may account for differences between men's and women's earnings and is closely related to the principle of "equal pay for equal work". The analysis links the conditional gender pay gap to the rate of increase seen in the use of robots in a specific sector and country (as obtained from the International Federation of Robotics), as well as a number of other characteristics (such as the industry and country in question).

The results suggest that robotisation increases the gender pay gap, with a 10 per cent increase in robotisation leading to a 1.8 per cent increase in the conditional gender pay gap across the sample as a whole (see Chart 3.4.1).

CHART 3.4.1. Robotisation is associated with a larger gender pay gap



Source: Structure of Earnings Survey, International Federation of Robotics, EU KLEMS and authors' calculations.
Note: This chart reports coefficients from instrumental variable regressions of the conditional gender gap in median monthly earnings in a given country-sector pair on the level of robotisation (inverse hyperbolic sine transformation of changes in the number of robots per 10,000 workers). The instrumental variable is replaceable hours, which measures the percentage of each industry's hours in 1980 (before robotisation) that were performed by occupations and later became susceptible to replacement by robots. The analysis is performed at "demographic cell" level (whereby data are collapsed by country, industry, year, age group, occupation and firm size). All regressions include a constant, the age group, the occupational group, the percentage of full-time workers, a dummy for firms employing more than 250 workers, the percentage of female workers, and the change in the percentage of female workers for a given country-sector pair. The calculation is based on Bellemare and Wichman (2020). The 95 per cent confidence intervals shown are based on robust standard errors with two-way clustering by country and industry.

Mechanisms

The results probably reflect the fact that men's productivity has increased more in response to robotisation, especially in medium and high-skill occupations. In other words, women tend to be under represented in medium and high-skill occupations in industries where workers' productivity is enhanced by robotisation. This exacerbates the gender pay gap, especially in countries where gender inequality was already severe. Since this analysis is based on a conditional gender pay gap, the results cannot be explained by changes in the gender composition of the workforce, either across the economy as a whole or in specific sectors.

Implications

In order to lean against this trend, governments need to ensure that education and vocational training systems provide all people – irrespective of their gender and other characteristics – with the skills they need to take advantage of technological progress. People in sectors affected by automation could, for example, benefit from targeted reskilling programmes. Dedicated funding for education providers that is tied to gender equality in training programmes or targeted support for childcare can also help to mitigate the unequal impact of automation across genders.

[34] See Grigoli et al. (2020).

BOX 3.5.

Promoting equal opportunities when demand for skills changes

Digitalisation is changing the ways in which people work, learn and earn across the EBRD regions, creating new opportunities for some while threatening to marginalise others. Remote-working possibilities, for example, can unlock new economic opportunities for workers with the right digital skills who are less mobile than others.

Process automation and machine learning are supplanting demand for manual and routine work, stranding workers' human capital in the absence of adequate retraining opportunities. Meanwhile, digital technologies can also boost demand for low-skilled workers in occupations that are difficult to automate (such as cleaning or construction), as well as increase labour demand in high-skill occupations which involve non-routine, creative tasks that leverage the use of digital technologies. The analysis below looks at such polarisation of jobs in the EBRD regions using employment data broken down by occupation.

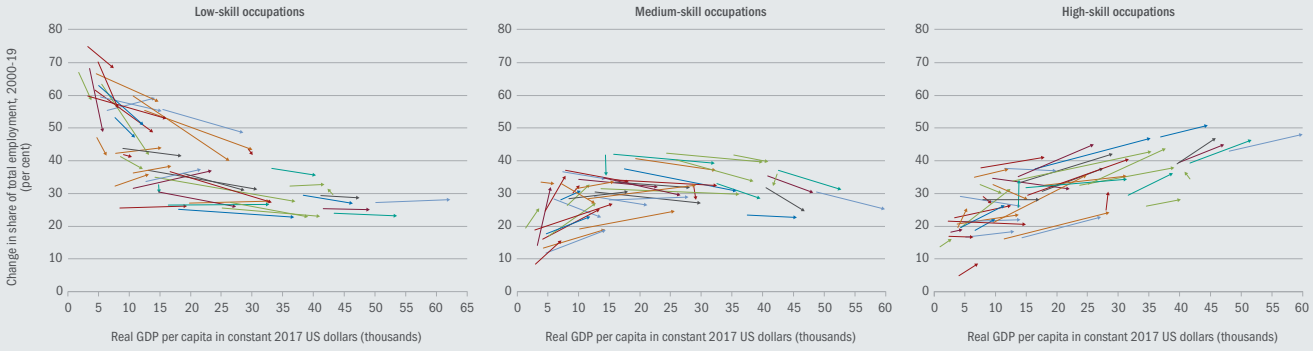
Skills profiles have shifted dramatically across the labour markets of the EBRD regions over the last two decades (see Chart 3.5.1). Low-skill occupations have been in decline, particularly in lower income economies that previously had large numbers of low-skilled workers as a percentage of total employment (such as Armenia, the Kyrgyz Republic, Moldova and Morocco). The percentages of low skilled workers in those economies have tended to slowly move towards the 25-30 per cent mark – the average across the G 7, where the percentage of low-skilled workers has been stable over the last two decades.

Demand for medium-skill occupations intensifies as economies develop, before falling away again. As economies in the EBRD regions have grown richer, many workers in traditional sectors with lower levels of value added have switched to more productive medium-skill work. In the Kyrgyz Republic, for instance, the percentage of workers with medium-skill occupations has increased by 19 percentage points since 2000. In contrast, that percentage has waned in more technologically advanced countries on the back of the automation of production (with declines of 6-7 percentage points being seen in Estonia and Slovenia, for example – equivalent to the rates of decline observed in Germany and the United States of America).

High-skill occupations, meanwhile, continue to expand in both lower and higher-income countries. For example, highly skilled workers' share of total employment has risen by 12 percentage points in Moldova and 11 percentage points in Poland since 2000. This is a welcome trend, insofar as workers with such occupations typically enjoy better working conditions, career opportunities and pay.

Analysis suggests that digitalisation has, on balance, been accompanied by upgrading of occupations in the EBRD regions. Policymakers can take a number of steps to help sustain such upskilling going forward. The first area of focus is equality of opportunity at the point of entry into the labour market. Second, policymakers should leverage partnerships between industry and providers of vocational training, as well as seeking private-sector input when developing sectoral skills standards to ensure a better match between the supply of skills in the economy and employers' demand for skills. In this context, the EBRD has been supporting a number of industry-specific training programmes, from ICT and agribusiness in Serbia to the automotive sector in Morocco. Third, equal access to the internet across urban and rural areas is a key feature of equality of opportunity in the digital era, as discussed in Chapters 1 and 4 of the report. And fourth, specific training programmes and more inclusive user interfaces may be needed in order to support people with disabilities, older workers and other people facing barriers to accessibility.

CHART 3.5.1. The shares of medium-skill occupations rise as economies develop, before falling away again on the back of automation



Source: ILOSTAT database, IMF and authors' calculations based on modelled ILO estimates.
Note: Low-skill occupations comprise ISCO-88 groups 5, 6 and 9 (service workers and shop and market sales workers; skilled agricultural and fishery workers; and elementary occupations). Medium-skill occupations comprise groups 4, 7 and 8 (clerks; craft and related trades workers; and plant and machine operators and assemblers). High-skill occupations comprise groups 1, 2 and 3 (legislators, senior officials and managers; professionals; and technicians and associate professionals).

BOX 3.6.

Is there too much automation?

There is enormous potential for digitalisation to improve the productivity of human effort. However, achieving a socially optimal level of digitalisation may be difficult. On the one hand, to the extent that new technologies such as software are costly to develop but easy to copy, their supply is sometimes lower than would be socially optimal. Tax systems often attempt to correct this by providing incentives to invest in R&D, which helps to create new, more productive jobs.

On the other hand, light taxation of capital and heavy taxation of labour can give rise to "excessive" digitalisation. Capital tends to be substantially more mobile across borders than labour, and international competition for investment in physical capital can drive down effective rates of taxation on capital relative to labour.[35] Large US technology companies, for instance, are estimated to pay an effective tax rate of around 5 per cent on their foreign profits.[36]

Taxes that favour capital incentivise firms to adopt more labour-saving technologies than would be socially optimal. If the tax wedge is large enough, firms may even use digital technologies that fail to perform as well as humans.[37] The wedge between the socially optimal level of tax on capital relative to labour and the actual level of tax is estimated to have increased since 2000 in the United States of America, as global competition for capital has intensified.[38] The wedge is largest when it comes to investment in software.

Job displacement owing to technological change is a necessary driver of economic development. Technological change tends to create new, productive jobs while destroying others, with net job creation estimated to be close to zero.[39] However, excessive job displacement caused by policy distortions can have considerable costs in terms of increased inequality and lower social cohesion. Those costs can be particularly high in economies where large numbers of people have occupations involving routine cognitive tasks. Automation is affecting a growing number of occupations, with AI performing increasingly complex tasks, from identifying fraudulent loan applications to finding errors in legal documents. What is more, job losses caused by such displacement have lasting effects on workers. Wages rarely recover relative to peers who leave their jobs by choice. Displacement can also impair health, increase mortality and have a negative impact on children.[40]

Labour market frictions such as job search costs or the cost of firing workers amplify the costs of under-taxation of capital by acting as an additional tax on labour. Indeed, it may be socially optimal to reduce taxes on labour to compensate for pronounced labour market frictions. In addition, flexible labour market policies, standardised professional accreditation and large-scale online job markets can all help to ease labour market frictions.

Rebalancing the taxation of labour and capital requires international cooperation. Discussions are under way on setting a global minimum tax rate for capital, which may pave the way for a broader rebalancing of tax systems.

[35] See Winner (2005).
[36] See Toplensky (2018).
[37] See Acemoğlu and Restrepo (2019).
[38] See Acemoğlu et al. (2020b).
[39] See Acemoğlu and Restrepo (2020) and Graetz and Michaels (2018).
[40] See Lachowska et al. (2020), Schaller and Stevens (2015), Sullivan and von Wachter (2009) and Oreopoulos et al. (2008).

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BANK
BRANCH CLOSED
4
FINTECH AND BANKS IN TRANSITION
LOAN APPLICATION
INSTALLING

Digitalisation is transforming the global financial system, with fintech innovators such as peer-to-peer lending platforms starting to compete with banks. This chapter uses unique survey data to look at the ways in which banks across the EBRD regions are responding to the risks and opportunities presented by fintech. On the one hand, banks themselves have now started to make substantial investments in new technologies – particularly digital wallet solutions, biometric identification systems and sophisticated algorithms for screening borrowers. On the other hand, they have also responded by expanding their online banking services, while pruning their branch networks. Such expansion of digital infrastructure has improved access to credit for small businesses and allowed households to access a broader palette of financial services.

Introduction

Digitalisation is transforming the global financial system at a rapid pace. Digital innovators such as crowd-funding platforms and big-tech firms are becoming strong competitors for traditional deposit-taking institutions.[1] Fintech firms are breaking up and unbundling the financial value chain by specialising in specific products and services, such as cross-border mobile payments and screening technologies based on big data. At the same time, they also offer aggregation services that allow customers to see all of their financial products with different providers in one mobile phone app.

The banking sectors of economies in the EBRD regions are no exceptions in this regard, being deeply affected by such digital transformation. Compared with richer countries, additional challenges abound in those regions, including low levels of financial literacy, weak technology ecosystems and poor digital infrastructure.[2] And yet, notwithstanding those challenges, a number of the economies where the EBRD invests – most notably the Baltic states – are taking on a leading role in the global digital revolution.

Against that dynamic background, this chapter starts by providing an overview of fintech and alternative finance across the EBRD regions using data from Cambridge University's Global Alternative Finance database. It then looks at how fintech is transforming the banking landscape in the economies where the EBRD operates, using unique data from the third Banking Environment and Performance Survey (BEPS III). As part of the BEPS III survey, the chief executive officers (CEOs) and heads of credit of 339 banks across 34 economies were surveyed in 2020 and 2021. During online face-to-face interviews, those bank insiders answered detailed questions on the ways in which fintech is affecting their banks and the strategies they are putting in place in response to the risks and opportunities presented by fintech and digitalisation.

Next, this chapter looks at the ways in which digitalisation has affected businesses' and individuals' access to finance since the global financial crisis of 2008-09, focusing on one of the key developments seen since then in the EBRD regions in terms of digital technology: the introduction of 3G and 4G mobile networks. That analysis uses highly granular data on mobile network coverage, combined with firm-level data from the Enterprise Surveys and individual-level data from the Global Findex Database. The chapter ends with a discussion of the potential downsides of fintech and the options available to policymakers who want to use the digitalisation of financial services to foster greater inclusion and strengthen financial stability.

[1] See, for example, Claessens et al. (2018) and Stulz (2019).
[2] See also IFC (2017) and Chapters 1 and 2 of this report.

What is fintech?

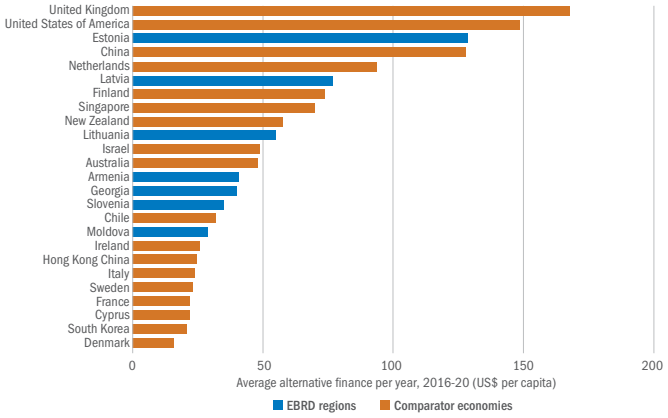
Fintech – financial technology – uses new technologies to improve financial services and make them accessible to more firms and households. Such new technologies range from digital wallets (which allow people to store their payment cards on their mobile phones) to robo-advisers and stock-trading apps. Fintech firms use specialist software and algorithms on computers and smartphones to deliver such services faster and more efficiently. Those firms are often start-ups, which disrupt incumbents in the finance industry by using technology to reduce operational costs and reach previously underserved markets. This allows consumers to "mix and match" services from various providers and re-bundle them according to their personal preferences (for example, by having a standard deposit account at a bank but using a mobile payment app such as Klarna or PayPal to make domestic and international payments).

Digitalisation and alternative finance

Digitalisation has enabled the emergence of a broad range of alternative finance models, which involve internet-based financial channels and instruments falling outside of the traditional financial system (outside of regulated banking and capital markets, for example). These models fall into three main categories. First, peer-to-peer (P2P) and marketplace lending platforms allow individuals or businesses to borrow directly from individual lenders or, increasingly, institutional investors. At the same time, leading big-tech firms in the fields of e-commerce, social media and internet search have started to provide credit by leveraging the wealth of information that they collect on consumers and businesses.[3] Second, equity crowdfunding allows individuals or institutions to invest in unlisted shares or securities issued by firms (often SMEs). And third, non-investment-based models such as donation crowdfunding allow funds to be raised for projects without the organiser being under any obligation to provide a monetary return. In addition to those three main categories, there are large numbers of other alternative finance models, such as mini-bonds, digital property funding and online invoice trading.

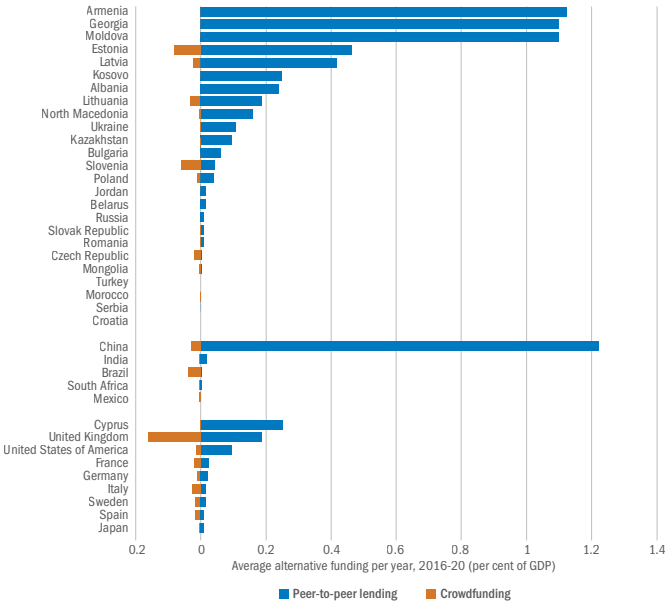
In absolute terms, China has the largest transaction volumes by some distance when it comes to alternative finance (with an average of US$ 84 billion per year over the period 2016-20), followed by the United States of America (US$ 52 billion), according to the Global Alternative Finance[4] database run by the Cambridge Centre for Alternative Finance. In per capita terms, the United Kingdom and the United States of America have the world's largest markets, with annual averages of around US$ 160 per head of population over the period 2016-20 (see Chart 4.1). Seven economies in the EBRD regions feature in the world's top

CHART 4.1. The United Kingdom and the United States of America have the world's largest alternative finance markets in per capita terms



Source: Cambridge Centre for Alternative Finance (CCAF), World Development Indicators and authors' calculations.
Note: This chart shows annual averages over the period 2016-20 for the top 25 economies only.

CHART 4.2. A number of economies in the EBRD regions have sizeable alternative finance markets



Source: CCAF, World Development Indicators and authors' calculations.
Note: Average alternative finance comprises both P2P lending and capital raised through investment-based and non-investment-based crowdfunding. The chart shows annual averages over the period 2016-20.

[3] See Cornelli et al. (2020).
[4] The raw data for the CCAF's database come from the Alternative Finance Industry Benchmarking Survey, which is supplemented with data scraped from online platforms. As survey data do not include the activities of non-respondent firms, the figures provided are likely to underestimate the true scale of alternative finance.

25 in per capita terms: Estonia (in third place globally), Latvia, Lithuania, Armenia, Georgia, Slovenia and Moldova. Most of those countries also have sizeable P2P lending markets relative to GDP (see Chart 4.2).

Estonia, Latvia and Lithuania are at the forefront of the fintech revolution in the EBRD regions. The Baltic states are particularly advanced in terms of online P2P consumer-lending platforms, with examples including Estonia's Bondora, Lithuania's Savy and Latvia's Mintos and Twino. Other Baltic fintech start-ups focus on the business market, including Estonia's Fundwise (an equity-based funding platform for SMEs) and Investly (a peer-to-peer lending and invoice-factoring platform for businesses). Because their domestic Baltic markets are small, some of these platforms have employed aggressive internationalisation strategies built around a global website and brand with a view to servicing the wider European continent. In so doing, firms such as Bondora, Mintos and Twino have developed into international market places for consumer loans, also operating in other transition economies (such as Armenia and Georgia).

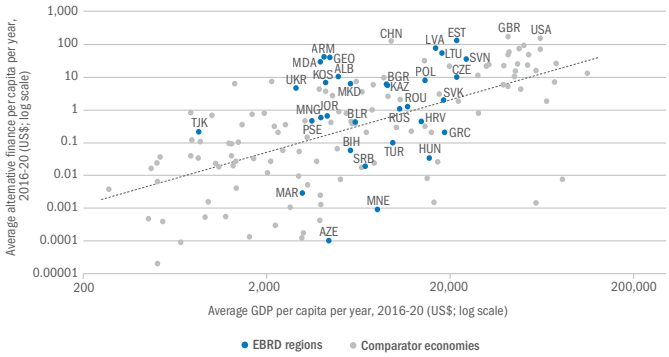
The Baltic states have achieved that leading position on the back of a supportive regulatory environment, highly developed IT infrastructure and a population with strong digital skills – all factors that have allowed local fintech start-ups to scale up quickly and cheaply.[5] Indeed, the Baltic states' alternative finance markets are now, in per capita terms, substantially larger than one would expect on the basis of their overall level of economic development (see Chart 4.3). The same is true of a number of other economies in the EBRD regions, such as Albania, Armenia, Georgia and Moldova.

Digital lending versus digital equity

Overwhelmingly, the EBRD regions are still reliant on debt – rather than equity – financing. Economic contractions in the wake of the global financial crisis, as well as large-scale emergency lending programmes during the recent Covid-19 pandemic, have resulted in high debt levels for many households and firms.[6]

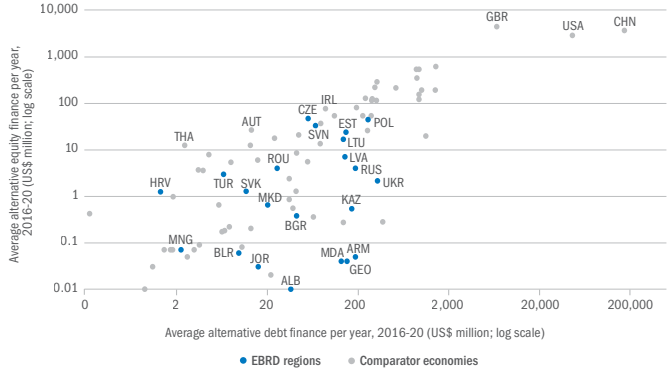
So far, alternative forms of finance have not been able to redress this imbalance between debt and equity funding (see Chart 4.4). Indeed, alternative funding models around the world also lean heavily towards debt funding. In the EBRD regions, alternative finance models are particularly biased towards debt funding in Armenia, Georgia and Moldova. By contrast, in comparator countries such as Austria, Ireland, Thailand and the United Kingdom, alternative equity markets also play a substantial role. Thus, the advent of alternative finance has exacerbated emerging Europe's heavy dependence on debt instruments and has not contributed to the much-needed rebalancing of financial systems.[7]

CHART 4.3. Alternative finance markets in the Baltic states are larger than would be expected on the basis of their overall level of economic development



Source: CCAF, World Development Indicators and authors' calculations.
Note: This chart shows annual averages over the period 2016-20. The sample is restricted to economies with at least two years of data between 2016 and 2020.

CHART 4.4. Alternative funding models also lean heavily towards debt funding



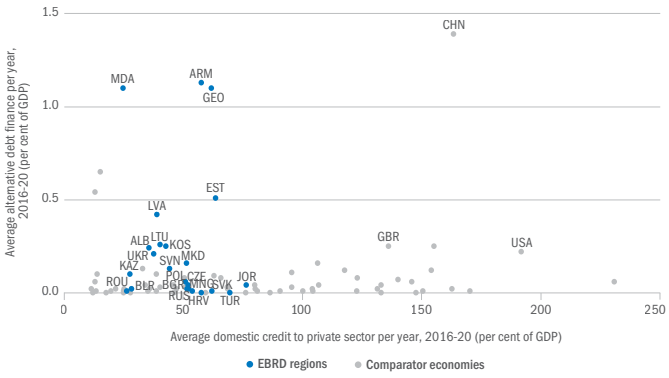
Source: CCAF and authors' calculations.
Note: This chart shows annual averages over the period 2016-20. The sample is restricted to economies with at least two years of data between 2016 and 2020.

7 ECONOMIES IN THE EBRD REGIONS FEATURE IN THE WORLD'S TOP 25 FOR ALTERNATIVE FINANCE PER CAPITA

[5] See Ziegler et al. (2020). See also Chapter 1 of this report.
[6] See EBRD (2015).
[7] See EBRD (2015).

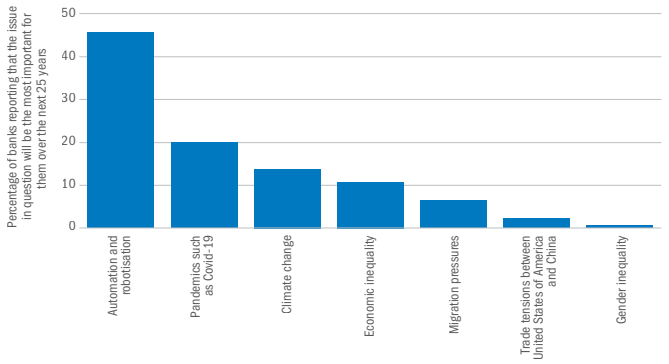
46%
OF BANK CEOs IN THE EBRD REGIONS BELIEVE THAT AUTOMATION WILL BE THE MOST IMPORTANT SOCIAL TREND AFFECTING THEIR BANK OVER THE NEXT 25 YEARS, COMPARED WITH
20%
FOR PANDEMICS AND
14%
FOR CLIMATE CHANGE

CHART 4.5. The largest fintech sectors are found in economies with either highly developed or underdeveloped banking sectors



Source: CCAF, World Development Indicators and authors' calculations.
Note: This chart shows annual averages over the period 2016-20. The sample is restricted to economies with at least two years of data between 2016 and 2020.

CHART 4.6. Automation is a key strategic concern for banks



Source: BEPS III and authors' calculations.
Note: These figures are weighted averages across economies.

The countries with the largest fintech sectors relative to the overall size of the economy (see Chart 4.5) fall into two categories: (i) countries with relatively small banking sectors (such as Armenia, Georgia and Moldova); and (ii) countries with much larger banking sectors (such as China, the United Kingdom and the United States of America). On average, the two measures are virtually uncorrelated, with a correlation coefficient of just 0.02. This may reflect opposing forces.

On the one hand, debt-based alternative finance may provide a useful disintermediated replacement for traditional financial intermediaries such as banks. In that case, models such as P2P lending should develop faster in countries where the supply of traditional bank credit is lower, benefiting firms and households that have not previously had access to finance. On the other hand, however, traditional bank lending and alternative debt-based finance may have similar drivers, such as strong legal protection for creditors. In that case, alternative debt models should flourish more in countries that have already developed deeper credit markets.

Fintech and banks: threats and opportunities

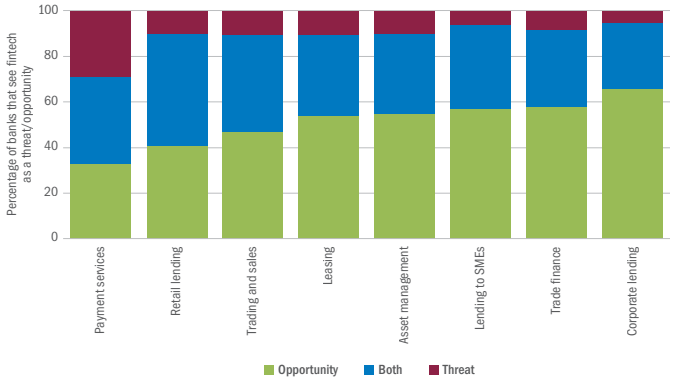
Digitalisation and the emergence of fintech are providing opportunities for banks across the EBRD regions, but they are also posing challenges. Fintech companies have been specialising in financial services for which they do not need access to a large balance sheet of their own. As a result, those firms have often had the advantage of being less heavily regulated than banks.[8] By chipping away at parts of the financial value chain, they are contributing to the gradual disintegration of the traditional banking model.[9] On the upside, however, advances in big-data analytics and artificial intelligence are giving banks new tools, helping them to reach out to market segments that have previously been difficult to lend to.

In order to gain a better understanding of the ways in which fintech is affecting different banks in different countries, the CEOs and heads of credit of 339 banks were interviewed in 2020 and 2021 as part of the BEPS III survey, which spanned 34 economies across the EBRD regions. Together, those surveyed banks account for 78 per cent of all banking assets in the economies in question.[10]

The survey confirmed that digitalisation and automation are uppermost in CEOs' minds (see Chart 4.6). Indeed, 46 per cent of those CEOs said that automation would be the most important social trend to affect their bank over the next 25 years – way ahead of pandemics (20 per cent) and climate change (14 per cent), despite the survey taking place in the midst of the Covid-19 crisis. This holds true across all of the regions where the EBRD operates, with CEOs in the southern and eastern Mediterranean (SEMED) and Turkey being particularly likely to cite automation as the main social trend affecting their bank over the medium term.

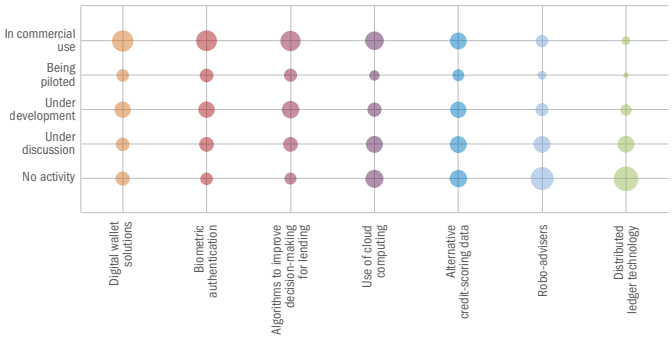
[8] See Stulz (2019). Moreover, Buchak et al. (2018) show that fintech lenders have gained more market share in US counties where banks have experienced more burdensome regulation.
[9] See Boot et al. (2021).
[10] The sample does not include any banks in Egypt, Lebanon, Russia or Turkmenistan.

CHART 4.7. Banks are most likely to see fintech as a threat in the area of payment services and least likely to regard it negatively when it comes to corporate lending



Source: BEPS III and authors' calculations.
Note: These figures are weighted averages across economies.

CHART 4.8. The fintech frontier varies substantially across technologies in the EBRD regions' banking sectors



Source: BEPS III and authors' calculations.
Note: The size of each circle is proportionate to the percentage of banks for which the relevant technology (horizontal axis) is at the developmental stage in question (vertical axis).

The main reason why banks' CEOs regard digitalisation and fintech competitors as a key challenge is that they affect banks' ability to remain competitive and attract new customers. Many fintech firms are increasing competitive pressures on banks, either by engaging directly with consumers (simply bypassing banks altogether) or by offering services to bank clients at the very end of the value chain. Digital lending platforms, for instance, provide credit directly to online customers. Such services often have the highest margins, thus leaving incumbent banks with a lower-margin product mix.[11]

Banks' CEOs consider fintech to be more of a threat than an opportunity in the areas of payment services, retail lending (that is to say, lending to households), and trading and sales (see Chart 4.7). This tallies well with evidence from another recent survey of large global banks,[12] which identified payment services and retail lending as the areas in which competition from fintech was fiercest. Retail lending is more standardised and easier to underwrite than corporate lending, thus making it more susceptible to fintech disruption. In contrast, banks are more optimistic about the role of fintech in areas such as corporate lending, trade finance and lending to SMEs.

Banks are actively responding to the opportunities and threats presented by fintech by introducing new technologies themselves (see Chart 4.8). Across the EBRD regions as a whole, the three most mature and widely applied technologies are digital wallet solutions, biometric identification and sophisticated algorithms aimed at improving the screening of potential borrowers, which have been deployed by around 40 per cent of surveyed banks. Meanwhile, significant numbers of other banks are in the process of developing such products.

Banks are less advanced when it comes to using cloud computing for internal processes and using alternative data (such as information from social media) in credit scoring, although many banks are actively exploring such technologies. For example, while only 23 per cent of surveyed banks are using alternative data sources to fine-tune their credit scoring, more than half (53 per cent) are in the process of discussing, developing or piloting such applications. Banks are also much less advanced when it comes to the introduction of robo-advisers (programmes that use machine learning to generate tailored investment advice for customers) or the use of blockchain or distributed ledger technologies (which involve a public digital database in which a system of blocks of records verifies transactions in a decentralised manner).[13] Most banks do not envisage developing such technologies.

The vast majority of banks (85 per cent) are developing new fintech technologies in house, while 66 per cent have formed commercial or non-commercial partnerships with fintech companies. Only a small percentage of banks have invested in their own fintech companies.

AROUND 40%
OF BANKS IN THE EBRD REGIONS HAVE INTRODUCED DIGITAL WALLETS, BIOMETRIC IDENTIFICATION AND SOPHISTICATED ALGORITHMS TO IMPROVE THE SCREENING OF BORROWERS

[11] See Petralia et al. (2019).
[12] See Chapter 3 of Petralia et al. (2019).
[13] See D'Acunto et al. (2019).

Drivers of banks' fintech strategies

In order to measure how advanced banks are in terms of their active engagement with fintech, this chapter creates three bespoke indices. The first index ("fintech use and development") gauges a bank's use and development of fintech technologies, with scores ranging from 0 (no development) to 4 (commercial use), as shown in Chart 4.8. These answers are aggregated and standardised as z-scores ranging from 0 to 1, with higher scores indicating that a bank is more digitally advanced.

The second index ("fintech investment") provides insight into a bank's investment and relations with fintech companies. This index is based on seven questions in the BEPS III survey, looking at whether a bank (i) has formed a commercial partnership with an existing fintech company in order to offer new products/services, (ii) has acquired an existing fintech company, (iii) has invested in a fintech company, (iv) has developed its own products/services in house using new technologies without cooperating with a fintech company, (v) has participated in a non-commercial partnership with a fintech company, (vi) has set up/sponsored a fintech incubator/accelerator and (vii) has any kind of ongoing relationship with a fintech company. The scores for each bank's various fintech-related investments and relationships are aggregated to form a z-score.

The third index ("digitalisation concerns") captures the extent to which a CEO believes that their bank faces constraints and obstacles related to digitalisation. This index looks at whether the bank (i) faces difficulties in identifying and establishing links with fintech companies relevant to its business, (ii) has concerns about IT security and regulatory uncertainty surrounding fintech, and (iii) would like to invest more in fintech companies and/or new technologies, but is prevented from doing so by financial constraints. Higher values for this index indicate greater concerns and/or obstacles. Regression analysis is then used to link these three indices to various bank-level characteristics (such as the regions where banks are located) and the characteristics of banks' CEOs.

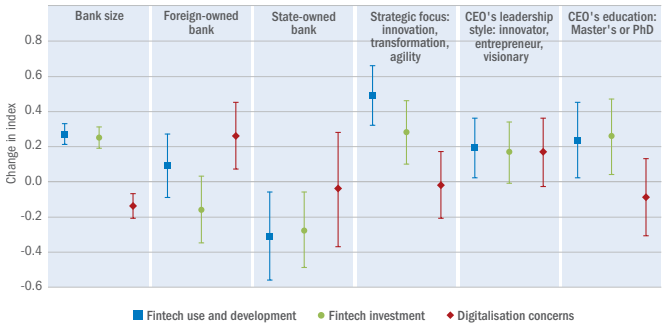
This analysis reveals that larger banks are more likely to have greater involvement in fintech, in terms of both the use of new technologies and investment in fintech companies (see Chart 4.9). Indeed, a 1 standard deviation increase in bank assets is associated with an increase of 45 per cent of a standard deviation in banks' use of digital technologies (with a similar increase being observed for the fintech investment index). Larger banks are also less likely to voice concerns about digitalisation-related obstacles. This may indicate that smaller banks are less able to cope with digital innovation and risk slowly losing market share, possibly leading to further mergers and acquisitions in banking sectors across the EBRD regions. At the same time, smaller banks often specialise in lending to smaller borrowers, who can more easily switch to P2P platforms, for example.[14]

State-owned banks appear to lag behind both private locally owned peers and foreign-owned banks in terms of active engagement with fintech. Indeed, while only 30 per cent of all privately owned banks think that their main competitor outcompetes them in the digital arena, the equivalent figure is significantly higher for state-owned banks at 44 per cent. Foreign-owned and private domestic banks are equally active in rolling out fintech technologies and investing in fintech companies, although foreign-owned banks are somewhat more worried about obstacles relating to fintech.

A bank's culture and its CEO's leadership style also matter in terms of a bank's approach to digitalisation. The BEPS III survey asked banks' CEOs whether the culture of their bank was mostly geared towards creating value through (i) commitment, communication and development (chosen by 32 per cent of all CEOs), (ii) innovative output, transformation and agility (32 per cent), (iii) efficiency, timeliness, consistency and uniformity (11 per cent), or (iv) a focus on market share, achievement of goals and profitability (25 per cent).[15]

Banks with a culture focusing mostly on innovation, transformation and agility are the ones that are most likely to be involved in fintech (see Chart 4.9). Their index of fintech use and development is, on average, 49 per cent

CHART 4.9. Fintech strategies depend on banks' size, ownership and leadership



Source: BEPS III and authors' calculations.
Note: Based on OLS models regressing the three indices (fintech use and development, fintech investment, and digitalisation concerns) on (i) bank size (log of total assets), (ii) dummy variables for foreign and state ownership, (iii) a dummy variable indicating whether the CEO believes that the culture of their bank is geared towards innovation, transformation and agility, (iv) a dummy variable indicating whether the CEO believes themselves to be an innovator, an entrepreneur and a visionary, and (v) a dummy variable indicating whether the CEO has a Master's degree or a PhD. Other controls include the CEO's gender and region fixed effects. The 90 per cent confidence intervals shown are based on robust standard errors.

[14] See Barba Navaretti et al. (2017).
[15] See also Cameron and Quinn (2006) on the Competing Values Framework. The correlation coefficient between banks' corporate cultures and their CEOs' leadership styles is 0.22.

of a standard deviation higher than that of similar banks with a different cultural focus. Agile and flexible banks appear to be best placed to leverage the fintech revolution, particularly when it comes to establishing partnerships with a select set of fintech companies.[16]

The intensity of banks' involvement in fintech is also correlated with the leadership styles of their CEOs. As part of the survey, CEOs were asked whether their role within the bank could best be described as (i) a facilitator, mentor and team builder, (ii) an innovator, entrepreneur and visionary, (iii) a coordinator, monitor and organiser, or (iv) a hard driver, competitor and producer.[17] CEOs with these different leadership styles tend to have differing views as to what constitutes an effective organisation. While "facilitators" (48 per cent of all surveyed CEOs) focus on using human development to create an effective bank, "innovators" (28 per cent) focus on innovation, vision and constant change. Likewise, while "coordinators" (14 per cent) focus on control and efficiency, "hard drivers" (9 per cent) believe that aggressive competition and customer focus is what makes an organisation effective.

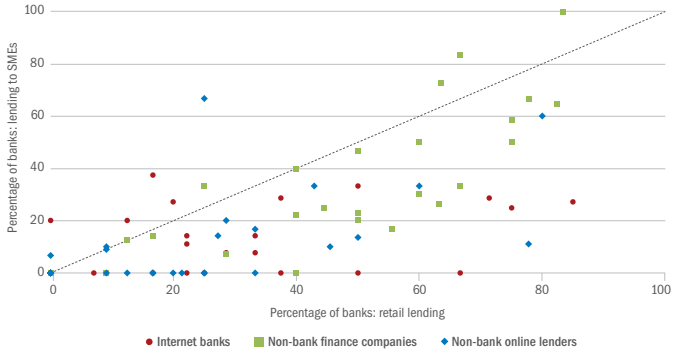
Banks that are led by CEOs who describe themselves as innovators, entrepreneurs and visionaries are significantly more likely to have a high degree of engagement with fintech (see Chart 4.9), and the same is true of CEOs with a Master's degree or higher. Those CEOs focus more on the external position of the bank, rather than internal maintenance, and prioritise rapid change over stability and control.

When asked what is holding their bank back in terms of digitalisation, 79 per cent of CEOs mention concerns about IT security, as well as regulatory uncertainty surrounding fintech. Other important barriers include financial constraints that limit banks' ability to invest in fintech (35 per cent) and difficulties in establishing links with fintech companies (23 per cent).

79%

OF BANK CEOs IN THE EBRD REGIONS SAY THAT CONCERNS ABOUT IT SECURITY AND REGULATORY UNCERTAINTY ARE OBSTACLES TO DIGITALISATION

CHART 4.10. Banks are experiencing strong competition from online and non-bank retail lenders



Source: BEPS III and authors' calculations.
Note: This chart indicates the percentages of banks in each economy which regard internet banks, non-bank online lenders and non-bank finance companies as strong competitors in the areas of retail lending (horizontal axis) and lending to SMEs (vertical axis). Data for Greece, Kosovo, Montenegro, Morocco, North Macedonia, Serbia and Tajikistan are not included.

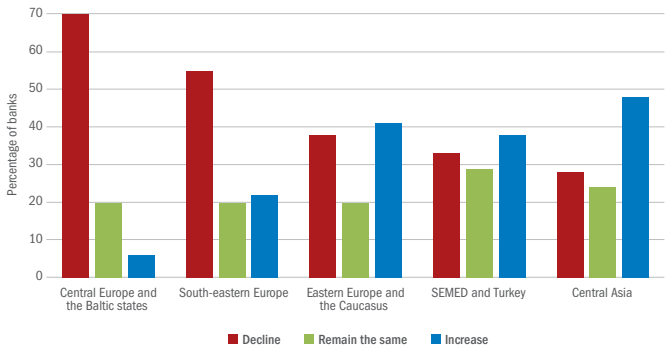
Fintech and branch networks

Banks across the EBRD regions are already experiencing strong competition from internet banks, non-bank online lenders and non-bank finance companies. These three types of alternative lender are more likely to be regarded as strong competitors in retail lending than lending to SMEs (see Chart 4.10). For instance, 31 per cent of bank CEOs across the EBRD regions consider internet banks to be a strong competitor in retail lending, compared with just 21 per cent for lending to SMEs.

Banks across the EBRD regions have responded to the increased competitive pressure from online lenders by rolling out online banking services for new and existing clients, with between 70 and 90 per cent of all banks now offering such services. However, banks are much more likely to accept online applications from smaller clients (especially retail customers) than larger corporate clients.

[16] See, for instance, World Economic Forum (2017).
[17] See Cameron and Quinn (2006).

CHART 4.11. Branch networks are expected to shrink further in the CEB and SEE regions



Source: BEPS III and authors' calculations.
Note: This chart shows the percentages of banks that expect their branch networks to decline, remain the same and increase in size over the next five years.

With banks increasingly focusing on online banking, they have started to dramatically reduce the size of their bricks-and-mortar branch networks. In many countries, banks' remaining branches have an increasing tendency to be clustered together, with new branches opening in economically strong centres while other branches in sparsely populated areas close. The emergence of "banking deserts" – areas that are almost entirely devoid of branches – has raised concerns about adverse effects on lending to small businesses and local employment opportunities.[18]

In countries where larger percentages of banks now accept online loan applications from retail and/or SME clients, more banks have been pruning their branch networks over the last decade. In these more digitalised banking sectors, banks' CEOs also expect to close more branches over the next five years. In particular, in central Europe and the Baltic states (CEB) and south-eastern Europe (SEE), more than half of all banks expect to reduce branch networks further in the near future. Larger banks and foreign-owned banks (a category that includes some of the largest commercial banks in emerging Europe) are about 12 percentage points more likely to indicate that branch closures form part of their medium-term strategy. By contrast, in eastern Europe and the Caucasus (EEC), the SEMED region, Turkey and Central Asia, expectations are more varied: some banks intend to whittle down their bricks-and-mortar branch networks, while others plan to expand them (see Chart 4.11).

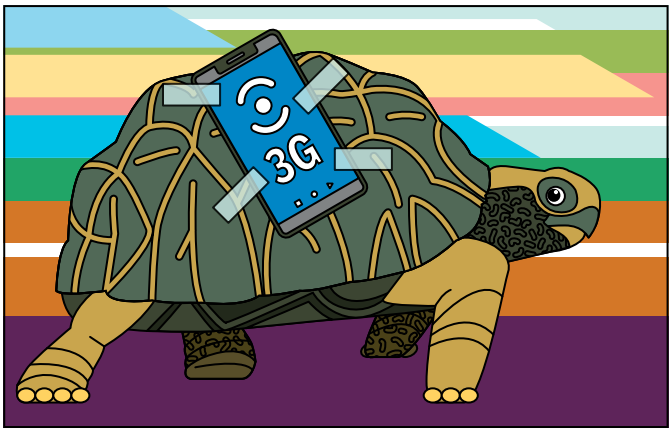
Across the EBRD regions, banks with more advanced digitalisation strategies (as measured by the fintech use and development index introduced earlier) are more likely to report intentions to close branches (see Chart 4.12). This relationship holds when taking into account banks' size and ownership structure.

Digitalisation and access to credit

Thus, digitalisation in the banking sector may be a double-edged sword for firms and families looking for a loan. On the one hand, fintech lenders are increasing competition in credit markets and banks are responding by accepting credit applications online. On the other hand, however, banks have started to reduce the size of their branch networks, sometimes drastically. What impact, on balance, has digitalisation had on businesses' and individuals' access to finance? To answer that question, this section looks at one of the most transformative digital advances of the last two decades: the introduction of mobile data networks.

The third generation of wireless mobile telecommunication technology (3G) enables fast transfers of data and internet access via mobile phones. 3G networks were first introduced in 2001 and paved the way for the introduction of smartphones (with the first iPhone being launched in 2007). Over the last decade, 3G technology has slowly been replaced by 4G technology, which offers connection speeds that are up to 15 times faster. Such improvements in mobile telecommunication technology can be transformative for both lenders and borrowers, for a number of reasons.[19]

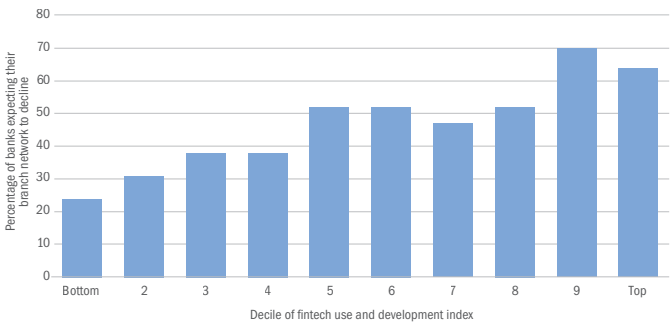
4G OFFERS SPEEDS THAT ARE UP TO 15 TIMES FASTER THAN 3G



[18] See Bonfim et al. (2021), Morgan et al. (2016), Nguyen (2019) and Qi et al. (2021).

[19] See Boot et al. (2021).

CHART 4.12. Fintech engagement is correlated with plans to close branches



Source: BEPS III and authors' calculations.
Note: These figures are weighted averages across economies.

First, lenders are better able to process information about potential borrowers that is obtained via their digital footprints (for instance, information about credit card transactions). Such big data improves risk assessment by incorporating information from non-traditional sources (such as social media) and using algorithms to predict borrowers' behaviour. The increased use of big data in lending can also reduce the importance of collateral in credit markets and potentially weaken the financial accelerator mechanism.[20]

Second, improvements in digital infrastructure can lower communication costs for people in distant locations. On the one hand, this allows lenders to offer financial services without any need for a physical presence (such as a bank branch), as well as giving borrowers greater choice of products on more favourable terms, thanks to increased competition. On the other hand, small business borrowers with a good internet connection can market their products to customers in more distant locations via digital market places, as well as offering better customer service thanks to their lower communication costs.

Third, the latest developments in financial technology are making payments faster and cheaper, owing to increased competition and the emergence of central bank digital currencies (see Box 4.1). For instance, digital payment companies such as PayPal, Adyen and Stripe facilitate payments for online purchases and reduce the cost of cross-border payments.[21] Such developments are especially beneficial for smaller businesses, which are often dependent on traditional payment companies when it comes to accepting payments.

Mobile networks and businesses' access to finance

The analysis in this section draws on the results of Enterprise Surveys conducted by the EBRD, the EIB and the World Bank. The data used are derived from the last three rounds of that survey (the fourth, fifth and sixth survey rounds), which were conducted in 2008-09, 2011-14 and 2018-20 respectively – periods in which the EBRD regions saw increasing adoption of first 3G and then 4G technology.

The Enterprise Survey data are combined with rich and detailed geographical data from Collins Bartholomew on mobile phone signal coverage at 1 km^2 level,[22] which allows us to see whether a firm located in a particular 1 km^2 grid square had access to a 3G or 4G mobile network in a given year. Those data are also matched with population data for 2015 from the Gridded Population of the World dataset (which is managed by the Center for International Earth Science Information Network) at 1 km^2 level, as well as data on bank branch locations collected as part of BEPS III.

While the roll-out of 3G happened at pace in the wake of the global financial crisis of 2008-09, the adoption of 4G technologies has taken place more slowly and is yet to be completed. In 2008, for instance, an average of 22 per cent of businesses surveyed in the Enterprise Surveys across all EBRD regions were located in a district with access to 3G. This quickly increased to 85 per cent at the end of 2012 and 96 per cent at the end of 2018. In contrast, the share of businesses with access to 4G averaged 39 per cent in 2014 across all EBRD regions and 87 per cent at the end of 2018.

A firm-level regression framework can be used to link businesses' access to credit to the staggered adoption of 3G and 4G technologies across the EBRD regions. All regressions include fixed effects at the level of subnational regions, as well as country-year and sector-year fixed effects, which takes account of any unobservable factors that may have a differential impact on lending to businesses across those various groupings.

The analysis also takes account of other factors affecting credit demand and supply, such as population density, the number of bank branches within a 5 km radius of the firm, whether the firm is an exporter, whether the firm is female-owned, whether the firm has been in business for less than five years, the firm's audit status and whether the firm has an urban or rural location. Notwithstanding the inclusion of these controls, the roll-out of 4G internet may be related to other unobserved factors affecting businesses' demand for credit and/or financial institutions' provision of credit across subnational districts. Hence, the findings should not necessarily be viewed as reflecting a causal link. They are still informative, however, with three results standing out.

[20] See Gambacorta et al. (2020).
[21] See Boot et al. (2021).
[22] See www.collinsbartholomew.com/mobile-coverage-maps/mobile-coverage-explorer (last accessed on 15 September 2021).

First, access to 3G has had a marginally positive impact on businesses' access to finance, while there is a significantly positive correlation between access to 4G and access to credit (see Chart 4.13). This suggests that new digital technologies may not produce gains immediately, with benefits possibly only being seen after technologies have been widely adopted. In the case of financial services, 4G network coverage and the concomitant rise in mobile applications have enabled individuals to access and compare products from banks and fintech firms on their mobile phones. For instance, a small business owner can now quickly obtain preliminary approval for a credit application via their phone, as potential creditors can access and assess the data required for credit scoring thanks to 4G's high data transfer speeds.

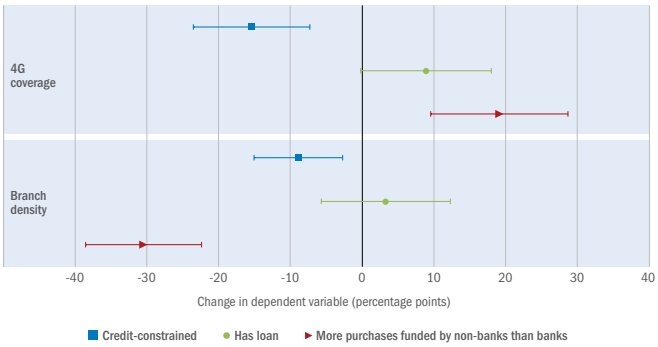
In particular, businesses with 4G access are 15 percentage points less likely to be credit-constrained than similar businesses without 4G access. In other words, such businesses are more likely to (i) not be discouraged by lenders from applying in the first place, (ii) have their loan application accepted and (iii) receive a loan for the desired amount (see Chart 4.13). This effect is comparable to having 1.7 more bank branches within 5 km of the firm's location. Businesses with 4G access are also 9 percentage points more likely to have taken out a loan than similar businesses without 4G.

This analysis also suggests that access to better mobile internet is associated with greater choice for borrowers. The Enterprise Surveys ask businesses that rely on external finance how many of their purchases are funded by traditional banks with a branch presence and how many are funded by non bank financial intermediaries (including online lenders). The analysis shows that businesses with 4G access are nearly 20 percentage points more likely to report that non-bank financial intermediaries fund more of their purchases than traditional banks.

Second, 4G access has a greater impact on smaller businesses than larger ones in terms of easing credit constraints (see Chart 4.14). Micro-firms (defined as firms with fewer than 10 employees) that have access to 4G are 18 percentage points less likely to be credit-constrained, compared with 9 percentage points for medium-sized firms (defined as firms employing between 50 and 249 people). The correlation between access to 4G and the probability of non-bank financial institutions funding more purchases than traditional banks also varies significantly depending on firm size. Indeed, large firms (those with 250 employees or more) that have 4G access are no more likely to use non-bank financial institutions to fund their purchases than large firms without 4G.

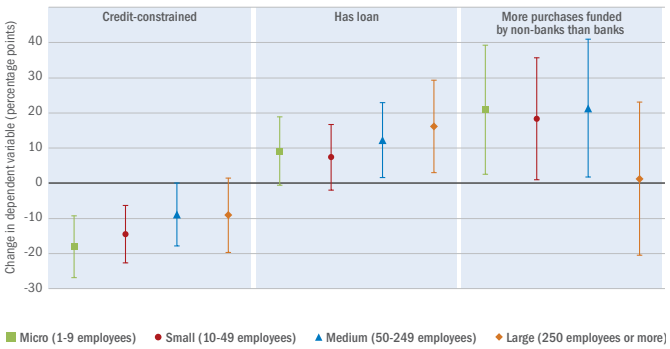
Third, mobile network infrastructure complements banks' physical branch networks. Indeed, the positive correlations between 4G access and (i) the easing of credit constraints, (ii) the probability of having a loan and (iii) the probability of having more purchases funded by non-bank financial intermediaries can be observed for a subsample of districts with above-median branch density, but not for a subsample where branch density is below the median. This

CHART 4.13. 4G mobile networks enable firms to access finance



Source: Enterprise Surveys and authors' calculations.
Note: This chart shows ordinary least squares estimates of the impact that the availability of 4G mobile networks at subnational region level has on financial inclusion at firm level. The 90 per cent confidence intervals shown are based on robust standard errors clustered at subnational region level. All models include subnational region, country-year and sector-year fixed effects, the population density of subnational regions, bank branch density within 5 km of a firm, and firm-level controls (with indicators for exporters, female owners, firms that have been in business for less than five years, audit status and urban/rural location). Localities with observations for fewer than five firms are excluded.

CHART 4.14. 4G has a greater impact on smaller firms in terms of access to finance



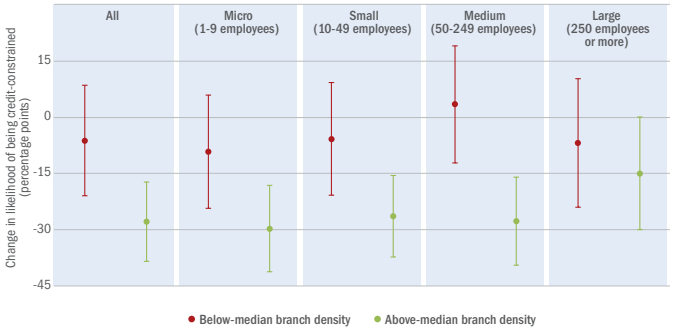
Source: Enterprise Surveys and authors' calculations.
Note: This chart shows ordinary least squares estimates of the impact that the availability of 4G mobile networks at subnational region level has on financial inclusion at firm level. The 90 per cent confidence intervals shown are based on robust standard errors clustered at subnational region level. All models include subnational region, country-year and sector-year fixed effects, the population density of subnational regions, bank branch density within 5 km of a firm, and firm-level controls (with indicators for exporters, female owners, firms that have been in business for less than five years, audit status and urban/rural location). Localities with observations for fewer than five firms are excluded.

effect is most noticeable for smaller businesses, which use branches more frequently than larger firms.[23] In a district with above-median branch density, micro-firms with 4G access are 29 percentage points less likely to be credit-constrained than similar firms without 4G access (see Chart 4.15), compared with 17 percentage points for large firms. This complementarity between 4G network coverage and branch density may arise because smaller firms use mobile networks to learn about banks' products and apply for an initial assessment, but still need to submit a loan application in person at a branch.

Although reducing the size of branch networks is often a major part of banks' digitalisation strategies in the EBRD regions, this analysis suggests that digital infrastructure may enhance banks' ability to deliver financial services via their branches, rather than replacing those branches entirely.

FIRMS WITH ACCESS TO 4G ARE 9 PERCENTAGE POINTS MORE LIKELY TO HAVE A LOAN THAN OTHER FIRMS

CHART 4.15. 4G access only reduces credit constraints where branch density is high



Source: Enterprise Surveys and authors' calculations.
Note: This chart shows ordinary least squares estimates of the impact that the availability of 4G mobile networks at subnational region level has on financial inclusion at firm level. The 90 per cent confidence intervals shown are based on robust standard errors clustered at subnational region level. All models include subnational region, country-year and sector-year fixed effects, the population density of subnational regions, bank branch density within 5 km of a firm, and firm-level controls (with indicators for exporters, female owners, firms that have been in business for less than five years, audit status and urban/rural location). Localities with observations for fewer than five firms are excluded.

Mobile internet democratises access to finance

This next section looks at how the expansion of mobile network coverage is linked to the financial inclusion of households in terms of both (i) increased access to finance for traditionally underserved individuals (such as those living in rural locations) and (ii) reductions in the cost of financial intermediation for all households. Digitalisation may mean that individuals who were previously financially excluded are able to invest in education, save money and launch new businesses, which contributes to the reduction of poverty and fosters economic growth.[24] Moreover, having a bank account facilitates asset building and wealth creation, which may allow the smoothing of consumption on retirement or when faced with economic shocks.[25]

We can use the 2015-20 waves of the Austrian National Bank's Euro Survey to look at the ways in which digitalisation has affected the financial inclusion of people living in central, eastern and south eastern Europe (see Box 4.2 for details). Analysis shows that access to bank accounts has increased throughout that region in the period since 2015, but individuals living in an area with 4G are more likely to have a bank account and use online services. In addition to bank accounts, digitalisation can also broaden financial inclusion through its impact on investment products such as life insurance, equities and pension funds. Importantly, individuals who use online banking and people living in areas with 4G are much more likely to access such investment products than individuals without access to online banking and people living in areas without 4G.

Against that background, the Covid-19 pandemic provides an opportunity to leverage the positive impact that mobile internet infrastructure can have on financial inclusion. As discussed in Box 4.3, individuals who have been exposed to an epidemic in the past two decades are much more likely to make online payments and carry out banking transactions using an ATM instead of a bank branch. The post-Covid-19 recovery will probably see many more individuals making use of such financial technologies, contributing to increased competition in the field of financial services – provided that reliable digital infrastructure and sufficient levels of digital literacy are in place.

[23] Tang (2019), for example, provides evidence from the United States of America showing that P2P lending complements bank lending for small borrowers.

[24] See Beck et al. (2007) and Bruhn and Love (2014).
[25] See Rhine et al. (2006).

The dark side of fintech

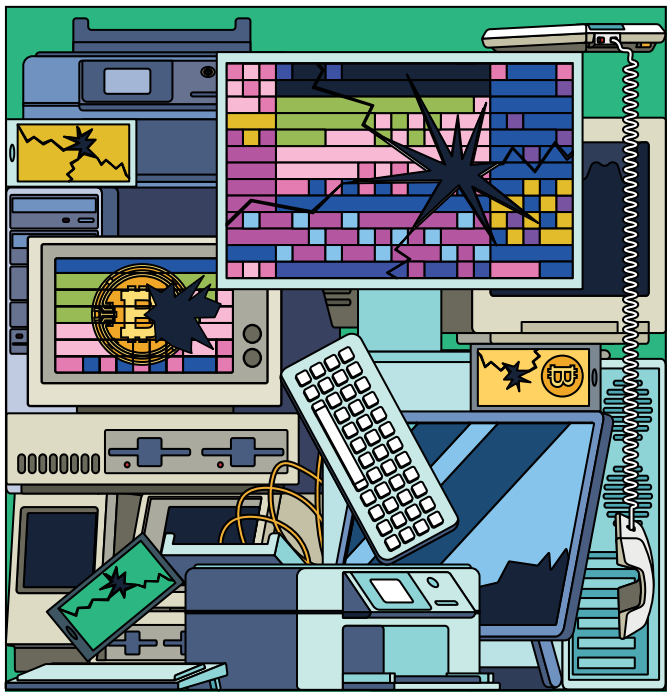
At the same time, however, the adoption of financial technologies is not without risks to financial resilience, inclusion, and consumer privacy and welfare. For instance, fintech-based lending risks further aggravating problems of over-indebtedness in specific groups.[26] Recent evidence from Tanzania, for example, shows that easily available credit accessed via mobile phones is less likely to be repaid when people borrow late at night. Moreover, many digital borrowers are repeatedly late with loan repayments, incurring large penalties, suggesting that they have got caught in a digital debt spiral.

A related concern is whether access to fintech-based technologies is itself equitable. Recent evidence from a large number of countries points to a fintech gender gap, suggesting that there are limits to the extent to which financial technology can, on its own, reduce gender-based disparities in the use of financial services.[27] For example, women are, on average, more worried about the security of online transactions.

More generally, new digital technologies offer consumers limited protection in terms of privacy. Recent advances in computing have enabled technology companies to collect granular data on individuals in real time, tracking people's bank transactions, movements and social media activity. This not only increases the risk of a loss of privacy, it also increases the risk of banks and fintech firms violating rules and laws on fair lending. When it comes to the assessment of credit risk, for instance, innovations in statistical technology which draw on alternative datasets and machine-learning techniques can lead to greater disparities in the credit terms offered to specific individuals, hurting groups that have traditionally been excluded from the financial system.[28]

Digital platforms enjoy significant economies of scale and network effects, given that they offer both financial and non-financial services – often bundled together – and hold large amounts of information on their users. This confers greater market power on such platforms, beyond anything that traditional banks offering services via physical branches can hope to achieve. That power, combined with high speed connectivity, allows digital platforms to offer fully personalised services to consumers in real time. While this increases product choice, it also gives greater pricing power to platforms offering those services, potentially undermining competition.

Other new financial technologies, especially those based on distributed ledger technologies, may have further downsides. For instance, digital currencies (or cryptocurrencies) typically rely on "proof of work" algorithms in a blockchain, whereby computers on a network compete with each other to solve a complex mathematical puzzle. This requires huge amounts of processing power, and the electricity consumed produces high levels of greenhouse gas emissions. Bitcoin – which is just one of many digital currencies – may be responsible for as much as 0.06 per cent of global energy-related CO_2 emissions, while the constant need to replace hardware results in continuous industrial waste.[29] While digital currencies have many potential benefits (including faster and more efficient settlement of payments), there are also regulatory concerns around their use in illegal trade and the potential for them to be used to fund terrorism, launder money and avoid capital controls. For instance, a quarter of all bitcoin users are believed to be involved in illegal activity, accounting for 46 per cent of all bitcoin transactions. It is estimated that a total of US$ 76 billion of illegal activity is carried out each year involving bitcoin – a figure close to the estimated value of the US and European markets for illegal drugs.[30]



[26] See CGAP (2018).
[27] See Chen et al. (2021).
[28] See Fuster et al. (2021).
[29] See IEA (2019).
[30] See Foley et al. (2019).

Conclusion

Technological disruption is transforming financial services across the EBRD regions. While alternative finance is still a fairly new concept in many EBRD regions, a number of countries in those regions are relatively advanced in specific areas, such as peer-to-peer lending. Banks' CEOs regard digitalisation as the biggest challenge that they will face in the coming years, citing competition from fintech providers in particular.

Small firms and households both have the potential to benefit from further digitalisation in the banking sector. As the analysis in this chapter has shown, digital infrastructure in the form of high-speed mobile internet can help to ease credit constraints for businesses and extend financial inclusion to traditionally underserved sections of the population. The digitalisation of financial services is not without risks, however, with policymakers needing to pay attention to a number of specific issues in order to ensure that digitalisation increases financial inclusion in the long term while preserving financial stability.

First, while P2P and crowdfunding markets have been growing rapidly in a number of economies in the CEB region and the former Soviet Union, and cross-country platforms have been established that successfully connect EBRD regions, growth in alternative finance has overwhelmingly been debt based. Moreover, retail borrowers' exposure to alternative debt instruments tends not to be on supervisory authorities' radars. It is often not captured in credit registries, enabling households to "double dip" and borrow from several different sources at the same time – a risk that is particularly acute in countries with a history of excessive private-sector borrowing.[31] Consequently, fintech appropriate consumer protection will be key in order to prevent households and small firms from becoming over-indebted. Credit reporting requirements and credit bureau functions also need to be updated, as the monthly reporting currently carried out by lenders is not well suited to the speed of online lending.[32]

Second, banks' digitalisation and fintech strategies vary widely, with one in five bank CEOs reporting that they have difficulty identifying and establishing links with fintech companies. With that in mind, banks and fintech companies could be encouraged to try out collaborative initiatives within the protected environment of a regulatory sandbox. A regulatory sandbox allows firms to test innovative products or business models in a live market environment, while ensuring that appropriate protections are in place (see Box 4.4). This helps regulators to understand emerging fintech technologies – including their potential benefits and adverse effects on consumers – before a product or service is fully available on the market. Another important barrier to increased adoption of fintech concerns IT security and regulatory uncertainty (see Box 1.2 in Chapter 1). Clear and predictable guidelines on digital alternatives to paper documents/contracts and wet-ink signatures are essential in that regard, since clear frameworks will help fintech companies and incumbent banks alike to introduce new technologies without any fear of falling foul of regulatory or supervisory rules.

Third, as the BEPS III survey shows, many banks have themselves introduced algorithmic credit scoring. With branches closing and loan applications increasingly moving online, supported by more sophisticated credit-scoring models, it will be important for policymakers to gain a better understanding of the implications of these fintech-related trends in terms of financial inclusion. While research suggests that algorithmic lending by fintech companies can reduce discrimination relative to face-to-face lenders, such technology does not fully eliminate discrimination in loan pricing. In order to ensure greater transparency in algorithms, regulators could require lenders to demonstrate that the big-data variables used in their credit-scoring models do not disadvantage certain groups.[33]

Fourth, equitable access to financial services across different locations is another concern. While branch reduction is a key part of banks' digitalisation strategies, the analysis in this chapter shows that access to mobile networks is most beneficial to businesses located in districts with relatively large numbers of physical bank branches. Thus, digitalisation has the potential to exacerbate firms' credit constraints in regions that lack access to high-quality mobile networks and have low levels of branch density. Those regions risk being left behind in terms of both digital infrastructure and banking services, which could have long-lasting adverse effects on economic activity and inclusion.

[31] See De Haas et al. (2021).
[32] See Kaffenberger and Totolo (2018).
[33] See Bartlett et al. (2021).

BOX 4.1.

Central bank digital currencies

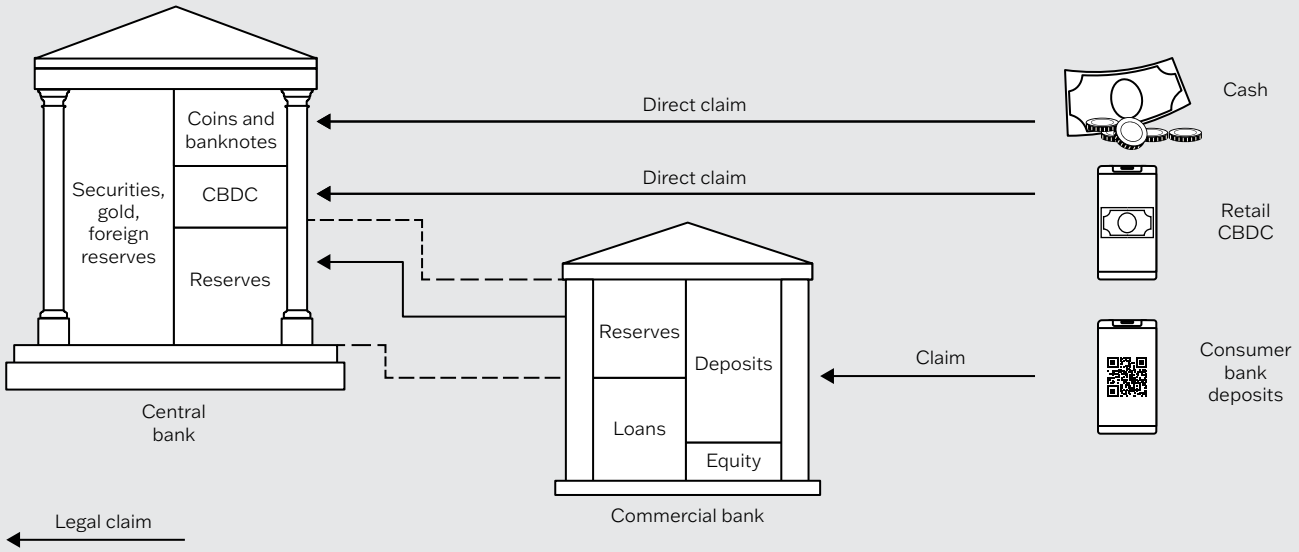
With cash transactions in decline and digital payments on the rise, a wave of new technological developments in the payment industry – including cryptocurrencies, stablecoins and the entry of large technology firms – has the potential to result in far-reaching changes to payment systems around the world.[34] While such innovations could yield benefits in terms of cost and convenience, their ultimate impact on consumer welfare will depend on the market structure and governance arrangements that underpin them. At present, for example, cryptocurrencies are primarily speculative assets, rather than a form of money. They also facilitate illicit transactions. Moreover, the network effects that confer market power on large technology firms could lead to data silos and anti-competitive practices. This could exacerbate the stubbornly high costs of existing payment systems and hamper equal access to digital payment options. Furthermore, the combining of transaction, internet search and social media data also raises concerns about data abuse and even personal safety.

Central bank digital currencies (CBDCs) are an opportunity for the monetary system to overcome such shortcomings of private-sector solutions. CBDCs can be designed for use by financial intermediaries only (wholesale CBDCs) or actors across the economy (retail CBDCs, which represent a direct claim on the central bank; see Chart 4.1.1). Retail CBDCs could offer the unique advantages of central bank money in digital form: transfers would be settled irrevocably; liquidity reserves would ensure that settlements work smoothly; and clear rules would ensure the integrity of the system. Since money backed by central banks represents a public good, open payment platforms with universal access would enable new entrants to challenge incumbents, fostering competition. Private-sector innovation would benefit consumers through increases in user participation (financial inclusion), greater privacy, reductions in the cost of payments and improvements in services. Such benefits could be particularly large in a cross-border context, where payment services are often characterised by a lack of competition and can be expensive and cumbersome to use.

With this architecture, central banks ensure trust in the monetary system, but leave consumer-facing tasks to the private sector. Those tasks include account management and the enforcement of rules combating money laundering and the financing of terrorism (AML/CFT rules). In such a two-tier CBDC system, sound data governance standards and digital identification can protect individuals' privacy against unjustified intrusion by commercial or government actors, while maintaining the integrity of the payment system.

Retail CBDCs could come in two forms. A cash-like design would allow token-based access and anonymity in payments. This option would give individual users access to the CBDC on the basis of a password-like digital signature, without requiring personal identification. Thus, transfers in CBDC would not be linked to specific individuals – anybody with the right password could make payments using the digital wallet.

CHART 4.1.1. Retail CBDCs could offer the unique advantages of central bank money in digital form



Source: Auer and Böhme (2021).

[34] See BIS (2021).

An alternative approach, account-based access, would be rooted in a digital identity scheme. This would facilitate the monitoring of illicit activity in the payment system, while the payment authentication process could be designed in such a way that privacy was preserved. However, it is not yet clear who would issue and administer such a digital identity, as trust in counterparties' ability to safely handle personal data varies substantially.

The ultimate benefits of CBDCs – and their specific designs – will depend on countries' current payment systems, their levels of economic development, their legal frameworks, users' preferences and the policy objectives that societies want to achieve.[35] A recent survey shows that payment safety and financial stability considerations are more important in advanced economies, while central banks in emerging markets and developing economies place greater emphasis on financial inclusion and efficiency.[36] For example, recent reports by the Czech National Bank and the National Bank of Ukraine, among others, stress the potential benefits of CBDCs in terms of improving the speed and convenience of payments and enabling equal access to financial services.

An account-based CBDC may allow greater central bank control over cross-border transfers in both the issuing and the receiving jurisdiction. This could help to mitigate the risks resulting from "digital dollarisation" – that is to say, the use of a foreign CBDC in domestic transactions. Multi-CBDC arrangements could increase the efficiency of cross-border payments by linking national CBDC payment systems.[37] This could offer particular benefits to small open economies, which are more reliant on international remittances and have been hit by the large decline in traditional correspondent banking relationships.[38] Cross-border payments (especially in correspondent banking) are highly costly as a result of cross-country differences in legislation, AML/CFT rules and settlement rules.[39] In this context, CBDCs are an opportunity to simplify the long chains typically seen in correspondent banking and increase the efficiency of payments with a view to facilitating international trade.

[35] See Auer et al. (2020).
[36] See Boar and Wehrli (2021).
[37] See Auer et al. (2021).
[38] See EBRD (2020).
[39] See BIS et al. (2021).

BOX 4.2.

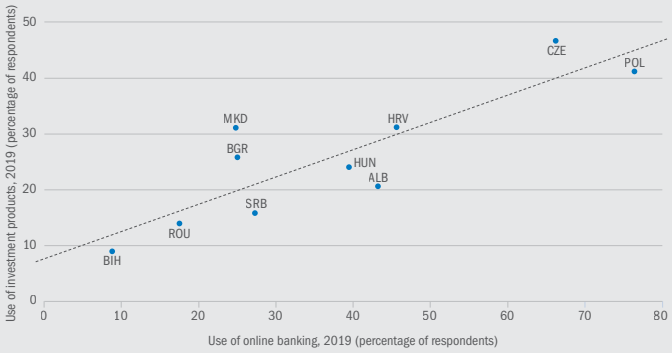
Digitalisation and financial inclusion

While we know that bank accounts can be a major gateway to broader financial inclusion, this box looks at other financial products, asking whether digital access affects financial inclusion when it comes to investment products such as life insurance, personal pensions, equities, bonds and mutual funds. The analysis in this box is based on data from the 2015 20 waves of the Austrian National Bank's Euro Survey, which covers at least 1,000 adults in each of the following countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Hungary, North Macedonia, Poland, Romania and Serbia.[40]

Since 2015, access to bank accounts has increased in all countries. Indeed, it is now almost universal in Croatia and the Czech Republic (although a third of people in Albania and Romania still do not have a bank account). Access to investment products has not increased to the same extent, however. Contractual savings products (life insurance and pensions) are more widespread than capital market investments, with life insurance being the most common investment product in most countries.

Investment products are more prevalent among individuals who also use online banking (see Chart 4.2.1) – and it is worth noting, in this regard, that in most countries less than half of the adult population used online banking

CHART 4.2.1. Investment products are more prevalent among households that use online banking



Source: Euro Survey.

TABLE 4.2.1. People with access to the internet at home are more likely to use investment products

Dependent variable	Bank account and investment product	Contractural savings products		Capital market investment		
		Bank account and life insurance	Bank account and pension fund	Bank account and equities	Bank account and mutual fund	Bank account and bond
Internet at home	0.068***	0.055***	0.031***	0.008**	0.019*	0.011***
	(0.007)	(0.006)	(0.006)	(0.004)	(0.004)	(0.003)
Owns mobile	0.008	0.002	0.001	0.001	-0.010*	-0.003
	(0.013)	(0.011)	(0.011)	(0.006)	(0.005)	(0.004)
Quality and duration of mobile coverage	0.169***	0.129***	0.073***	0.041***	0.005	0.021**
	(0.028)	(0.022)	(0.021)	(0.014)	(0.011)	(0.009)
Local economic activity	0.012***	-0.002	0.013***	0.004*	0.001	0.001
	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.001)
Number of observations	22,292	22,419	22,394	22,388	22,374	22,373
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes

Source: Euro Survey and authors' calculations.
Note: Average marginal effects derived from bivariate probit regressions, with clustered standard errors in parentheses. *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively. All specifications control for age, gender, marital and labour market status, household income, home ownership, risk aversion, financial literacy, experience of hyperinflation and financial losses during transition, the log of the population size and the log of the distance to the nearest bank branch. The quality and duration of mobile coverage ranges from 0 (no mobile coverage) to 1 (4G coverage since 2012) and is based on annual maps in Collins Bartholomew's Mobile Coverage Explorer. Local economic activity is proxied by the log of the VIIRS average stable night light within a 20 km radius of an individual's place of residence (see Henderson et al., 2012).

[40] See www.oenb.at/en/Monetary-Policy/Surveys/OeNB-Euro-Survey.html (last accessed on 15 September 2021)

prior to the Covid-19 pandemic. This correlation might just show that wealthier and more financially literate individuals are more likely to use both online banking and investment products.[41] Alternatively, digital access may influence the use of investment products. A probit regression analysis can help to shed further light on this relationship by linking individuals' use of investment products with the quality and duration of mobile coverage in their area of residence, while taking into account individual socio-economic characteristics and – crucially – the level of economic development in the local area as reflected in night light data (as companies rolling out mobile networks could target wealthier areas, where households are more likely to hold investment products).

The results of this analysis suggest that individuals who have access to the internet at home are 7 percentage points more likely to hold an investment product, 6 percentage points more likely to have life insurance and 2 percentage points more likely to have invested in a mutual fund than similar individuals without access to the internet (see Table 4.2.1). Furthermore, compared with an individual living in an area with no mobile coverage, someone who has been living in an area with 4G since 2012 is 15 percentage points more likely to have both an investment product and a bank account, when controlling for local economic activity and physical access to banks. Furthermore, granular regional data on bank accounts, contractual savings products and capital market investment suggest that rolling out 4G in a region has a significant positive impact on the percentage of individuals who hold investment products, while rolling out 3G does not seem to have any effect.

While bank accounts remain the principal gateway to broader financial inclusion, improving digital access appears to be a means of increasing people's use of contractual savings products and – to a lesser extent – capital market investment. During the Covid-19 pandemic, digital access to financial services has been crucial in avoiding personal contact and the handling of cash. The pandemic-induced increase in the use of digital financial services could, therefore, help to improve financial inclusion in areas other than bank accounts.

[41] See www.oenb.at/en/Monetary-Policy/Surveys/OeNB-Euro-Survey.html (last accessed on 15 September 2021)

BOX 4.3.

Digital divides during epidemics: evidence from the adoption of fintech

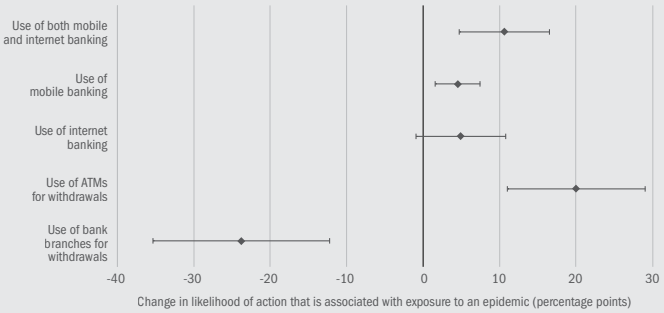
Throughout history, epidemics have triggered crucial breaks in technological trends. For instance, by killing at least a quarter of Europe's population during the 14th century, the Black Death precipitated the adoption of capital-intensive agricultural technologies such as the heavy plough and the watermill, with labour becoming scarce and expensive. More recently, Covid-19 has already been shown to have increased remote working, online shopping and the provision of telehealth services.[42]

However, not everyone is able to adjust their way of life to the same extent in response to a pandemic. For example, white-collar workers in well-paid professions have been more able to shift to remote working during the Covid-19 crisis, whereas women have been less likely to benefit from remote working, as they are more likely to work in occupations that require in-person contact.[43] It has also been harder for older individuals (defined here as people aged 65 or over) to adjust to the new ways of working, while people living in areas with limited broadband have been less capable of self isolating.[44]

Building on Saka et al. (2021), this box asks whether epidemics since the turn of the century (such as Ebola, MERS and Zika) have led to shifts towards new financial technologies (such as online banking) and away from traditional bricks-and-mortar bank branches. Data on epidemics around the world have been taken from Ma et al. (2020), who date epidemic events using announcements by the World Health Organization. That information is then combined with the results of nationally representative Global Findex surveys of individual financial behaviour, which were conducted by the World Bank (in partnership with Gallup) in more than 140 countries in 2011, 2014 and 2017.

Exposure to an epidemic significantly increases the likelihood of a person using mobile banking, making payments online via the internet or carrying out transactions using an ATM instead of a bank branch, taking into account individual characteristics such as the person's country of residence (see Chart 4.3.1). Indeed, it is estimated that use of mobile banking at national level more than doubles in response to such exposure. Increases in the use of ATMs almost exactly offset the estimated decline in the number of in-branch transactions, with the total number of banking transactions remaining broadly unchanged following exposure to an epidemic.

CHART 4.3.1. Exposure to an epidemic leads to greater use of technology in financial services



Source: Global Findex and Ma et al. (2020).
Note: These estimates are derived from individual-level models regressing binary variables capturing the use of various technologies on exposure to an epidemic. All specifications control for individual characteristics and country and year fixed effects and use the Global Findex sampling weights. The 95 per cent confidence intervals shown are based on robust standard errors clustered at country level.

Additional analysis carried out for subsamples of data suggests that young, well-educated, high income individuals in full-time employment are the most likely to carry out transactions online in response to an epidemic, with no significant differences by gender.

Furthermore, individuals living in subnational regions with better mobile internet coverage are more likely to shift towards online banking in response to an epidemic.[45] This finding holds when comparing regions with and without 3G coverage within the same epidemic-hit country. In contrast, 2G coverage (which does not support mobile data) does not have a significant effect when included alongside 3G.

Overall, the results highlight the importance of pre-existing inequalities in terms of the ways in which epidemics drive the adoption of fintech. Disadvantaged sections of the population are less likely to use remote-access technologies and digital finance in a post-pandemic world. Ensuring that digital infrastructure is rolled out in regions that are lagging behind and building trust in remote access banking services can both help to bridge these divides.[46]

[42] See Brenan (2020), Grashuis et al. (2020) and Richardson et al. (2020).
[43] See Saad and Jones (2021) and Coury et al. (2020).
[44] See Farrell (2020) and Chiou and Tucker (2020).
[45] See Saka et al. (2021).
[46] See Klapper (2020).

BOX 4.4.

Fintech inside a sandbox

Playgrounds often feature a small box on the ground filled with sand, where children play under the watchful eyes of their parents. This is where the term "sandbox" – one of the most common words in the fintech universe – originates from. A "regulatory sandbox" provides a protected environment in which eligible firms can experiment with the introduction of new products and services, allowing businesses to see whether their innovative solutions comply with regulatory requirements without any risk to financial stability. Regulators supervise such testing closely on the basis of predefined parameters and timeframes and provide feedback.

The first regulatory sandbox was launched in mid-2016 by the United Kingdom's Financial Conduct Authority (FCA). When a sandbox is launched, fintech companies from around the world can apply to market their products and see whether they comply with financial regulations. Firms that are selected to participate in the sandbox receive advice from a dedicated case officer to help them navigate the complexities of regulations and ease the route to authorisation.[47]

This, in turn, helps regulators to see how existing regulations apply to a new product and decide whether their rules need updating before that product is made available to the wider market. Their aim, in that regard, is to incentivise competition and increase the product choice that is available to consumers. By observing their sandbox, they can learn how to adjust their compliance rules so as to enable the most innovative companies to grow quickly, while preserving consumer protection.

Analysis of the United Kingdom's sandbox experience reveals that firms which entered the sandbox were more successful in raising follow-on funding (typically from venture capital funds) to enable their future growth.[48] It also suggests that using the regulatory sandbox to speed up authorisation of a product reduced regulatory costs and information asymmetries between fintech companies and fund providers.

Some countries have opted for a different approach, establishing innovation hubs in order to foster innovation and increase inclusion in financial services. However, what distinguishes regulatory sandboxes from innovation hubs is sandboxes' ability to actually test an idea in the market. Nevertheless, both concepts foster closer collaboration between authorities and supervised entities, and they both help to ensure a level playing field for incumbent firms and new market entrants (such as fintech start-ups, banks and technology firms) that wish to venture into the digital finance sector.

A number of economies in the EBRD regions (including Estonia, Greece and Poland) are in the process of launching regulatory sandboxes, supported by the European Commission and the EBRD. International organisations can support the introduction of regulatory sandboxes by facilitating cross-border collaboration between regulators and both traditional and non-traditional financial service providers.

Emerging markets could also benefit from establishing thematic regulatory sandboxes (with a focus on remittances, for instance).[49] Such thematic sandboxes could help local regulators to gradually adjust their compliance and supervisory rules and build trust in fintech products.

[47] See FCA (2017) and Cornelli et al. (2021).

[48] See Cornelli et al. (2021).
[49] See Wechsler et al. (2018).

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5
REGULATORY
FRAMEWORK
THE FINANCIAL MARKET DEVELOPMENT INDEX

This chapter introduces a new index measuring the development of financial markets in the EBRD regions and comparator economies. The first part of the index covers conditions supporting the sustainable development of financial markets, looking at the macroeconomic environment, legal and regulatory frameworks, market infrastructure and the investor base. The second component tracks market outcomes in terms of the depth, liquidity and diversification of markets across various asset classes. The two components are closely related, although smaller economies tend to have markets that are less deep than the supporting conditions alone might suggest. Despite notable improvements since 2014 in terms of the conditions for financial market development in the EBRD regions (particularly regarding macroeconomic conditions and market infrastructure), substantial challenges remain. This chapter also identifies key constraints for each economy in terms of the future development of financial markets.

Introduction

This chapter introduces a new index capturing the development of financial markets in the EBRD regions and several comparator economies (both advanced economies and emerging markets). It focuses on traded financial products, covering money, capital and derivatives markets. The advanced economy comparators are Canada, Cyprus, France, Germany, Japan, Sweden, the United Kingdom and the United States of America. The emerging market comparators (Colombia, Peru, South Africa and Thailand) span three different continents and are similar to their peers in the EBRD regions in terms of their size and level of economic development.

The Financial Market Development Index (FMDI) comprises two equally weighted subindices covering (i) the necessary conditions for sustainable market development and (ii) asset class-specific indicators reflecting the extent of such development. The first subindex covers macroeconomic conditions, legal and regulatory frameworks, market infrastructure and the depth of the local investor base (which is, to some extent, determined by the pension system and other structural policies).

The second part of the index captures market outcomes in terms of the depth, liquidity and diversification of markets across several asset classes: fixed income, equities, money markets and derivatives.[1] The two components of the index are closely related, although markets in smaller economies tend to be less deep than the supporting conditions alone might suggest.

Despite notable improvements since 2014 in terms of the conditions for financial market development in the EBRD regions (particularly in terms of the macroeconomic environment and market infrastructure), substantial challenges remained at the end of 2020.

The lack of a well-developed local investor base is a key constraint in most economies in the EBRD regions that do not have well-established defined contribution pension systems. In addition, life insurance companies (where they exist) tend to have low investment capacity.

While market infrastructure tends to be a key constraint in economies with less developed financial markets (such as Albania, Azerbaijan, Belarus and Kosovo), more developed markets (such as Poland and Slovenia) also face challenges in the area of clearing and nominee accounts. Meanwhile, legal and regulatory frameworks are a key constraint in Egypt, Lebanon, Turkmenistan and Ukraine.

Macroeconomic conditions are less of a constraint in the EBRD regions. At the same time, however, there is still significant dollarisation of loans and deposits in a number of economies. And in smaller, less developed markets, interest

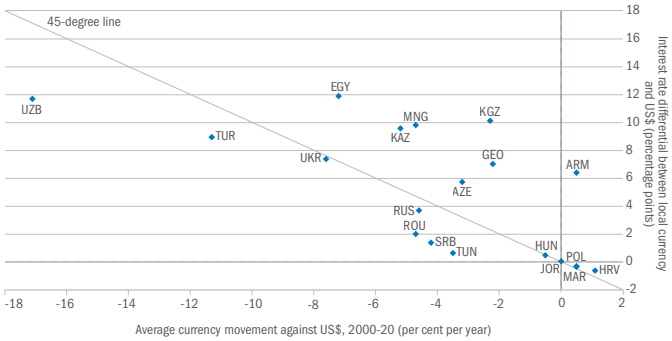
[1] See Annex 5.1 in the online version of this report for a full description of the methodology underpinning the construction of the index.

rate differentials between comparable debt instruments denominated in local and foreign currencies can be large and persistent, exceeding average long-term currency depreciation by 5 percentage points or more.

Overall, south-eastern Europe (SEE) and Russia have seen the greatest improvements in terms of the conditions supporting financial market development (particularly in the area of legal frameworks). Overall progress in terms of reducing the distance to the frontier has been slowest in Turkey and the southern and eastern Mediterranean (SEMED), as improvements in market infrastructure have been offset by the weakness of macroeconomic frameworks.

This chapter starts by looking at the two components of the index, discussing macroeconomic conditions, legal and regulatory frameworks, market infrastructure and investor bases, as well as market outcomes across asset classes. That discussion touches on the evolution of the conditions governing financial market development over time, as well as looking at the interest rate differentials between local currency and foreign currency instruments that can be observed in various economies. The chapter then moves on to look at the conditions that appear to matter most for financial market development in individual economies, before ending with a number of concluding remarks.

CHART 5.1. In a number of economies, interest rate differentials between instruments denominated in local and foreign currencies exceed the average long-term rate of currency depreciation



Source: Bloomberg, IMF, national authorities and authors' calculations.
Note: Based on sovereign bonds with an outstanding maturity of between four and seven years or the closest available maturity. Negative values on the horizontal axis denote depreciation against the US dollar. In the case of Romania, interest rate differentials and currency depreciation are measured relative to the euro, rather than the US dollar.

The components of the Financial Market Development Index

Macroeconomic conditions

Historically, many emerging markets and developing economies have experienced significant dollarisation of loans, deposits and capital market transactions.[2] Such high levels of dollarisation often go hand in hand with high interest rates in local currency relative to equivalent rates in foreign currency (typically US dollars or euros), which compensate investors for the high perceived likelihood of fiscal, external and banking crises. What is more, such crises have indeed been a common occurrence.[3]

In a vicious cycle, high levels of dollarisation make adjusting to external shocks more difficult and increase the likelihood of a crisis. An economy's currency typically depreciates in response to an adverse shock (such as a drop in commodity prices in the case of a major commodity exporter). This makes a country's exports more competitive and makes imports more expensive, boosting domestic demand. However, if the liabilities of households, firms or the government are denominated in foreign currency, the cost of servicing them rises as the local currency depreciates, hindering that macroeconomic adjustment.

In order to break this cycle, stable economic conditions are needed over a prolonged period of time with a view to building investors' confidence in the local currency and local capital markets, coupled with a strong political commitment to pursuing a credible capital market development agenda. When these conditions are met, the gap between the interest rates on long-term government debt denominated in local currency and the US dollar tends to converge to zero or the average long-term rate of currency depreciation. However, in smaller, less developed markets, interest rate differentials can be large and persistent, exceeding average long-term currency depreciation (measured here over a 20-year period) by 5 percentage points or more, as is the case in Egypt, the Caucasus and several economies in Central Asia (see Chart 5.1).

Reflecting these trends, the pillar capturing macroeconomic conditions that are supportive of local financial markets comprises four equally weighted components: price stability underpinned by a credible monetary policy, low perceived vulnerabilities in the external sector, sound government finances and a well-functioning banking sector. When these conditions are met, local capital markets can be effectively connected to global markets and the local banking system, providing a counter cyclical source of funding during crises. In addition, the government is able to provide emergency support to some key market players in the event of economic turbulence, and its securities serve as a robust benchmark for the development of other market segments. In contrast, in an environment of high and volatile inflation and high perceived risks of a fiscal, banking or balance-of-payments crisis, markets are likely to remain less

[2] See EBRD (2015) for a discussion of this issue.
[3] See Laeven and Valencia (2013) for data and an overview, as well as EBRD (2010).

THE FIRST PART OF THE INDEX CAPTURES CONDITIONS SUPPORTING THE DEVELOPMENT OF CAPITAL MARKETS: THE MACROECONOMIC ENVIRONMENT, LEGISLATIVE FRAMEWORKS, MARKET INFRASTRUCTURE AND THE INVESTOR BASE

THE SECOND PART OF THE INDEX TRACKS MARKET DEPTH AND DIVERSIFICATION ACROSS FOUR ASSET CLASSES: EQUITIES, FIXED INCOME, MONEY MARKETS AND DERIVATIVES

liquid, with investors demanding a substantial premium to compensate them for perceived risks.

The price stability score is higher where average annual (year-on-year) inflation is lower and so is the differential between the local currency policy rate and the yield on long-term US dollar denominated bonds issued by the government.

The score capturing conditions in the external sector gives credit to economies with significant international reserves relative to their short-term external financing needs (measured as the sum of the current account deficit and external debt with an outstanding maturity of one year or less). Meanwhile, high reliance on commodity export revenues as a percentage of GDP lowers the score. At the same time, however, the objective of curbing external vulnerabilities needs to be balanced against the objective of effectively connecting local and global capital markets and building a diversified investor base. Consequently, additional credit is given to economies with fewer restrictions on cross-border capital flows (as measured by an index of capital account openness).[4]

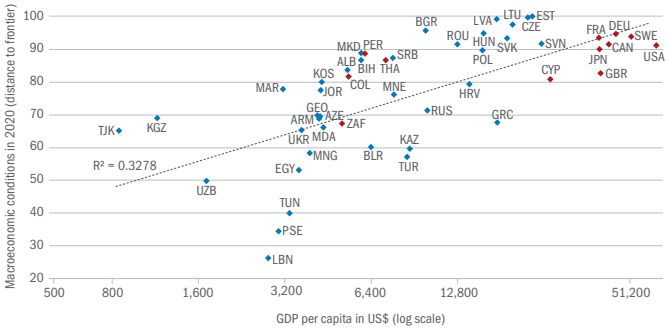
The score capturing government finances looks at levels of government debt and interest payments (as a percentage of GDP), with government debt having half the weight to account for the differing debt-servicing abilities of high- and lower-income economies.

The score measuring conditions in the banking sector penalises economies with high levels of non performing loans (NPLs) relative to total loans and high loan-to-deposit ratios, while recognising that a well-functioning banking system relies on both wholesale and retail sources of funding (so banking systems with loan to deposit ratios of up to 90 per cent are awarded the maximum score, while sectors where loans are 250 per cent or more of deposits are awarded the minimum score).

The overall score for the pillar capturing macroeconomic conditions is expressed in terms of the distance to the frontier (which represents the highest-scoring economy for the period in question: Estonia). A similar approach is followed for the three other pillars of the first subindex. Sweden scores highest as regards legal and regulatory frameworks, Japan is the highest-scoring economy when it comes to the investor base, and several economies (including the United Kingdom and the United States of America) are regarded as being at the frontier in terms of market infrastructure. Thus, the overall subindex of conditions for sustainable financial market development, which averages scores across the four pillars, represents the distance to a hypothetical frontier that aggregates the strongest conditions across several economies, with no economy currently standing at that frontier (which is represented by a score of 100).

As one might expect, economies with higher levels of income per capita (measured using GDP per capita in US dollars) tend to have better macroeconomic conditions (see Chart 5.2). This relationship is far from perfect, however. Turkey, for instance, scores poorly relative to its income per capita, reflecting its persistently high inflation and external financing requirements. In Bulgaria, Morocco and Serbia, on the other hand, macroeconomic policy frameworks appear to be stronger than one would expect on the basis of income per capita alone.

CHART 5.2. Many economies in the EBRD regions have macroeconomic conditions that are comparable to those of advanced economies



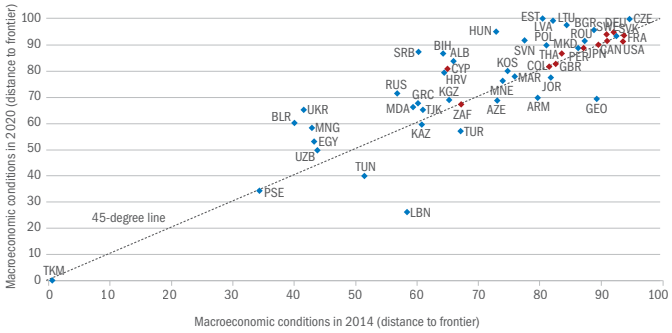
Source: National authorities, IMF, CEIC, Bloomberg and authors' calculations.
Note: GDP per capita is expressed in US dollars at market exchange rates. The distance to the frontier is indicated on a scale of 0 to 100, where 100 represents the frontier.

[4] See Chinn and Ito (2006).

Over time, macroeconomic conditions have strengthened somewhat in most economies in the EBRD regions, thanks to more robust fiscal and monetary policy frameworks (which can be seen in the fact that the dots tend to lie above the 45-degree line in Chart 5.3). Notable exceptions, each of which reflects specific circumstances, include Lebanon (which has defaulted on sovereign debt), Georgia and Tunisia (which are tourism-dependent economies where the Covid-19 crisis has exacerbated external and fiscal imbalances) and Turkey (which has persistently high inflation and a large current account deficit).

On average, the economies of the EBRD regions now tend to score relatively highly on macroeconomic conditions that support the development of capital markets. Indeed, when it comes to macroeconomic frameworks, EU member states in the EBRD regions score just as highly as – if not higher than – advanced economy comparators, as do some economies in the Western Balkans.

CHART 5.3. Since 2014, macroeconomic conditions have improved in most economies in the EBRD regions



Source: National authorities, IMF, CEIC, Bloomberg and authors' calculations.
Note: The distance to the frontier is indicated on a scale of 0 to 100, where 100 represents the frontier.

Legal and regulatory frameworks

Effective legal and regulatory frameworks are crucial in order to reduce the risks and costs associated with capital market transactions and incentivise increased market activity. In particular, robust property rights and the quality of their enforcement have been found to determine the degree of development in capital markets. They tend to be stronger in countries where legal systems are based on common law rather than civil law.[5] Furthermore, countries where minority shareholders enjoy stronger protection against expropriation by insiders have been shown to have more developed securities markets.[6]

Consequently, the pillar capturing legal and regulatory frameworks covers international property rights and the rule of law, but also measures the development of legal and regulatory frameworks that are relevant for money and derivatives markets. It encompasses four equally weighted components: accounting and reporting standards; the legal environment underpinning financial transactions; membership of global standard-setting bodies; and the rule of law and the soundness of the regulatory environment. The accounting and reporting standards component is based on scores measuring the strength of auditing and reporting standards as compiled by the World Economic Forum and the use of International Financial Reporting Standards (IFRS) or Generally Accepted Accounting Principles (US GAAP). These are prerequisites for raising financing through capital markets, and their absence in some countries in the EBRD regions represents a significant obstacle to the expansion of activity, particularly in the corporate issuance segment.

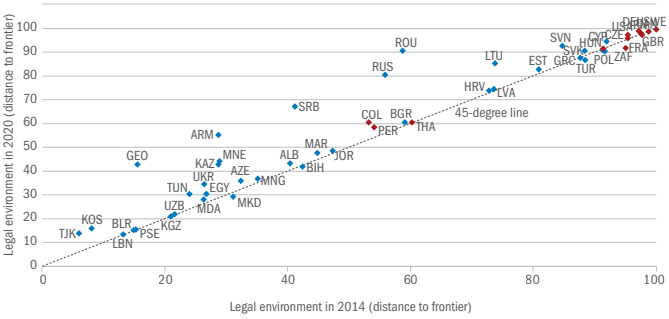
Derivatives are essential components of financial markets, as they allow market participants to manage risks through hedging and facilitate access to local currency for international lenders and investors. This is particularly important in circumstances where onshore local currency securities markets are underdeveloped. The development of derivatives trading – especially over-the-counter (OTC) trading – can be greatly facilitated by the existence of master agreements covering areas such as netting, close-out netting and the adequate provision and enforcement of collateral.[7]

Repurchase (repo) agreements are a key component of a well-functioning money market and the monetary policy transmission mechanism, requiring a robust framework to ensure the enforceability of and access to collateral.[8] Reflecting this, the score capturing the legal environment for financial transactions reflects the use of master agreements provided by the International Swaps and Derivatives Association (ISDA) and the use of general master repurchase agreements (GMRAs) developed by the International Capital Market Association (ICMA).

The legal and regulatory framework pillar also captures countries' membership of international standard-setting bodies, which reflects their readiness to adhere to global regulatory standards governing securities and derivatives markets, as well as the prudential regulation and supervision of their financial sectors. That third component of the pillar rewards countries for membership of the International Organization of Securities Commissions (IOSCO), which is the global standard setter for the securities sector and develops, implements and promotes adherence to internationally recognised standards for securities regulation. Given the bank-centric nature of financial systems in the EBRD regions and banks' key role in financial markets as traders, issuers, intermediaries and investors, that component also reflects countries' membership of

[5] See La Porta et al. (1997).
[6] See Djankov et al. (2008).
[7] See ISDA (2010).
[8] See ICMA (2019).

CHART 5.4. Legal and regulatory frameworks have been strengthened in many economies in the EBRD regions since 2014



Source: Bank for International Settlements (BIS), ISDA, IOSCO, Property Rights Alliance, WEF, World Justice Project and authors' calculations.
Note: The distance to the frontier is indicated on a scale of 0 to 100, where 100 represents the frontier.

the Basel Committee on Banking Supervision (BCBS), which is the global standard-setting body for the prudential regulation of banks.

While the first three components of the legal and regulatory framework pillar focus on the laws adopted in each country, the fourth component aims to capture the strength of enforcement. It combines (i) the Property Rights Alliance's International Property Rights Index and (ii) the World Justice Project's Rule of Law Index (which is the leading global index for original independent data on the rule of law, covering 128 countries and jurisdictions).

Many economies have strengthened the legal frameworks governing the development of financial markets since 2014, including Romania, Russia and Serbia (see Chart 5.4). Such improvements have stemmed mainly from the issuance of ISDA legal opinions and improved adherence to global regulatory standards for securities markets and the banking sector. Romania is the only country in the EBRD regions where GMRAs have been introduced in the past five years, while new ISDA legal opinions have also been issued in Armenia and Georgia. Adherence to global regulatory standards for securities markets has also been strengthened in Armenia and Kazakhstan (which have both become IOSCO members), while the use of IFRS accounting standards has been enhanced in Georgia and Montenegro.

As in the case of macroeconomic conditions, the overall score for the legal and regulatory framework pillar is strongly – but not perfectly – correlated with economic development. In Belarus, for instance, the legal frameworks governing financial markets are far less developed than one would expect on the basis of the country's per capita income.

Market infrastructure

The development of local capital markets requires reliable clearing and settlement infrastructure, as well as services provided by central securities depositories (CSDs) and central clearing counterparties (CCPs) that ensure the safekeeping and efficient trading of securities and derivatives, reduce settlement and counterparty risks, and support financial stability. These key dimensions of financial market development are captured by the market infrastructure pillar.

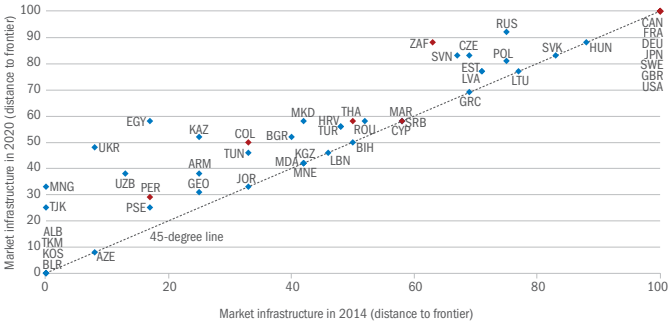
A clearing component looks at whether an independent CCP has been established and, if so, whether that CCP complies with the internationally recognised standards contained in the European Market Infrastructure Regulation (EMIR) or equivalent regulations for non-EU countries. A lower score is assigned if a stock exchange or a CSD provides clearing services.

The settlement component is assigned the maximum score where the national CSD complies with the standards stipulated by the Central Securities Depositories Regulation (CSDR). This reflects the availability of a delivery-versus-payment (DVP) settlement method with a T+2/T+3 settlement cycle, which enables foreign institutional investors to effectively access local markets. The minimum score is assigned if pre-funding is required. A T+2 (T+3) settlement cycle implies settlement (and transfer of, say, shareholder rights in the case of equity purchases) two (three) working days after the transaction takes place.

The market infrastructure pillar also assesses market access and the degree of investor protection through a component reflecting the establishment of omnibus accounts with legally defined nominee status, which have historically played an important role in allowing foreign investors to access capital markets in emerging market economies. Nominee accounts are those where the investor holds securities in the name of a different entity (for example, a market intermediary or the national CSD), which acts as the operator of the nominee account and whose name appears on the register of the issuer of securities. The use of nominee accounts is an essential component of financial markets, as it facilitates securities trading by reducing administration costs and transaction times. In order to ensure adequate protection of investors, such accounts need to have a legally defined nominee status which can effectively provide for securities ownership (including voting rights in the case of equities) and segregate client assets from those of the intermediary. Such segregation limits the risk of investors not being able to recover their assets if the intermediary encounters financial difficulties.

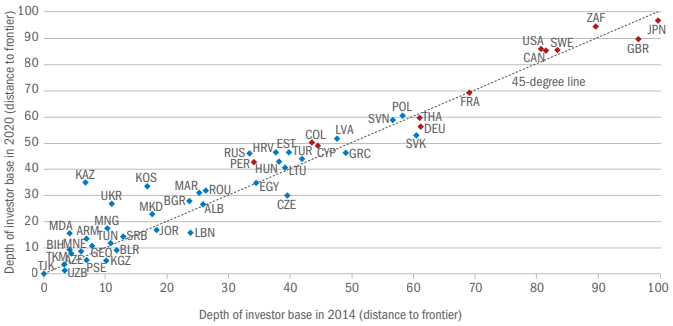
The assessment of market infrastructure also looks at whether there are direct links between national CSDs and international central securities depositories (ICSDs) such as Clearstream and Euroclear, enabling foreign investors to access local capital markets without the need to open an account with the local CSD. Indirect links via an intermediary

CHART 5.5. Market infrastructure has improved in many economies since 2014



Source: National CSDs, clearing entities and securities exchanges, Clearstream, Euroclear and authors' calculations.
Note: The distance to the frontier is indicated on a scale of 0 to 100, where 100 represents the frontier.

CHART 5.6. The depth of the investor base has changed little over time



Source: Bloomberg, European Central Bank, IMF, OECD, S&P Global Market Intelligence, Swiss Re, WEF and authors' calculations.
Note: The distance to the frontier is indicated on a scale of 0 to 100, where 100 represents the frontier.

acting as a subcustodian (as in the case of Greece and Poland, for instance) are assigned a lower score.

Since 2014, notable improvements have been observed in a number of economies in the EBRD regions in the area of market infrastructure, in line with the general improvements in digital infrastructure that were documented in Chapter 1. Indeed, several economies where market infrastructure was previously weak (such as Egypt, Kazakhstan and Ukraine) have seen particularly large improvements (see Chart 5.5). Local market access for international investors has improved in a number of countries (such as Armenia, Egypt, Georgia, Kazakhstan, Romania and Ukraine) through the establishment of links between domestic CSDs and ICSDs. Clearing infrastructure has been upgraded in a number of economies (including Kazakhstan, Russia and Turkey). Settlement efficiency for securities transactions has improved in Egypt, North Macedonia, Russia and Uzbekistan thanks to the introduction of DVP and/or the implementation of a T+2 settlement cycle, and legally robust nominee status or omnibus accounts have been introduced in Bulgaria, Mongolia, Tajikistan, Tunisia and Ukraine.

Local investor base

The final pillar of the conditions part of the index tracks the depth and diversification of the local investor base, which largely reflects the development of defined contribution pension systems (involving individual pension savings accounts), as well as other structural policies supportive of the development of life insurance and other institutional investors (such as mutual funds). The pillar assessing the local investor base aggregates indicators capturing total assets in retirement savings plans and total gross life insurance premia (both as a percentage of GDP), as well as the number of mutual funds available in the local currency.

Institutional investors such as pension funds and life insurance companies are incentivised to make long-term investments, as these match their long-dated liabilities (such as future pension payments). Indeed, the size of the institutional investor base and the level of contractual savings (such as individual pension accounts) explain, along with macroeconomic stability, a large percentage of cross-country differences in the depth of financial markets.[9]

As financial systems in the EBRD regions tend to be dominated by banks – similar to the situation in many advanced European economies – the investor base pillar also takes account of the banking sector's aggregate holdings of debt securities. This reflects bond trading by banks' treasury departments and could also serve as a proxy for activity in repo markets.[10]

In contrast with the recent improvements in macroeconomic conditions, market infrastructure and legal frameworks, there has generally been relatively little change in the depth of local investor bases since 2014 (see Chart 5.6). At the same time, significant improvements have been observed in Croatia, Kazakhstan and Kosovo (where private pension funds' assets have increased substantially), as well as in Russia (which has seen improvements in pensions, life insurance and banks' bond holdings).

This is also an area where there are more differences between advanced economy comparators, with more developed local investor bases being found in Japan and the United Kingdom and a smaller investor base being observed in Germany, reflecting differences in pension systems and saving behaviour. The local institutional investor bases of emerging market comparator economies have witnessed improvements during the reference period and, like advanced economies, also exhibit a high degree of heterogeneity. For example, South Africa's large private pension system puts it higher than most advanced economies in our sample, whereas the local institutional investor bases of smaller economies in South America are broadly comparable to those of countries in the EBRD regions.

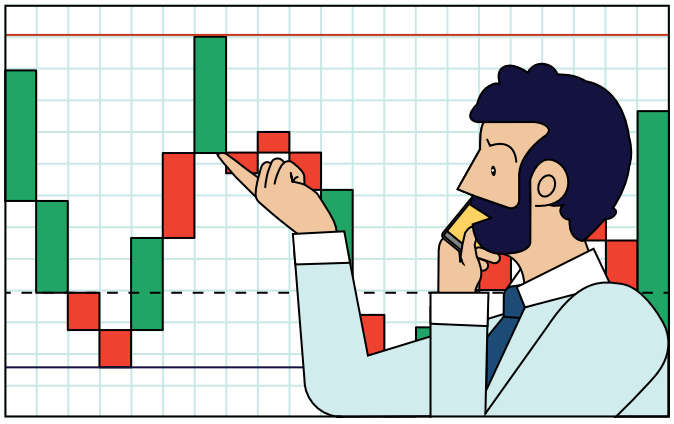
[9] See IFC (2017).
[10] In general, higher scores are awarded in economies where banks hold more traded securities (expressed as a percentage of total bank assets). At the same time, however, large holdings of sovereign bonds may crowd out credit to the private sector. Moreover, if banks tend to buy sovereign bonds and repo them with the central bank, locking in "risk-free" returns, those securities may be rarely traded, with the activity contributing little to market building. To reflect that fact, a threshold of 30 per cent is applied when evaluating the ratio of banking sector debt securities to total assets.

Market depth and diversification

The second subindex of the FMDI focuses on market outcomes, as opposed to conditions that support market development. It reflects the depth, diversification and liquidity of markets across four asset classes: equities, fixed income, money markets and derivatives (each with a weight of 25 per cent).

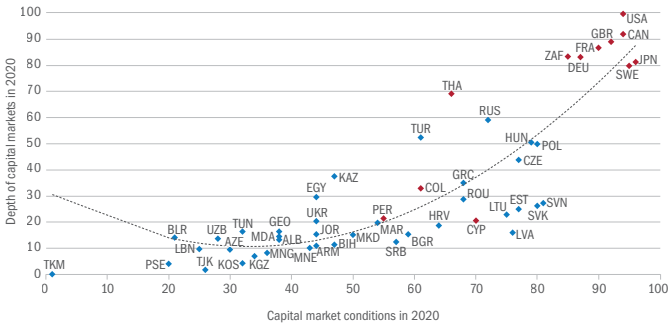
Each component aggregates between 4 and 12 indicators, reflecting market capitalisation, turnover, benchmark index classification (MSCI and FTSE for equities; Barclays Global for fixed income) and the number of different issuers for each asset type (corporations, financial institutions, municipal authorities and governments). The index also takes account of the availability of specific instruments, such as exchange-traded funds (ETFs), bonds issued by international financial institutions (IFIs) in local currency and green bonds, as well as the availability of a robust sovereign yield curve serving as a benchmark for municipal and corporate securities across different maturities. The money markets component also encompasses indicators that aim to measure liquidity and diversification by considering the availability of reliable short-term local benchmark rates and their use in financial instruments by market participants, based on EBRD treasury traders' expert opinions.

As expected, the depth and diversification of financial markets are closely linked to local conditions (see Chart 5.7). For example, the largest and most liquid markets in the EBRD regions can be found in the countries with the strongest financial market conditions (such as the Czech Republic, Hungary, Poland and Russia).



EACH SUBCOMPONENT OF THE INDEX OF FINANCIAL MARKET DEVELOPMENT AGGREGATES BETWEEN 4 AND 12 INDICATORS

CHART 5.7. Economies with better conditions for capital market development tend to enjoy greater market depth



Source: BIS, Bloomberg, Cbonds, EBRD, ICMA, IMF, MSCI, World Federation of Exchanges and authors' calculations.
Note: The trend line represents a quadratic fit.

However, the size of the economy appears to affect this relationship. The greater the issuance of sovereign debt and pools of other instruments in nominal terms, the greater the market liquidity, making markets more attractive to both local and non-resident investors. As a result, smaller economies – including economies in central Europe and the Baltic states (CEB) – tend to have lower market depth and liquidity for a given level of conditions. In this context, regional integration of smaller markets, supported by appropriate policy measures, can help to make those markets more attractive to investors (see Box 5.1 for a discussion of the experience of the Baltic states). Conversely, several large economies with weaker conditions for the development of capital markets (including Egypt, Kazakhstan and Ukraine) have larger, more liquid markets than one would expect on the basis of the supporting conditions alone.

While conditions for the development of financial markets – especially macroeconomic stability and legal and regulatory frameworks – have been strengthened since 2014, few economies in the EBRD regions have witnessed improvements in the depth and liquidity of their financial markets during that period. The greatest improvements have been observed in countries where fixed income markets have expanded significantly (such as the Czech Republic, Egypt, Hungary, Kazakhstan and Russia). In many cases, these developments reflect large-scale issuance of government debt securities to finance policies adopted in response to the Covid-19 crisis. In addition, with the exception of Russia, those improved scores also reflect the issuance of the first green bonds in those markets. In Egypt (and, to a lesser extent, the Czech Republic and Russia) significant improvements have also been seen in local money markets.

Conditions for the development of financial markets: the remaining challenges

The overall subindex of conditions for financial market development is a weighted average of its four components. It ranges from 0 to 100, with higher values corresponding to conditions that are more supportive of financial market development.

Although the relationship between those four components is strong, priorities in terms of the conditions for the development of local financial markets vary across economies. Table 5.1 indicates the area with the greatest distance to the frontier in each economy. By construction, any economy, regardless of its level of financial market development, will have at least one area that is identified as a key constraint (with several areas being highlighted in cases where the differences between the relevant distances are small enough not to be statistically significant).

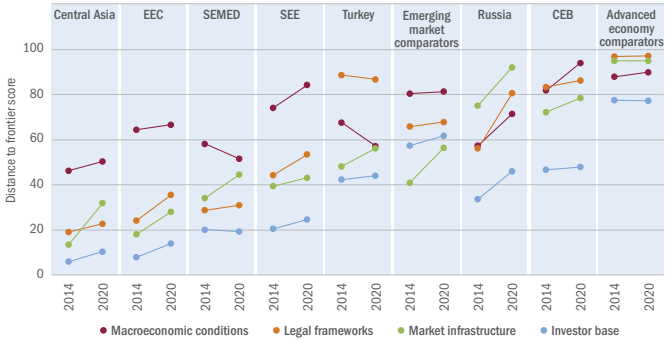
The lack of a well-developed local investor base is a key constraint in most economies in the EBRD regions, as well as some comparator economies (including Germany). Many of those countries do not have well-established defined contribution pension systems (referred to as "second-pillar" pension systems), while life insurance companies (where they exist) have low investment capacity.

While market infrastructure tends to be a key constraint in economies with less developed financial markets (such as Albania, Azerbaijan, Belarus and Kosovo), more developed markets (such as Greece, Poland and Slovenia) also face challenges in the area of clearing or nominee accounts. In Poland a direct link with an ICSD is needed to strengthen cross-border market access, while in Greece reforms are required to introduce legally defined nominee accounts in order to strengthen investor protection while ensuring the efficiency of transactions.

Legal and regulatory frameworks are a key constraint in Egypt, Lebanon, Turkmenistan and Ukraine. Within the European Union, Latvia (which does not have an ISDA legal opinion on netting/close-out netting) also has a relatively low score in this area.

Macroeconomic conditions tend to be less of a constraint in the EBRD regions (in contrast with, say, South Africa, where the Covid-19 crisis has compounded the effects of weak investment over the last decade). That being said, a number of economies do have relatively large distances to the frontier in terms of macroeconomic conditions, with examples including Turkmenistan and Lebanon (where dual exchange rates are present), Turkey (where inflation expectations are not anchored) and Russia (where a lack of economic diversification is weighing on perceptions of macroeconomic stability). Meanwhile, many advanced comparator economies have seen the distance to the macroeconomic conditions frontier increase of late, with public debt levels and inflation rates rising markedly on account of the Covid-19 crisis.

CHART 5.8. The SEE region and Russia have seen the greatest improvements in conditions



Source: National authorities, IMF, CEIC, Bloomberg and authors' calculations.
Note: The scores shown in this chart for the various regions and categories are simple averages based on the figures presented in Table 5.1. The emerging market comparators are Colombia, Peru, South Africa and Thailand, and the advanced economy comparators are Canada, Cyprus, France, Germany, Japan, Sweden, the United Kingdom and the United States of America. The distance to the frontier is indicated on a scale of 0 to 100, where 100 represents the frontier. Country groups are ranked in ascending order on the basis of the overall subindex of conditions.

Overall, the SEE region and Russia have seen the greatest improvements in terms of conditions supporting the development of capital markets, particularly in the area of legal and regulatory frameworks (see Chart 5.8). Across the EBRD regions and emerging market comparators, improvements in terms of market infrastructure have tended to outpace improvements in other categories. Overall progress in terms of reducing the distance to the frontier has been slowest in Turkey and the SEMED region, as improvements in market infrastructure have been offset by the weakness of macroeconomic frameworks and, in some cases, the weakening of legal frameworks.

INDEX VALUES ARE ON A SCALE OF

0 TO 100

AND INDICATE THE DISTANCE TO THE FRONTIER (WHICH IS REPRESENTED BY THE HIGHEST-SCORING ECONOMY IN EACH CATEGORY)

TABLE 5.1. Index of conditions for financial market development and market depth

Economy	Conditions		Market depth		Conditions in 2020			
	2020	2014	2020	2014	Macroeconomic conditions	Legal frameworks	Market infrastructure	Investor base
Japan	96.3	96.8	81.2	71.9	90.0	98.7	100.0	96.6
Sweden	94.7	93.8	79.8	70.1	93.9	99.4	100.0	85.4
Canada	93.8	93.0	91.8	79.1	91.4	98.5	100.0	85.2
United States of America	93.6	92.6	99.6	93.8	91.2	97.2	100.0	85.8
United Kingdom	92.3	94.4	89.0	86.2	82.7	97.1	100.0	89.5
France	89.6	89.7	86.6	86.5	93.5	95.7	100.0	69.1
Germany	87.2	87.8	83.0	71.3	94.7	98.0	100.0	56.2
South Africa	85.3	78.9	83.3	59.8	67.3	91.6	88.0	94.3
Slovenia	81.5	71.6	27.3	26.9	91.7	92.6	83.0	58.7
Poland	80.3	76.7	49.8	50.5	89.7	90.3	81.0	60.3
Slovak Republic	79.9	81.3	26.2	22.4	93.3	90.5	83.0	52.9
Hungary	79.1	72.7	50.5	43.3	94.9	90.7	88.0	42.7
Czech Republic	76.7	73.9	43.8	30.8	99.7	94.3	83.0	29.8
Estonia	76.5	68.2	24.8	14.4	100.0	82.7	77.0	46.4
Latvia	75.5	68.8	16.0	31.6	99.1	74.4	77.0	51.5
Lithuania	75.1	68.7	22.9	24.6	97.5	85.3	77.0	40.4
Russia	72.4	55.4	59.1	47.0	71.3	80.4	92.0	45.9
Cyprus	69.8	64.9	20.6	15.9	80.8	91.5	58.0	48.9
Romania	67.9	56.2	28.7	33.3	91.4	90.4	58.0	31.7
Greece	67.6	66.6	35.0	28.4	67.6	87.6	69.0	46.1
Thailand	66.1	63.8	69.1	47.6	86.7	60.4	58.0	59.5
Croatia	63.8	55.9	18.6	16.1	79.3	73.7	56.0	46.3
Turkey	60.9	61.5	52.3	46.1	57.0	86.6	56.0	43.9
Colombia	60.5	53.0	32.9	26.2	81.7	60.4	50.0	50.1
Bulgaria	59.0	53.0	15.2	14.7	95.7	60.5	52.0	27.8
Serbia	56.7	43.2	12.3	16.3	87.3	67.1	58.0	14.3
Peru	54.7	48.2	21.4	18.8	88.7	58.4	29.0	42.6
Morocco	53.5	51.1	19.7	17.4	77.8	47.5	58.0	30.9
North Macedonia	49.7	44.4	15.1	7.3	88.8	29.1	58.0	22.7
Kazakhstan	47.3	30.4	37.4	18.7	59.5	42.8	52.0	34.8
Bosnia and Herzegovina	46.9	40.3	11.2	10.3	86.7	41.7	50.0	9.2
Armenia	44.1	35.2	10.8	13.1	69.7	55.2	38.0	13.4
Egypt	44.0	30.5	29.5	12.2	53.1	30.3	58.0	34.6
Jordan	43.9	45.2	15.2	10.1	77.4	48.4	33.0	16.8
Ukraine	43.6	21.9	20.3	18.4	65.2	34.5	48.0	26.7
Montenegro	42.7	37.9	10.1	10.4	76.1	44.2	42.0	8.5
Georgia	38.4	34.5	16.3	19.2	69.4	42.6	31.0	10.6
Albania	38.4	33.2	13.1	12.6	83.7	43.2	0.0	26.5
Moldova	37.9	33.1	14.5	11.9	66.1	28.1	42.0	15.4
Mongolia	36.3	22.2	8.1	7.5	58.3	36.7	33.0	17.4
Kyrgyz Republic	34.2	34.7	7.0	8.6	68.9	20.8	42.0	5.0
Kosovo	32.3	25.0	4.2	3.9	79.9	15.8	0.0	33.4
Tunisia	32.0	29.9	16.3	12.3	39.9	30.4	46.0	11.6
Azerbaijan	30.1	29.6	9.4	6.7	68.7	35.8	8.0	7.7
Uzbekistan	27.7	20.5	13.6	3.4	49.7	21.9	38.0	1.2
Tajikistan	26.0	16.8	1.7	0.0	65.1	13.7	25.0	0.0
Lebanon	25.3	35.5	9.7	4.7	26.1	13.3	46.0	15.7
Belarus	21.1	16.9	14.0	13.2	60.1	15.4	0.0	8.9
West Bank and Gaza	19.9	18.4	3.9	3.4	34.3	15.1	25.0	5.3
Turkmenistan	0.9	1.3	0.0	0.0	0.0	0.0	0.0	3.5

Source: EBRD.
Note: Index values for 2014 (2020) are calculated on the basis of data for 2014 (2020) or the closest year available. Index values are on a scale of 0 to 100 and indicate the distance to the frontier (which is represented by the highest-scoring economy in each category). Economies are ranked on the basis of the overall score for conditions in 2020, which is calculated as an average of the four conditions pillars. The distance to the frontier is calculated by taking z-scores (standardised deviations from the mean) for each category, adding the lowest value observed across all economies and expressing the resulting score as a percentage of the maximum score (the frontier). For each economy, the area with the lowest score is highlighted. Where the differences between an economy's lowest scores are not statistically significant, several scores are highlighted.

Conclusion

This chapter has introduced a new index measuring the development of financial markets in the EBRD regions. The first part of the index covers macroeconomic conditions supporting financial market development, market infrastructure, legal and regulatory frameworks and local investor bases. The second part evaluates market outcomes in terms of the depth, diversification and liquidity of markets for various classes of financial instruments.

The EBRD regions have seen notable improvements since 2014 in terms of the conditions for financial market development, but various key constraints can be observed as regards the future development of such markets. Those constraints vary across economies and can serve as a useful guide for policymakers when it comes to in-depth diagnostic assessments and the implementation of targeted, well-sequenced reforms. The index is expected to be updated annually.

BOX 5.1.

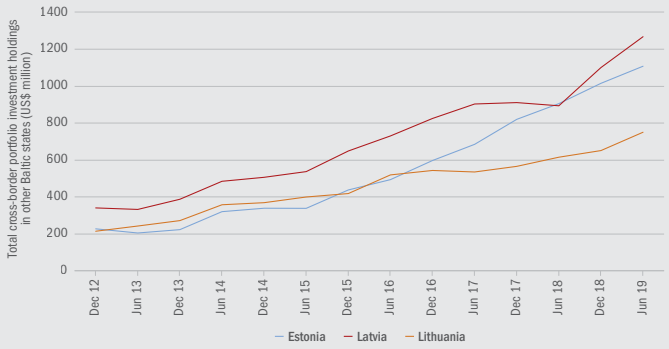
Regional integration of capital markets in the Baltic states

This box discusses the benefits of capital market integration in the Baltic economies (Estonia, Latvia and Lithuania), building on the EBRD's recent assessment of Baltic capital markets, which was completed in 2020. Despite their strong regulatory frameworks and well-established market infrastructure, Baltic capital markets are constrained by their size and the associated limitations on liquidity. Fixed income markets lack depth, with the outstanding stock of corporate debt securities in the three countries ranging between 0.6 and 1.4 per cent of GDP. There are only about 60 companies listed on the main and secondary lists across the national exchanges, with market capitalisation ranging from 3 per cent of GDP in Latvia to 11 per cent in Estonia. Owing to the resulting poor liquidity (with no listed company having market capitalisation in excess of €1 billion), those markets' weights in global index benchmarks are very low (0.42 per cent for Estonia and 0.25 per cent for Lithuania, while Latvia remains unclassified in the MSCI Frontier Markets Index). As a result, securities offerings fail to attract significant interest from international investors.

Increasing cross-border portfolio flows, establishing shared market infrastructure and using the same currency should all support the regional integration of the three countries' capital markets. The three economies have a shared stock exchange (Nasdaq Baltic), and in 2017 their national CSDs were merged to form Nasdaq CSD SE, with highly efficient straight-through processing directly connected to the European Central Bank's TARGET2-Securities platform. Moreover, the establishment of a direct link with Clearstream in December 2019 has further improved market access for international investors. Supported by the adoption of a common currency (the euro), cross-border portfolio investment holdings across the three Baltic states have increased rapidly, rising from US$ 0.8 billion in 2012 to US$ 3.2 billion in 2019 (see Chart 5.1.1).

A 2017 memorandum of understanding between the governments of the three Baltic states, the European

CHART 5.1.1. Cross-border portfolio investment holdings across the three Baltic states have risen rapidly



Source: IMF and authors' calculations.

Commission and the EBRD has paved the way for multiple initiatives aimed at attracting investment through the establishment of a common capital market. These include a framework for corporate commercial paper using common issuance documentation (with the first transaction taking place in 2021) and a pan-Baltic accelerator fund aimed at supporting access to finance for pre initial public offering (pre-IPO) exchange-traded small and mid-cap companies. Significant progress has also been made on legislative frameworks for covered bonds, with the first issuances taking place in 2020. Work is ongoing with a view to aligning those frameworks in order to enable issuances to be covered by pan-Baltic pools of assets – a very attractive solution for financial institutions operating in all three countries.

Work is also ongoing with index providers on the adoption of a pan-Baltic single index classification. This would bring the region closer to meeting the size requirements for inclusion in the emerging markets category, although the combined size of the three markets would remain small compared with other emerging markets in the region (such as Bulgaria, Hungary or Poland), and additional efforts to list large companies (with market capitalisation in excess of €1 billion) would be needed in order to meet the market size criteria set by index providers.

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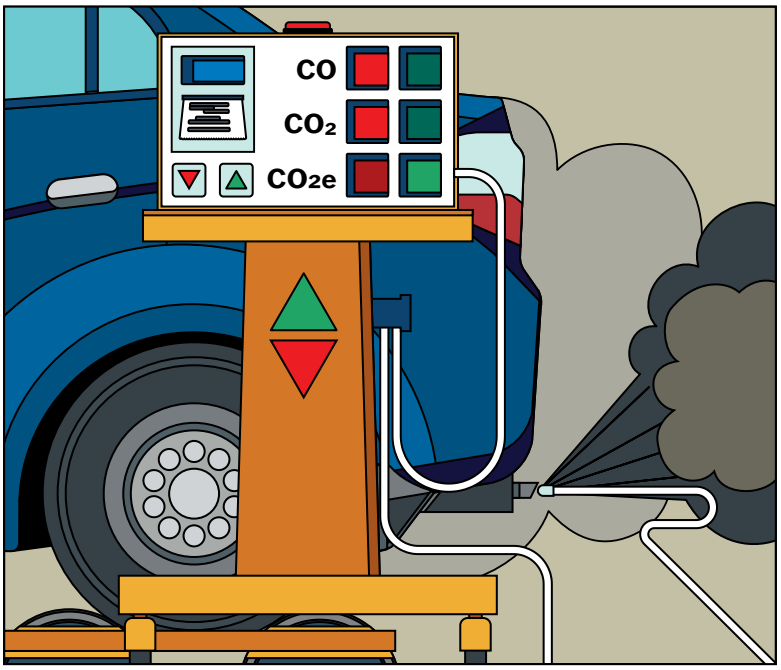
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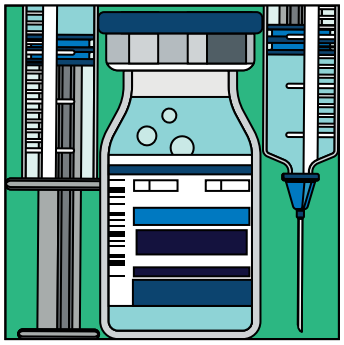

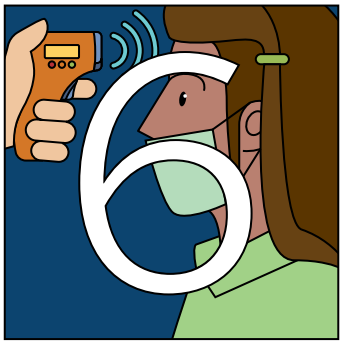
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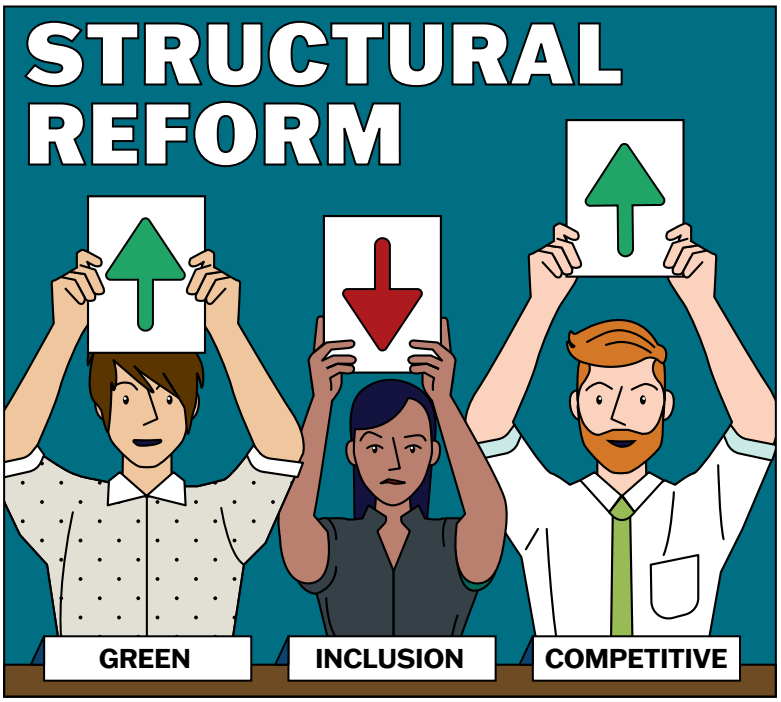
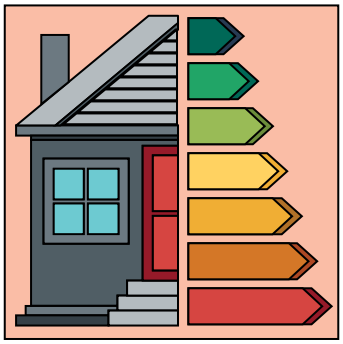
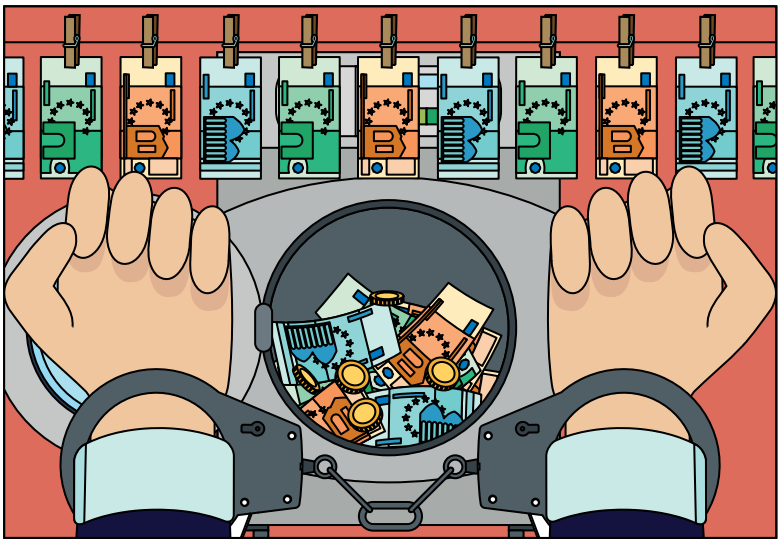

STRUCTURAL REFORM
GREEN
INCLUSION
COMPETITIVE





This section of the report presents updated transition scores for the economies in the EBRD regions and discusses reforms carried out by governments over the last year. While the Covid-19 pandemic has caused substantial economic turmoil in the EBRD regions, many governments have continued to push ahead with reform measures or have restarted reform efforts that were temporarily on hold owing to the increased uncertainty. Reforms have continued to be implemented in areas such as competitiveness, governance and energy efficiency, with transition scores capturing the gradual improvements seen in those areas. At the same time, however, several economies have seen the reversal of previous reforms, resulting in declining scores, with performance gaps and reform needs remaining acute in many cases.

Introduction

Over the last year, governments and policymakers across the EBRD regions have been preoccupied with dealing with the Covid-19 pandemic and its fallout. As detailed elsewhere in this report and in the online country assessments, the pandemic caused most countries' economies to contract in 2020 and necessitated the development of comprehensive response packages, thus diverting attention away from reform agendas. The pandemic has also had important implications for the sustainability of economies, resulting in significant turmoil and uncertainty in the financial sector. Unemployment has increased, damaging efforts to make societies more inclusive. Border and trade restrictions have created problems for established production networks and global supply chains and have set back the process of integration. However, most economies are now bouncing back in 2021, allowing a renewed focus on reforms and a reversal of some of the most damaging effects of the pandemic. Encouragingly, the analysis in this section shows that many countries have pushed ahead with their reform agendas and continued to carry out important structural reforms.

The assessment in this section focuses on six qualities of a sustainable market economy, looking at whether economies are competitive, well-governed, green, inclusive, resilient and integrated. Analysis of changes to "assessment of transition qualities" (ATQ) scores over the last year points to a number of specific developments across the EBRD regions.[1] Across those six qualities, increases in scores have been concentrated mainly in central Europe and the Baltic states (CEB), south-eastern Europe (SEE) and Central Asia, while declines have been observed primarily in eastern Europe and the Caucasus (EEC) and the southern and eastern Mediterranean (SEMED). Improvements have been observed mainly for governance, green and resilience scores, while declines have tended to be concentrated in scores for inclusion (see Chart S.1 and Table S.1).[2]

Competitiveness scores have improved moderately across the EBRD regions over the last year. This is primarily the result of continued incremental improvements in the business environment and increases in credit to the private sector. Over the period 2016-21, most economies have made steady progress in terms of improving the business climate and SMEs' access to finance, supporting the knowledge economy and improving the skills base in the labour force. Despite those broad-based gains, competitiveness scores have deteriorated in a few countries (most notably Lebanon and Ukraine), driven by the declining complexity of economic activity, a worsening of trade conditions and falling labour productivity.

[1] For each quality, progress with transition is assessed on a scale ranging from 1 (worst possible performance) to 10 (frontier representing the standards of a sustainable market economy). ATQ scores are based on a wide range of external and internal data sources and calculated in accordance with a detailed methodology. See https://2021.tr-ebrd.com/reform/ for a detailed description of that methodology.

[2] Many of the underlying datasets on which ATQ scores are based are updated irregularly or with time lags. For that reason, some ATQ scores may not capture recent reforms. Consequently, a medium-term perspective covering the period 2016-21 gives a better indication of economies' trajectories in terms of reforms and structural changes. With that in mind, the discussion in this section looks at changes to scores over the last year and over the period 2016-21.

Governance scores, too, have mostly improved over the last year, albeit with a few notable exceptions. Scores have increased significantly in a number of economies in the CEB region (the Czech Republic, Estonia, Latvia and Lithuania), as well as Egypt, Kazakhstan, Ukraine and Uzbekistan. At the same time, notable deteriorations have been observed in Jordan and Tunisia. Over the period 2016-21, developments have been more mixed, with improvements in Armenia, Azerbaijan, Egypt and Lithuania, and deteriorations in Albania, Bosnia and Herzegovina, Lebanon, Mongolia, North Macedonia and Poland. Improvements have been driven mainly by increased compliance with standards aimed at tackling money laundering and the financing of terrorism (AML/CFT standards), greater protection of private and intellectual property rights, improved frameworks for challenging regulations and greater participation in e-government. Deteriorations primarily reflect gradual declines for indicators measuring the effectiveness of the courts, informality, perceived corruption and frameworks for challenging regulations. In Poland, the score for judicial independence has also declined significantly.

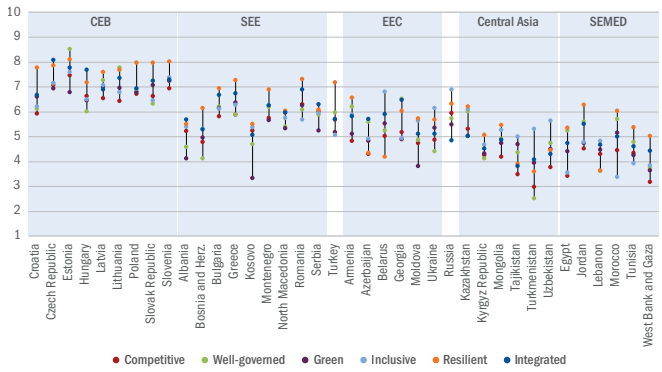
Green scores have also generally improved over the last year following the renewal of commitments to the 2015 Paris Agreement in a number of countries in the SEE region (Bosnia and Herzegovina, Bulgaria, Greece, Montenegro, North Macedonia and Romania) and the CEB region. Meanwhile, a lack of progress with carbon-pricing mechanisms has led to modest declines in Egypt, Jordan and Turkmenistan. A similar trend can be observed over the period 2016-21, with scores improving significantly in a number of CEB economies, as well as Bulgaria, Montenegro, North Macedonia, Romania and Uzbekistan.

Inclusion scores have deteriorated in a number of economies. In Azerbaijan, Croatia, Georgia, Tajikistan and the West Bank and Gaza, gender inclusion scores have declined over the last year, while youth inclusion scores have deteriorated in Bosnia and Herzegovina, Bulgaria, Kazakhstan, Russia and Serbia. In contrast, Jordan's inclusion score has improved over the last year. Developments over the period 2016-21 are mixed, with inclusion scores declining in Croatia, the Czech Republic, Kazakhstan and Serbia, but improving markedly in Azerbaijan, Montenegro and Tajikistan.

ATQ scores for **energy resilience** have increased in Croatia, Estonia, Morocco and Serbia over the last year as a result of improvements in regulation and progress with the restructuring of the energy sector. Meanwhile, **financial resilience** scores have improved in most economies, driven by improved capital adequacy ratios and increased banking-sector activity, as well as progress with risk management practices and corporate governance frameworks. However, financial resilience scores have declined in Belarus and Lebanon, reflecting significant vulnerabilities in the Belarusian financial sector and Lebanon's multi-faceted crisis. Over the period 2016-21, financial resilience scores have improved in a number of economies, driven by declining NPL ratios and progress with legal and regulatory frameworks.

Integration scores have improved in a few economies (including Estonia, Mongolia and Uzbekistan) over the last year. Such gains have typically been modest and reflect improvements in FDI inflows and the declining cost of cross-border trade. Over the period 2016-21, the EBRD regions have seen continued increases in integration, driven by improvements in ICT infrastructure and increases in trade volumes.

CHART S.1. ATQ scores for six qualities of a sustainable market economy, 2021



Source: EBRD.
Note: Scores range from 1 to 10, where 10 denotes the synthetic frontier for each quality.

Competitive

Over the last year, competitiveness scores have improved – albeit modestly – in most economies in the EBRD regions, driven primarily by improvements in the business environment and increases in credit to the private sector. The most notable improvements have been seen in countries with lower initial scores (particularly Jordan, Tajikistan and Turkmenistan). Only Poland has seen its score decline – a development that reflects a modest deterioration in the business environment, as well as a decline in credit to the private sector. Meanwhile, Lebanon has seen declines in a number of business environment indicators over the last year (reflecting increases in the difficulty of setting up a new business and dealing with insolvency). That deterioration has been exacerbated by soaring inflation, significant weakening of the local currency and severe shortages of foreign currency.

TABLE S.1. ATQ scores for six qualities of a sustainable market economy

	Competitive			Well-governed			Green			Inclusive			Resilient			Integrated		
	2021	2020	2016	2021	2020	2016	2021	2020	2016	2021	2020	2016	2021	2020	2016	2021	2020	2016
Central Europe and the Baltic states																		
Croatia	5.92	5.86	5.83	6.12	6.08	6.18	6.62	6.25	5.83	6.22	6.33	6.49	7.77	7.76	7.29	6.68	6.66	6.57
Czech Republic	7.07	7.05	6.93	7.13	7.01	6.89	6.95	6.71	6.39	7.17	7.20	7.37	7.86	7.93	7.95	8.08	8.09	7.97
Estonia	7.46	7.46	7.36	8.52	8.38	8.43	6.78	6.41	6.22	7.60	7.62	7.59	8.11	8.01	7.87	7.78	7.53	7.51
Hungary	6.64	6.61	6.47	6.02	6.04	5.79	6.46	6.09	5.96	6.51	6.52	6.71	7.19	7.02	6.99	7.69	7.65	7.64
Latvia	6.54	6.54	6.43	7.27	7.01	6.82	7.00	6.62	6.15	7.07	7.08	7.17	7.60	7.48	7.41	6.89	6.94	7.32
Lithuania	6.44	6.44	6.47	7.77	7.40	7.20	6.96	6.59	6.34	6.78	6.85	6.82	7.68	7.53	7.47	7.35	7.31	7.24
Poland	6.72	6.73	6.66	6.83	6.86	7.26	6.79	6.42	6.44	6.92	6.91	6.78	7.98	7.89	7.93	6.95	6.99	6.81
Slovak Republic	6.63	6.60	6.54	6.32	6.36	6.21	7.07	6.69	6.60	6.45	6.51	6.43	7.98	7.86	7.82	7.25	7.26	7.41
Slovenia	6.95	6.94	6.85	7.26	7.22	7.10	7.26	6.89	6.58	7.39	7.43	7.38	8.02	7.72	7.74	7.29	7.26	7.13
South-eastern Europe																		
Albania	5.22	5.18	4.85	4.59	4.51	5.16	4.13	4.13	4.16	5.39	5.35	5.33	5.51	5.43	5.18	5.69	5.69	5.53
Bosnia and Herzegovina	4.78	4.77	4.85	4.12	4.04	4.52	4.95	4.71	4.56	5.32	5.39	5.41	6.14	6.11	5.85	5.30	5.31	5.08
Bulgaria	5.83	5.82	5.69	6.22	6.18	5.88	6.15	5.78	5.35	6.13	6.30	6.18	6.95	6.80	7.04	6.68	6.71	6.93
Greece	5.88	5.84	5.94	5.89	5.83	5.62	6.36	5.99	5.98	6.29	6.25	6.13	7.27	7.29	6.87	6.75	6.79	6.13
Kosovo	5.24	5.20	4.53	4.69	4.64	4.81	3.34	3.33	3.17	5.38	5.35	5.33	5.51	5.49	5.11	5.08	5.08	4.66
Montenegro	5.76	5.71	5.32	6.19	6.27	5.83	5.66	5.31	5.08	6.26	6.20	6.00	6.90	6.78	6.34	6.26	6.25	5.74
North Macedonia	5.97	5.95	5.78	5.41	5.42	5.77	5.33	4.96	4.45	5.76	5.77	5.72	6.03	6.10	5.64	5.98	5.97	5.67
Romania	6.31	6.28	6.04	6.08	6.03	5.92	6.25	5.88	5.70	5.68	5.65	5.58	7.31	7.29	7.22	6.90	6.87	6.71
Serbia	6.01	5.94	5.68	5.88	5.78	5.63	5.25	5.12	4.91	5.96	6.11	6.21	6.09	5.99	5.96	6.31	6.26	6.16
Turkey	5.68	5.62	5.48	5.97	5.92	6.08	5.18	5.18	4.98	5.06	4.98	4.95	7.19	7.21	7.36	5.72	5.69	5.87
Eastern Europe and the Caucasus																		
Armenia	4.82	4.74	4.51	6.22	6.13	5.72	5.11	5.09	4.90	5.88	5.85	5.75	6.56	6.60	6.23	5.83	5.85	5.36
Azerbaijan	4.30	4.23	4.17	5.61	5.56	5.10	4.83	4.82	4.60	4.92	5.02	4.73	4.34	4.26	4.12	5.70	5.81	5.55
Belarus	5.03	5.01	4.55	5.25	5.27	4.78	5.53	5.53	5.49	6.82	6.81	6.74	4.18	4.30	3.80	5.91	5.87	5.51
Georgia	5.18	5.18	4.69	6.53	6.50	6.54	4.90	4.90	4.71	4.94	5.14	5.12	6.04	6.13	5.49	6.47	6.57	6.13
Moldova	4.75	4.72	4.69	4.88	4.86	4.55	3.81	3.81	3.66	5.64	5.58	5.65	5.74	5.80	5.31	5.12	5.16	5.10
Ukraine	4.87	4.86	5.01	4.42	4.25	4.09	5.36	5.22	4.99	6.16	6.17	6.18	5.68	5.93	4.93	5.11	5.08	4.85
Russia	5.95	5.90	5.57	5.73	5.70	5.42	5.49	5.26	5.01	6.89	6.97	6.81	6.33	6.31	6.25	4.84	4.83	4.92
Central Asia																		
Kazakhstan	5.32	5.29	5.14	6.02	5.86	5.64	5.02	5.03	4.65	6.11	6.38	6.35	6.21	6.14	6.28	5.03	5.00	4.95
Kyrgyz Republic	4.25	4.19	3.90	4.13	4.14	4.09	4.33	4.14	3.92	4.68	4.66	4.84	5.08	5.11	5.16	4.51	4.53	4.52
Mongolia	4.20	4.20	4.11	4.92	4.95	5.30	4.75	4.74	4.61	5.27	5.23	5.40	5.47	5.41	5.44	4.88	4.75	4.92
Tajikistan	3.48	3.35	3.25	4.36	4.36	4.00	4.70	4.69	4.62	5.01	5.13	4.66	3.91	3.96	3.61	3.81	3.84	3.39
Turkmenistan	2.99	2.88	2.91	2.52	2.43	2.52	3.94	4.03	3.94	5.32	5.36	5.32	3.60	3.58	3.59	4.09	4.04	4.08
Uzbekistan	3.77	3.71	3.50	4.73	4.63	4.55	4.49	4.48	3.93	5.64	5.58	5.61	4.45	4.47	4.03	4.30	4.09	3.62
Southern and eastern Mediterranean																		
Egypt	3.41	3.34	3.44	5.25	5.03	4.52	4.40	4.51	4.26	3.56	3.55	3.59	5.35	5.37	4.94	4.75	4.79	4.34
Jordan	4.52	4.27	4.15	5.60	5.76	5.72	4.73	4.93	4.96	4.78	4.62	4.67	6.28	6.15	5.55	5.52	5.54	5.79
Lebanon	4.29	4.29	4.45	3.61	3.68	3.84	4.47	4.36	4.36	4.83	4.83	4.95	3.63	3.95	4.03	4.67	4.66	4.79
Morocco	4.46	4.43	4.08	5.72	5.75	5.34	5.16	5.16	5.23	3.37	3.30	3.45	6.05	6.02	5.65	5.01	4.99	4.97
Tunisia	4.34	4.27	4.24	4.79	4.98	5.05	4.26	4.27	4.10	3.93	3.90	4.06	5.38	5.03	4.93	4.60	4.59	4.41
West Bank and Gaza	3.18	3.16	3.06	3.72	3.77	3.65	3.64	3.64	3.72	3.83	3.90	3.95	5.02	4.95	4.82	4.70	4.44	4.43

Source: EBRD.
Note: Scores range from 1 to 10, where 10 represents a synthetic frontier corresponding to the standards of a sustainable market economy. Scores for years prior to 2021 have been updated following methodological changes, so they may differ from those published in the *Transition Report 2020-21*. Owing to lags in the availability of underlying data, ATQ scores for 2021 and 2020 may not fully correspond to that calendar year.

Similar trends can be observed over the period 2016-21. Most economies in the EBRD regions have seen their competitiveness scores increase over that period, driven by general improvements in the business environment, greater labour productivity, better workforce skills, improvements in the knowledge economy and greater access to finance for SMEs. Notable improvements have been observed in Belarus, Georgia, Kosovo and Montenegro. In those economies, changes have been driven mainly by improvements in the perceived quality of logistics services, increases in credit to the private sector and higher scores for indicators measuring the ease of doing business. Meanwhile, competitiveness scores have deteriorated significantly in Lebanon and Ukraine. In Lebanon, this has been driven by a decrease in the complexity of economic activity (as measured by an index of economic complexity) and a decline in advanced business services as a percentage of exports. In Ukraine, import tariffs and subsidies for the private sector have increased, while the perceived quality of logistics services has deteriorated. In both economies, those trends have been exacerbated by a decline in labour productivity. Modest declines have also been observed in a number of other economies on account of increases in import tariffs and reduced participation in global value chains.

Reform of state-owned enterprises and privatisation

Several economies in the EBRD regions have pushed ahead with reforms to their governance frameworks for state-owned enterprises over the last year. In April 2021, for example, Serbia adopted a new strategy governing the ownership and management of state-owned business entities, which covers the period 2021-27. That strategy proposes establishing a centralised ownership function for all state-owned enterprises (within the Ministry of the Economy), developing a single framework for the ownership and governance of all state-owned enterprises, and completing their corporatisation by transforming them into joint-stock or limited liability companies. In a similar vein, in March 2021 Uzbekistan adopted a strategy governing the management and reform of state-owned enterprises over the period 2021-25. That strategy introduced criteria justifying state ownership and set targets for reducing state-owned enterprises' footprint in the economy, as well as calling for the drafting and adoption of new laws on privatisation and the management of state-owned property. Uzbekistan has also seen continued privatisation efforts over the last year, with a number of large assets being sold. Meanwhile, the Georgian government has announced plans to start reforming its state-owned enterprises in 2021 with a view to improving their corporate governance practices. A special council is expected to lead this reform effort, starting with work at Georgian State Electrosystem (GSE), a transmission system operator. Despite a challenging political environment, Tunisia has continued the process of reforming the operations and governance practices at STEG, the national electricity and gas company.

In Ukraine, the sale of small state-owned assets has continued, while the sale of large state assets was temporarily put on hold from September 2020 to April 2021 owing to the ongoing Covid-19 pandemic. The restarting of that initiative will allow the government to embark on the process of selling several important enterprises in the mining, manufacturing, energy and hospitality sectors. Meanwhile, Ukraine has made some progress with reforming the corporate governance of state-owned enterprises, which has involved the gradual corporatisation of such entities, the establishment of independent boards and the adoption of disclosure requirements. At the same time, some worrying developments have also been observed, such as the government's dismissal of the management of Naftogaz (a major Ukrainian oil and gas company), which involved circumventing the company's supervisory board. That incident has undermined previous progress in this area.

In February 2021, the Romanian government overturned a two-year ban on the sale of publicly owned shares in state enterprises (which had been imposed by the Romanian parliament in August 2020). That change will pave the way for the sale of shares in a number of state-owned enterprises (including electricity producer Hidroelectrica). And in December 2020, following the completion of Kazakhstan's last privatisation programme, a new privatisation plan was approved for the period 2021-25, with more than 600 enterprises earmarked for full or partial privatisation. That plan includes key enterprises such as Air Astana (a major airline), Kazakhtelecom (a telecommunications company) and KazMunayGas (an oil and gas company).

UNDER KAZAKHSTAN'S PRIVATISATION PLAN FOR 2021-25, MORE THAN

600

ENTERPRISES ARE EARMARKED FOR FULL OR PARTIAL PRIVATISATION

Competition policy

Some countries have also made significant progress with the frameworks governing the enforcement of competition policy. In Bulgaria and Croatia, for example, updated competition regulations entered into force in 2021, ensuring that those countries' legal frameworks were aligned with the EU's competition laws (particularly the European Competition Network (ECN+) Directive). Those new competition regulations give competition authorities greater autonomy and facilitate the enforcement of competition legislation. In Kazakhstan, meanwhile, a new agency for the protection and development of competition was created in October 2020, reporting directly to the country's president. That agency has an extensive mandate to protect and promote competition, investigate anti-competitive behaviour by firms and regulate markets with dominant players. Previously, the functions of a competition authority were performed by a committee within the Ministry of the Economy.

Land reforms

Some economies have made progress with land reforms. After adopting a law on the deregulation of land sale transactions in May 2021, Ukraine established a market for farmland on 1 July 2021. That reform ended a 20-year ban on the sale of farmland in Ukraine, which was discouraging investment in that sector and restricting the expansion of agricultural finance. For the time being, the law only allows farmland to be sold by and to Ukrainian citizens, with legal persons not allowed to participate in the market. However, that issue will be reconsidered after 2024, with foreign citizens and legal persons allowed to participate in the market if approval is granted in a national referendum. The gradual liberalisation of the agricultural land market is expected to encourage significant investment in the sector, supporting the expansion of agricultural finance and improving both yields and agricultural productivity.

Uzbekistan, meanwhile, made several changes to its land legislation in June 2021, paving the way for improvements in land use. In particular, that legislation now allows land to be allocated to the private sector, with either full ownership rights or leaseholder rights only. Previous practices whereby land tended to be allocated for either permanent or temporary use have been discontinued. While that reform stops short of introducing further mechanisms that would facilitate the creation of a land market, it will nevertheless lead to greater certainty and clarity regarding land ownership rights in the country.

Well-governed

Over the last year, governance scores have improved in most economies in the EBRD regions, driven by increased compliance with AML/CFT standards and higher scores for participation in e-government. Marked improvements have been observed in a number of economies in the CEB region (the Czech Republic, Estonia, Latvia and Lithuania), as well as Egypt, Kazakhstan, Ukraine and Uzbekistan. In the CEB region and Egypt, increases have been driven by improvements in corporate governance standards and practices. And in Egypt, they have also been driven by increased scores for perceptions regarding informality, corruption, political stability and the effectiveness of the courts. Overall, the governance environment in Egypt has benefited from the implementation of important reforms under successive IMF programmes. In Kazakhstan, the increased score reflects improvements in perceptions regarding corruption and budgetary transparency. And in Uzbekistan, scores have increased primarily as a result of improvements in the enforcement of contracts, participation in e-government, freedom of the media and perceptions regarding corruption.

Over the last year, most declines for governance-related indicators have concerned freedom of the media (in the SEMED region and Hungary – and also in Estonia, which, despite that deterioration, continues to perform well in this area), participation in e-government (in Belarus, the SEMED region and a few economies in the CEB region) and perceived informality (in Armenia and Tunisia). Jordan and Tunisia have also seen marked deteriorations in their overall governance scores. In Jordan, this stems from a decline in compliance with AML/CFT standards, reduced participation in e-government and a deterioration in the assessment of political stability. Tunisia's score, meanwhile, has declined on the back of worsening assessments of the effectiveness of the courts and perceived corruption and informality.

Over the period 2016-21, changes in governance scores have been more mixed. Governance scores have improved in many economies in the EBRD regions as a result of increased compliance with AML/CFT standards, greater participation in e-government, improved frameworks for challenging regulations and better protection of private and intellectual property. Notable improvements have been observed, for example, in Armenia, Azerbaijan, Egypt and Lithuania. In Armenia, that increase reflects improvements in the perception of corruption, the framework for challenging regulations, judicial independence and the protection of property rights. Azerbaijan's drivers are similar to those of Armenia (apart from the fact that its score for participation in e-government has deteriorated). In Egypt, meanwhile, that increase stems from a steady improvement in the country's scores for perceived political stability, corruption and the effectiveness of the courts.

At the same time, however, a number of economies have seen their governance scores deteriorate over the last five years, primarily reflecting a worsening of perceptions regarding informality, corruption and the effectiveness of the court system. In addition, several economies have seen deteriorations in judicial independence, budgetary transparency and the enforcement of contracts. In the SEE region in particular (notably Albania, Bosnia and Herzegovina and North Macedonia), declining scores have been due primarily to worsening perceptions of corruption and informality. The deterioration in Poland's score has been driven by declines in judicial independence and the effectiveness of the courts.

Corruption

Several countries have continued to push ahead with reforms aimed at improving the quality of governance, although some negative trends have also been observed. In particular, reforms aimed at addressing corruption have been initiated in several economies. In March 2021, for example, the Armenian parliament adopted a law creating a new anti-corruption body with stronger investigative and enforcement functions, merging several existing agencies with anti-corruption powers. The following month, the country's parliament also adopted legislation establishing a specialist anti-corruption court to handle all corruption-related cases. New anti-corruption legislation also entered into force in Serbia in September 2020, expanding the competencies of the country's anti-corruption agency, as well as increasing its legal and financial independence. In particular, that agency now has greater powers to access information on the assets of public officials and their relatives, resolve conflicts of interest and act on anonymous reports. The agency now also has the right to assess and evaluate legislation from an anti-corruption perspective.

In October 2020, Slovenia amended its law on integrity and the prevention of corruption with a view to clarifying the role and responsibilities of its Commission for the Prevention of Corruption. Those amendments also extended the list of public officials that are subject to special anti-corruption rules and made improvements to the process of appointing the head of that commission. In the same month, Kazakhstan amended its anti-corruption legislation with a view to further strengthening the country's anti-corruption framework. In addition to an absolute ban on giving gifts to public officials and members of their families, those amendments also expanded the definition of a "public official" for the purposes of anti-corruption rules, with that term now including everyone who is involved in implementing public tender procedures and projects financed out of the state budget. Meanwhile, as part of their forward looking plans in this area, Russia and the Kyrgyz Republic have also adopted extensive anti-corruption strategies for the period 2021-24.

In March 2021, the Ukrainian parliament approved a law strengthening the independence of its national anti-corruption bureau. That law ensures that the head of the bureau is appointed on a competitive basis and limits government interference in the bureau's work. While that represents a positive development, progress in this area has been uneven in recent years. In October 2020, for example, Ukraine's constitutional court issued rulings that restricted the powers of the national anti-corruption bureau and meant that public officials were no longer criminally liable for false declarations regarding assets. In response, the Ukrainian parliament reintroduced criminal liability, but those new regulations did not fully rectify the reform reversals caused by the court's rulings. Meanwhile, the Ukrainian parliament also approved key judicial reform bills in July 2021, which are designed to strengthen the independence and integrity of the judicial system and the introduction of the European Green Deal..

Business environment

Several countries have made progress in terms of improving their business environments. Georgia, for example, has reformed its insolvency rules following the adoption of a new insolvency law in September 2020 (which entered into force in April 2021). That new insolvency framework provides for increased protection of creditors' rights, with insolvency processes and rehabilitation mechanisms aligned with international best practices, as well as strengthening the role of the courts in insolvency proceedings. At the same time, however, long-awaited reforms relating to the rule of law and the judiciary are progressing slowly.

Similarly, Turkey made major amendments to its bankruptcy law in June 2021 with a view to facilitating the sale of assets during bankruptcy proceedings and increasing the efficiency of restructuring. Meanwhile, the Moldovan parliament has made progress with the adoption of a new customs code, seeking to unify and streamline the country's customs legislation. That new code passed its second reading in the Moldovan parliament in August 2021 and, following final approval, is expected to enter into force in 2023. The new code is expected to improve the quality of the services provided by the customs service, reduce costs and delays relating to the declaration of goods, and reduce the risk of fraud and corruption through online monitoring of customs operations. In Russia, a comprehensive regulatory guillotine programme was launched in January 2021 with a view to amending or cancelling legacy regulatory requirements on businesses. So far, that programme, which covers more than 40 economic sectors and activities, has led to the discontinuation of over 3,000 legal acts and decrees that were regarded as being outdated or redundant.

RUSSIA HAS LAUNCHED A REGULATORY GUILLOTINE PROGRAMME COVERING MORE THAN
40
ECONOMIC SECTORS AND ACTIVITIES

THAT PROGRAMME HAS LED TO THE DISCONTINUATION OF OVER
3,000
LEGAL ACTS AND DECREES THAT WERE REGARDED AS BEING OUTDATED OR REDUNDANT

Digitalisation of public services

Several governments have also made progress with the digitalisation of public services – motivated in part by the Covid-19 pandemic. In October 2020, for example, the Mongolian government launched the E-Mongolia electronic platform, which provides more than 180 government services in a single location (and is expected to provide over 500 services in the future). In Bulgaria, the digitalisation of the judiciary has accelerated following legislative amendments adopted in December 2020. Those amendments allow videoconferencing to be used in civil, administrative and criminal proceedings (albeit only for the collection of evidence in the case of criminal proceedings). In addition, telemedicine is now also allowed under Bulgarian legislation (although only in a state of emergency), after the government adopted regulatory amendments authorising digital referrals and prescriptions. In Armenia and Uzbekistan, meanwhile, important strategy documents have been adopted, outlining plans for the digitalisation of public services and the development of broadband and telecommunications infrastructure.

THE E-MONGOLIA INITIATIVE PROVIDES MORE THAN
180
GOVERNMENT SERVICES ON A SINGLE ELECTRONIC PLATFORM

Green

Green scores have generally increased over the last year, especially in the SEE and CEB regions. Increases in those regions have stemmed primarily from improvements to carbon-pricing mechanisms and the strengthening of "nationally determined contributions" (NDCs) in the context of the Paris Agreement and the introduction of the European Green Deal. Meanwhile, declines have been observed in Egypt, Jordan and Turkmenistan, owing to a lack of progress with carbon-pricing mechanisms. (At the same time, Egypt issued its first green bond in September 2020 and has continued to support the transition to a green economy.)

Over the period 2016-21, green scores have improved in most economies in the EBRD regions. Those improvements have been driven mainly by reduced greenhouse gas emissions from agriculture and the heating of buildings, increased uptake of renewable energy technologies and more substantial commitments as part of countries' NDCs. The most notable progress has been observed in Bulgaria, Croatia, the Czech Republic, Estonia, Latvia, Lithuania, Montenegro, North Macedonia, Romania, Slovenia and Uzbekistan, driven by enhanced commitments in their "intended nationally determined contributions" (INDCs), references to adaptation in their NDCs, and planning and actions in the area of "just transition".[3] In addition, Bulgaria and North Macedonia have seen declines in estimated CO_2 emissions for residential buildings, while Montenegro's carbon-pricing mechanism has been improved. In Uzbekistan, meanwhile, there have been improvements to vehicle emissions standards and overall institutional quality.

At the same time, however, Jordan and Morocco have seen their green scores deteriorate over the period 2016-21. In Jordan, that decline stems from a failure to comply with the latest guidance on best practices for carbon-pricing mechanisms. And in Morocco, it is the result of falling scores for mitigation, adaptation and other indicators.

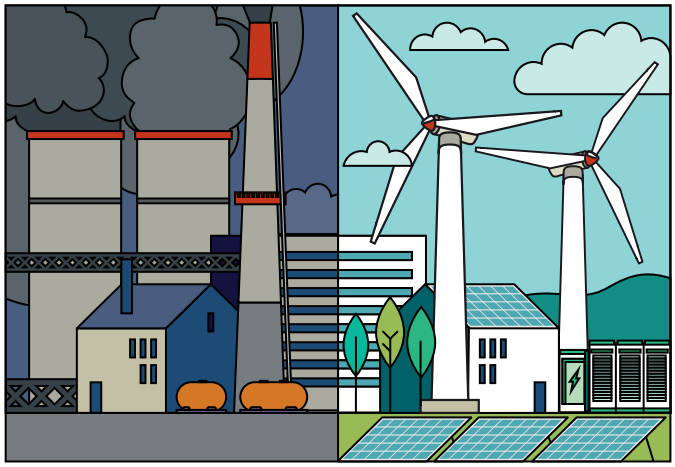
Climate change and energy efficiency

Over the last year, several countries have improved their regulatory environments in the areas of climate change and energy efficiency. In December 2020, for example, the Albanian parliament adopted a law on climate change, which has paved the way for the establishment of a comprehensive framework combating climate change in the country. That law covers the integration of climate change mitigation and adaptation issues into other legislation and strategies, the submission of the country's NDCs and the strengthening of emission control regulations. In Serbia, meanwhile, four new laws on renewable energy sources, energy, energy efficiency and mining were adopted in April 2021. Those laws bring about a number of notable changes, including the introduction of auctions for the allocation of market premiums and

[3] This year's green ATQ scores also reflect countries' progress towards a "just transition", which measures the steps that governments are taking to mitigate the impact which green transformation has on their economies and societies.

feed-in tariffs, and various incentives for adopting renewable energy technologies and energy efficiency measures, as well as simplifying the issuance of permits and approvals in the sector. In Kazakhstan, a new environmental code was adopted in January 2021, which introduced several important changes, including a requirement for the country's 50 largest industrial companies (in the oil and gas, mining, metal processing and power generation sectors) to replace their carbon-intensive legacy technologies with market-leading alternatives by 2025. In Bulgaria, the country's waste management law was amended in January 2021 to include more ambitious recycling targets for packaging materials. Several countries in the EEC region (including Armenia, Georgia and Ukraine) have also submitted updated NDCs in the last year.

KAZAKHSTAN'S NEW ENVIRONMENTAL CODE REQUIRES THE COUNTRY'S
50
LARGEST INDUSTRIAL COMPANIES TO REPLACE THEIR CARBON-INTENSIVE LEGACY TECHNOLOGIES WITH MARKET-LEADING ALTERNATIVES BY
2025



Inclusive

Changes in inclusion scores over the last year have been mixed. Scores have deteriorated in many economies, including Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, Georgia, Kazakhstan, Russia, Serbia, Tajikistan and the West Bank and Gaza. Only Jordan has seen a significant improvement, driven by its improved performance in the Women, Business and the Law Index. Modest improvements in gender equality scores have also been observed in Estonia, Latvia and Moldova, mainly owing to increases in the percentage of women in managerial roles and the percentage of female employers. Other economies have seen declines in gender equality scores, however, driven by a variety of different factors. In Azerbaijan and Croatia, those scores reflect declines in the percentage of female employers. In Georgia, that development reflects the fact that women's labour force participation rate has declined by more than men's. And in the West Bank and Gaza, the decline stems primarily from a deterioration in the Women, Business and the Law Index. Turning to the youth component of the inclusion index, improvements in youth inclusion scores have been very modest over the last year, while notable deteriorations have been driven by only a couple of factors. In Georgia, Hungary, Latvia and Romania, for example, declining scores reflect increases in youth unemployment (relative to older adults). And in Bosnia and Herzegovina, Kazakhstan, Serbia and Tajikistan, declines reflect weaker performance in terms of harmonised test scores for students.[4]

Changes over the period 2016-21 also point to mixed developments across the EBRD regions. The most notable improvements have been observed in Azerbaijan, Montenegro and Tajikistan. In Tajikistan, that increase reflects improvements in financial inclusion (particularly for young people and, to a lesser extent, women). In Montenegro, increased scores reflect improvements in the flexibility of labour regulation and a decline in unemployment. In Azerbaijan, increases in scores have been smaller, but spread across a number of different indicators. At the same time, however, significant deteriorations have been observed in Croatia, the Czech Republic, Kazakhstan and Serbia, reflecting developments in both youth and gender inclusion. Croatia's score reflects a fall in the percentage of female employers, declines in financial inclusion for both women and young people, and a general deterioration in the quality of the education system (as captured by both a perception-based indicator and harmonised test scores). In the Czech Republic, Kazakhstan and Serbia, meanwhile, declines have primarily been due to poor performance in terms of the Social Institutions and Gender Index, lower harmonised test scores and a deterioration in financial inclusion.

[4] These deteriorations actually occurred prior to the period 2020-21, but they are captured in this year's scores owing to lags in the reporting of underlying student performance data.

Gender equality

Several countries have significantly improved their regulatory frameworks in terms of facilitating the achievement of gender equality. In Serbia, for example, a new law on gender equality was adopted in May 2021. That law requires state agencies to perform gender budgeting and places several obligations on public and private-sector employers in terms of assessing their gender balance and identifying specific measures to achieve and monitor gender equality goals. Meanwhile, several countries in Central Asia have adopted comprehensive gender equality strategies. In May 2021, for example, Uzbekistan adopted a long-term strategy on gender equality that will run until 2030. That strategy focuses on several different areas with a view to improving gender equality, emphasising (i) the goal of increasing the percentage of women in management positions at state authorities, (ii) measures to facilitate women's economic empowerment, including through increased access to employment and entrepreneurial opportunities (particularly in rural areas), (iii) the strengthening of gender-related statistics and (iv) measures to prevent violence and discrimination against women. In April 2021, Tajikistan adopted a national strategy aimed at enhancing the role of women, which will run from 2021 to 2030 and outlines the country's policies in relation to various gender equality objectives. And in December 2020, Turkmenistan adopted a national action plan for gender equality covering the period 2021-25. That action plan outlines a number of goals regarding access to education, the prevention of gender-based violence and economic empowerment of women.

Disabilities

In May 2021, the Armenian parliament adopted a law on the rights of people with disabilities, paving the way for further progress in this area. That law, which represents a significant development, includes several guarantees (on accessibility, reasonable accommodation and access to justice) and bans disability-based discrimination. Georgia, meanwhile, adopted a major package of labour legislation in September 2020, bringing the country into line with ILO labour standards and EU directives and extending the protections afforded by labour rights.

Resilient

ATQ scores for resilience combine data and information on (i) energy resilience and security and (ii) financial institutions. The discussion below considers each one in turn.

Energy

Energy resilience scores have only changed very modestly over the last year. Scores have improved in Croatia, Estonia, Morocco and Serbia, while Ukraine has seen its score deteriorate. In Croatia, improvements are related to the diversification of gas supplies following the commissioning of the Krk liquefied natural gas terminal in January 2021. In Estonia, that increase reflects improvements to the country's gas supply following the establishment of a common gas market for the Baltic states and the completion of the Balticonnector pipeline. In Morocco, improvements have been driven by progress with the establishment of an energy regulator. And in Serbia, the increased score reflects improvements in the international connectivity of the country's gas network, with interconnection agreements being aligned with the Network Code on Interoperability.

Over the period 2016-21, developments in energy resilience scores have been mixed, with improvements being observed in Croatia, Ukraine and Uzbekistan. In Croatia, improvements have been fairly modest, mainly reflecting the recent diversification of the gas supply. In Ukraine, they have been driven mainly by reforms in the gas sector, including the unbundling of the state-owned company Naftogaz (albeit the pace of gas-sector reforms in Ukraine has slowed somewhat of late). In Uzbekistan, meanwhile, increased scores reflect continued efforts to improve the regulatory environment and the unbundling of the power sector in 2019. At the same time, deteriorations have been observed in Belarus, Bosnia and Herzegovina, the Kyrgyz Republic and Moldova, mainly as a result of delays to necessary reforms in the sector.

Renewable energy

Several countries have pushed ahead with reforms to their regulatory frameworks over the last year with a view to facilitating the broader deployment of renewable energy projects. Bulgaria, for example, amended its energy legislation in January 2021 to eliminate certain levies and increase support for new renewable energy projects. Meanwhile, Kazakhstan has amended its energy regulations to introduce a special surcharge on end-user tariffs, with a view to covering costs associated with the growing share of electricity coming from renewable sources. In Lebanon, on the other hand, the country's continued energy crisis (which has seen significant nationwide power cuts) is a source of

considerable concern and points to a major lack of resilience in the country's power system. In Poland, an important regulatory measure governing offshore wind was adopted in January 2021, paving the way for significant investment in that area.

Financial institutions

Financial resilience scores have improved in most economies in the EBRD regions over the last year, with notable improvements being observed in Bulgaria, Hungary, Jordan, Latvia, Lithuania, Montenegro, the Slovak Republic, Slovenia and Tunisia. The increases seen in Bulgaria, Slovenia and Tunisia have been driven by improvements to existing sectoral regulations, governance practices and safety nets. Specifically, those increases reflect improvements to (i) the deposit insurance scheme in Tunisia, (ii) the legal and regulatory frameworks in Bulgaria and Slovenia, (iii) risk management and corporate governance practices in Tunisia and (iv) the quality of supervision in Bulgaria and Tunisia. The improvements seen in the other economies reflect higher capital adequacy ratios (Hungary, Latvia and Lithuania) and increased activity by private banks (Jordan and Montenegro). At the same time, several economies (particularly Belarus and Lebanon) have seen marked deteriorations in their financial resilience scores. In Lebanon, most financial resilience indicators have declined in the last year amid the ongoing economic and financial crisis. In Belarus, that deterioration reflects lower levels of liquidity in the banking sector and an increase in loan-to-deposit ratios.

Over the period 2016-21, many economies in the EBRD regions have seen significant increases in their financial resilience scores, with marked improvements being observed in Belarus, Bosnia and Herzegovina, Georgia, Greece, Jordan, Moldova, Montenegro, Tunisia and Ukraine. Improvements mainly reflect increases in capital adequacy ratios, decreases in foreign currency-denominated loans, the marked reductions seen in NPL ratios in the majority of countries, increased activity by non-bank financial institutions and improvements to legal and regulatory frameworks. However, in some countries (particularly Lebanon and Turkey), financial resilience scores have declined markedly. The declines seen in Lebanon and Turkey reflect the reversal of reforms made to regulatory frameworks and sectoral supervision, a worsening of risk management and corporate governance standards, and the deterioration of deposit insurance schemes.

Regulation and restructuring of the banking sector

Several countries have made progress with reforms to the regulatory and governance frameworks for their banking sectors over the last year. Mongolia, for example, made important amendments to its banking law in January 2021, requiring banks to have at least nine directors sitting on their supervisory boards, with at least a third of those directors being independent. Moreover, the suitability and professional qualifications of proposed board members must now be reviewed by the country's central bank before they can take up their positions. What is more, a single shareholder can now hold a maximum of 20 per cent of a bank's shares, with mandatory IPO procedures being used to ensure compliance with that threshold. In addition, the definition of a "systemic bank" has been expanded to include factors other than the amount of bank capital, and new reporting and transparency obligations have been imposed on banks. Egypt, meanwhile, adopted significant new legislation in September 2020, allowing the country's central bank to issue banking licences to fintech firms and giving it a mandate to oversee non-bank fintech businesses. Those changes to the country's regulatory environment are expected to encourage further investment in Egypt's fintech sector and support the development of new fintech services. In Ukraine, a new law on payment services was adopted in July 2021, introducing the concept of "open banking" and various new types of payment service. Ukraine also made a number of amendments to its banking law in July 2021, strengthening banks' capital requirements and other supervisory requirements. Moldova amended its banking legislation in November 2020 to strengthen the independence of the country's central bank and ensure the integrity and finality of its decisions regarding monetary policy, regulation and banking supervision.

Several countries have made progress with the restructuring of their banking sectors. Tajikistan, for example, has withdrawn the banking licences issued to Agroinvestbank and Tojiksodirotbank (which have long been distressed) after earlier attempts to restore their financial health failed. Similarly, Ukraine has continued its efforts to clean up its banking sector, albeit NPLs remain a significant concern (especially at state-owned banks). In Lebanon, however, the ongoing economic and financial crisis has revealed significant vulnerabilities in the country's banking sector, particularly in light of the sector's high exposure to public debt and sovereign debt risk. Potential restructuring of government debt could lead to significant losses in the banking sector and limit its ability to support the private sector and the wider economic recovery.

Integrated

Changes in integration scores have been very modest over the last year. Marked improvements have been observed in Estonia, Mongolia and Uzbekistan, while Azerbaijan has seen its score deteriorate somewhat. The increases seen in Estonia, Mongolia and Uzbekistan have been driven mainly by greater FDI inflows. In addition, Uzbekistan has also seen improvements in the conditions for international trade, as captured by trade volumes and the cost of cross-border trade. The deterioration seen in Azerbaijan, meanwhile, reflects significant fluctuations in both FDI and non-FDI inflows. Across the EBRD regions, there have also been moderate improvements in external integration on the back of increased numbers of enforced regional trade agreements and declines in the cost of cross-border trade.

Over the period 2016-21, most economies in the EBRD regions have seen their integration scores improve, with only a few countries seeing moderate declines. Scores have improved most in Greece, Montenegro and Uzbekistan, while the largest deteriorations have been observed in Bulgaria, Jordan and Latvia. In Greece, improvements reflect increases in non-FDI inflows, greater financial openness and new regional trade agreements, as well as improvements in the quality and provision of broadband services. In Montenegro, improvements have been driven by the increased quality and coverage of internet services and improved logistics services. In Uzbekistan, increased scores reflect higher-quality logistics services and improvements in infrastructure, which have facilitated increased FDI inflows. The deteriorations seen in Bulgaria and Jordan have mainly been the result of worsening conditions for international trade and direct investment, as well as the worsening of logistics. Similar changes have been observed in Latvia, where scores for the timeliness of shipping and the ability to track and trace shipments have declined, and losses during shipping have increased. In addition, economies in the EBRD regions have also seen improvements in the quality and provision of broadband services over the period 2016-21, with access to broadband and 3G coverage increasing in all economies.

Some countries have seen other notable developments in this area over the last year. Egypt, for example, has continued to invest in important transport infrastructure, including a new dry port near Cairo, as well as implementing reforms relating to the operation of the Suez Canal. In April 2021, Uzbekistan was admitted to the EU's Generalised Scheme of Preferences (GSP+) trade scheme, which allows it to export products relating to more than 60 per cent of EU tariff lines without paying any tariffs. Moreover, in order to improve regional integration and cooperation in the Western Balkans, Albania, North Macedonia and Serbia agreed in July 2021 to set up a shared border-free travel area by 2023. In a related development, the six Western Balkans economies (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia) removed all roaming charges for mobile phones in that region from July 2021. Lastly, February 2021 saw the launch of a major railway rehabilitation project in Albania, which will involve fully replacing the existing railway line between the capital, Tirana, and the country's largest port, Durrës.

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A glossary for this report is available at

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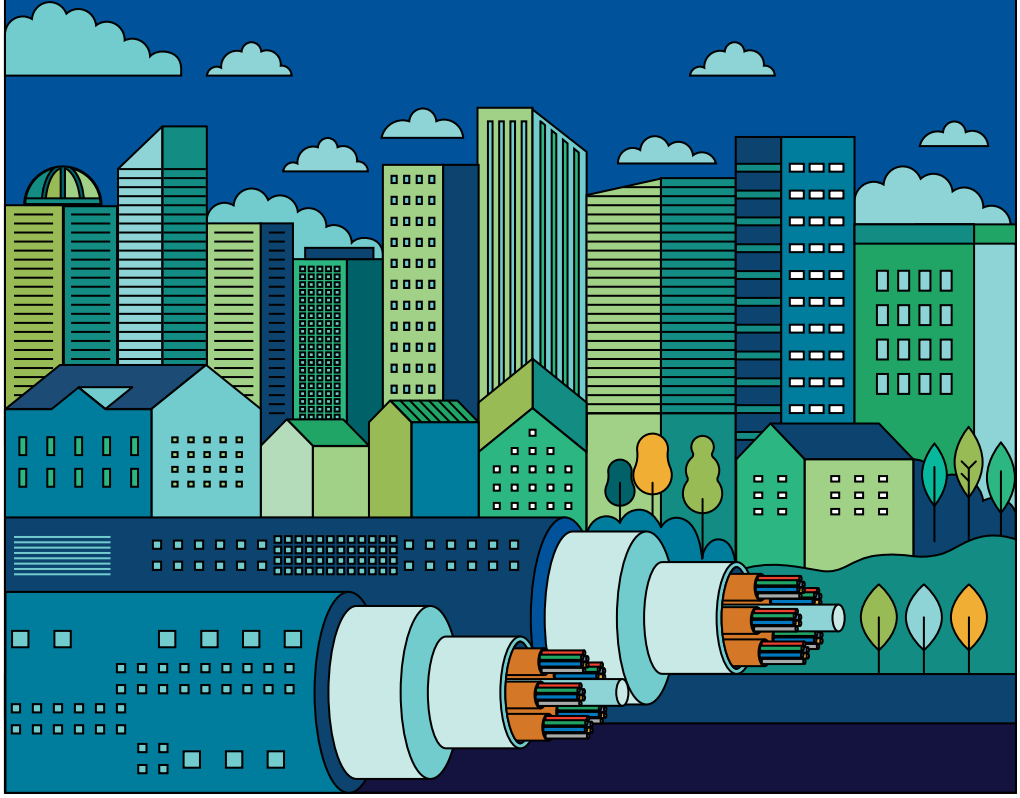

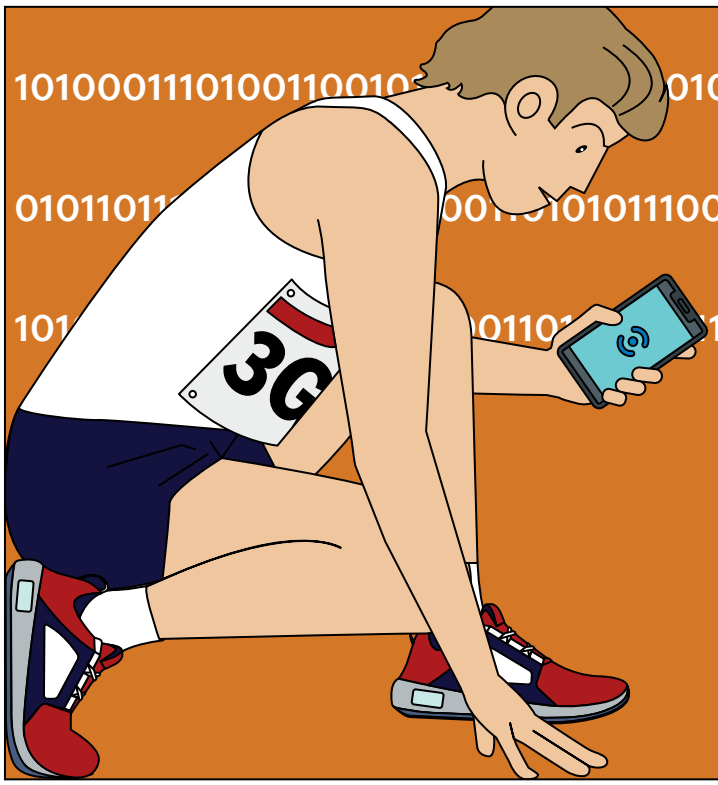

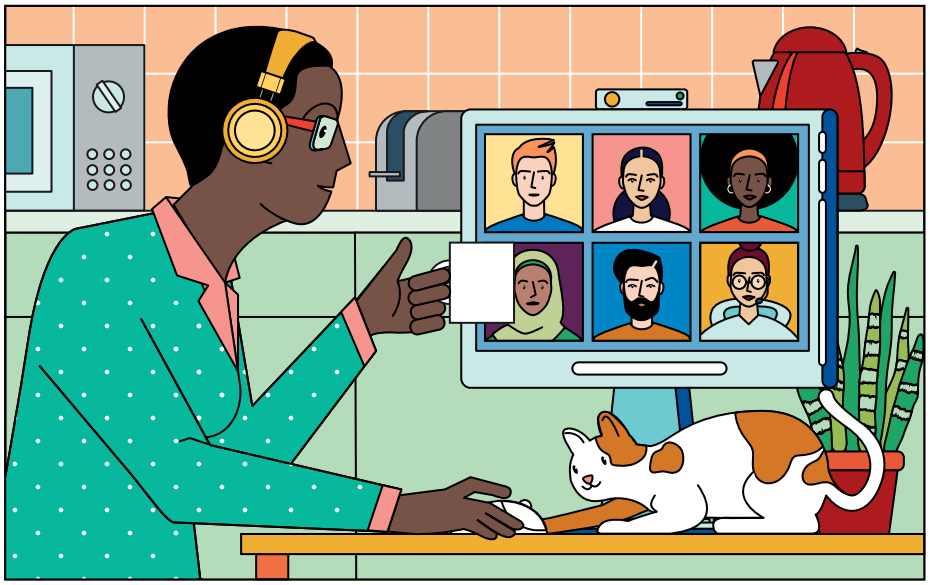

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