



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?

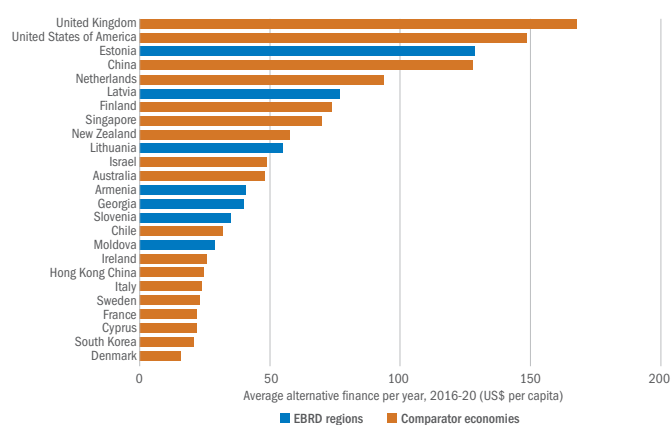
Fintech – financial technology – uses new technologies to improve financial services and make them accessible to more firms and households. Such new technologies range from digital wallets (which allow people to store their payment cards on their mobile phones) to robo-advisers and stock-trading apps. 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 Finance⁴ 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

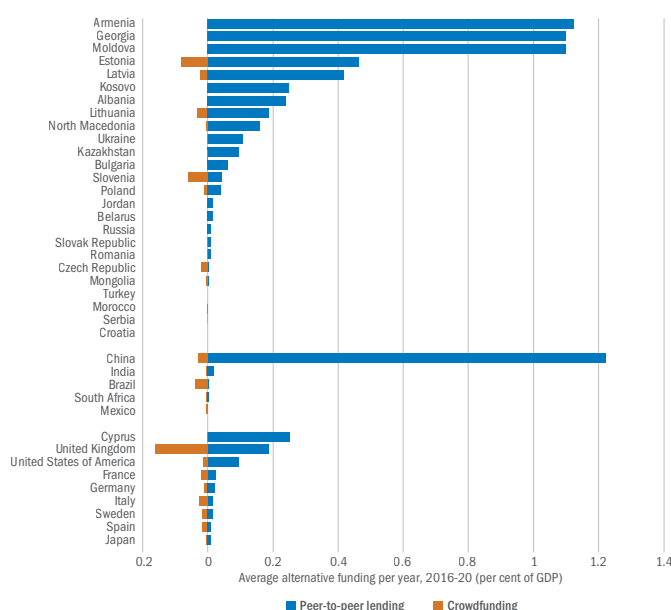
CHART 4.1. The United Kingdom and the United States of America have the world's largest alternative finance markets in per capita terms



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).

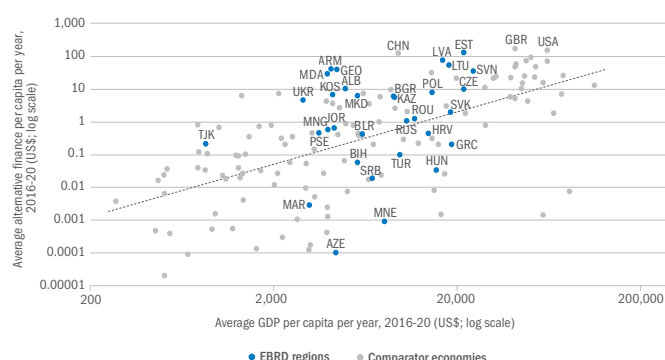
The Baltic states have achieved that leading position on the back of a supportive regulatory environment, highly developed IT infrastructure and a population with strong digital skills – all factors that have allowed local fintech start-ups to scale up quickly and cheaply.⁵ Indeed, the Baltic states' 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

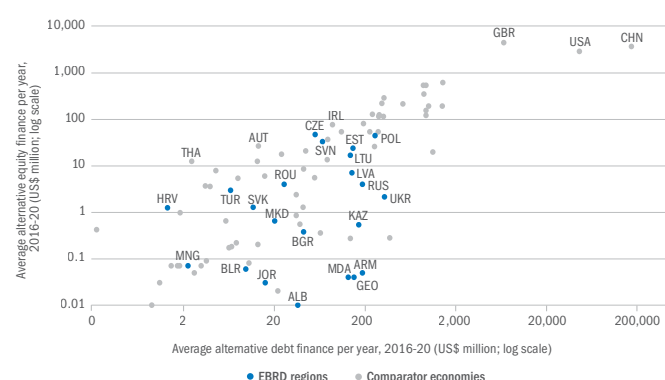
CHART 4.3. Alternative finance markets in the Baltic states are larger than would be expected on the basis of their overall level of economic development



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**

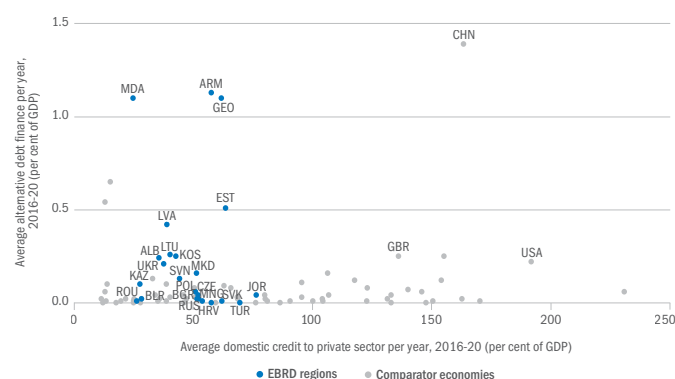
⁵ See Ziegler et al. (2020). See also Chapter 1 of this report.

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

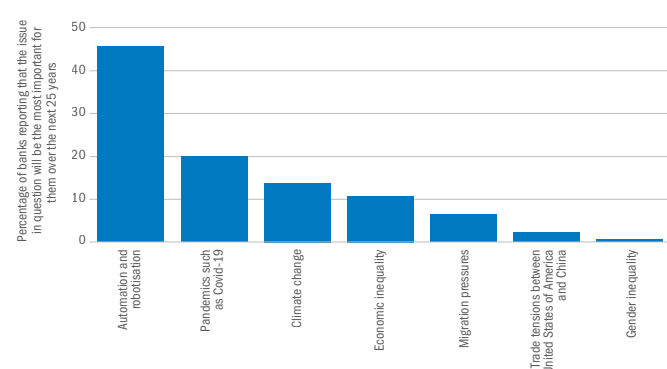
CHART 4.5. The largest fintech sectors are found in economies with either highly developed or underdeveloped banking sectors



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

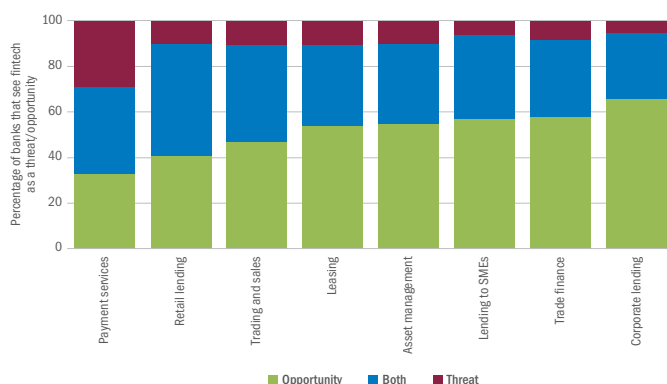
The survey confirmed that digitalisation and automation are uppermost in CEOs' minds (see Chart 4.6). Indeed, 46 per cent of those CEOs said that automation would be the most important social trend to affect their bank over the next 25 years – way ahead of pandemics (20 per cent) and climate change (14 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.

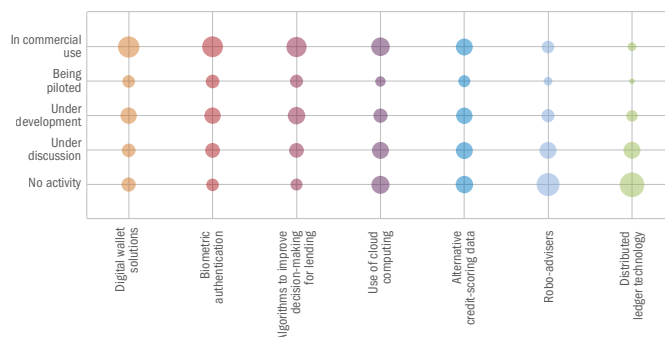
Note: These figures are weighted averages across economies.

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.

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).

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'Acuneto 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

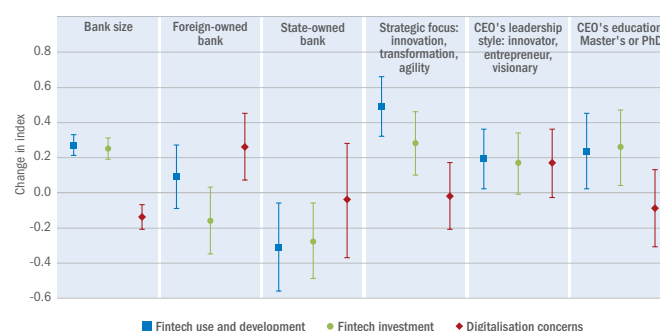
specialise in lending to smaller borrowers, who can more easily switch to P2P platforms, for example.¹⁴

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.

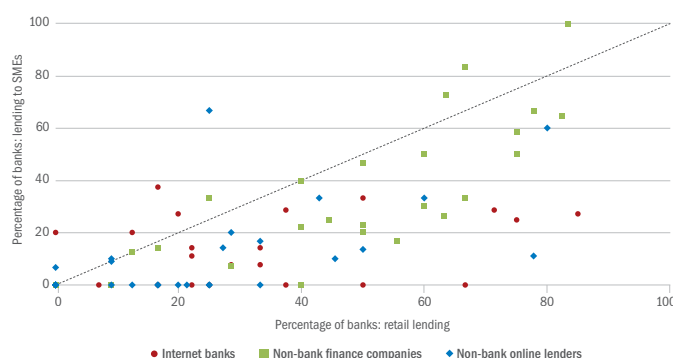
Note: Based on OLS models regressing the three indices (fintech use and development, fintech investment, and digitalisation concerns) on (i) bank size (log of total assets), (ii) dummy variables for foreign and state ownership, (iii) a dummy variable indicating whether the CEO believes that the culture 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.

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.

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).

Fintech and branch networks

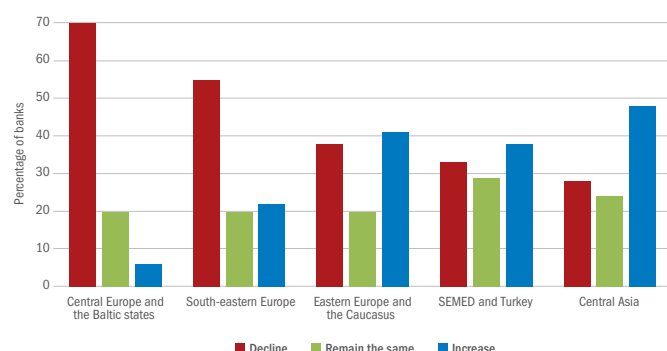
Banks across the EBRD regions are already experiencing strong competition from internet banks, non-bank online lenders and non-bank finance companies. These three types of alternative lender are more likely to be regarded as strong competitors in retail lending than lending to SMEs (see Chart 4.10). 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).

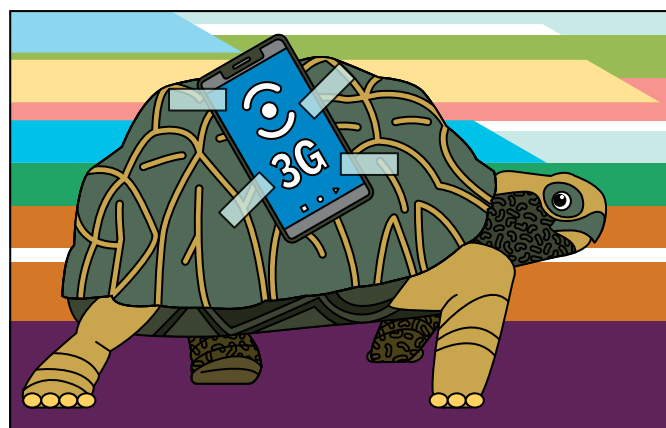
Across the EBRD regions, banks with more advanced digitalisation strategies (as measured by the fintech use and development index introduced earlier) are more likely to report intentions to close branches (see Chart 4.12). This relationship holds when taking into account banks' size and ownership structure.

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

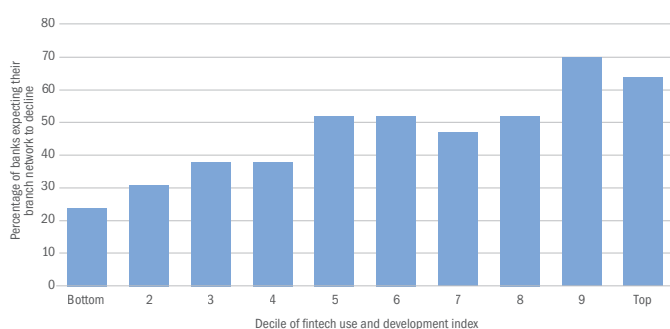
4G OFFERS SPEEDS THAT ARE UP TO 15 TIMES FASTER THAN 3G



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 km² level,²² which allows us to see whether a firm located in a particular 1 km² 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 km² 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.

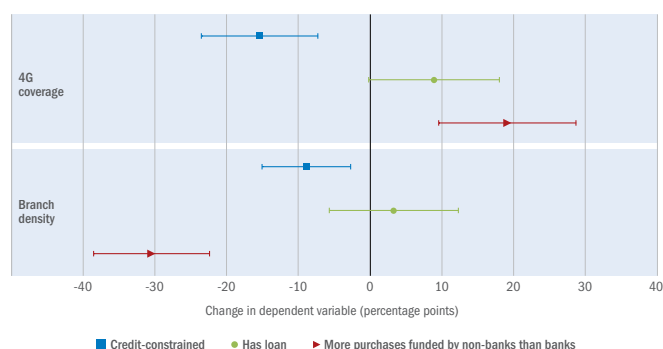
This analysis also suggests that access to better mobile internet is associated with greater choice for borrowers. The Enterprise Surveys ask businesses that rely on

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

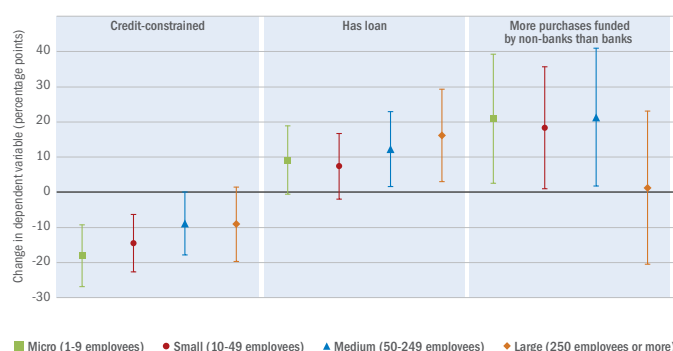
CHART 4.13. 4G mobile networks enable firms to access finance



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.

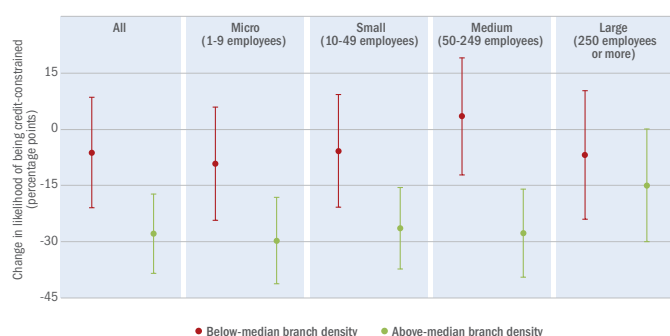
Note: This chart shows ordinary least squares estimates of the impact that the availability of 4G mobile networks at subnational region level has on financial inclusion at firm level. The 90 per cent confidence intervals shown are based on robust standard errors clustered at subnational region level. 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.

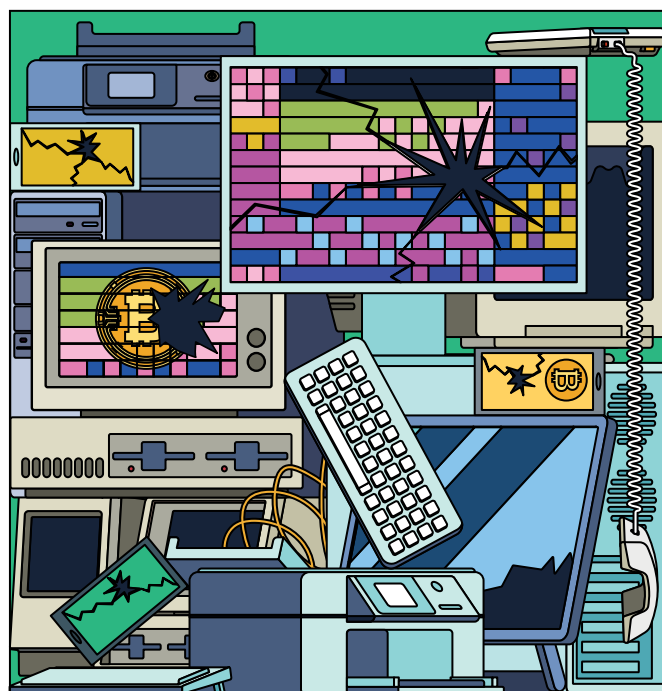
A related concern is whether access to fintech-based technologies is itself equitable. Recent evidence from a large number of countries points to a fintech gender gap, suggesting that there are limits to the extent to which financial technology can, on its own, reduce gender-based disparities in the 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 CO₂ 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.

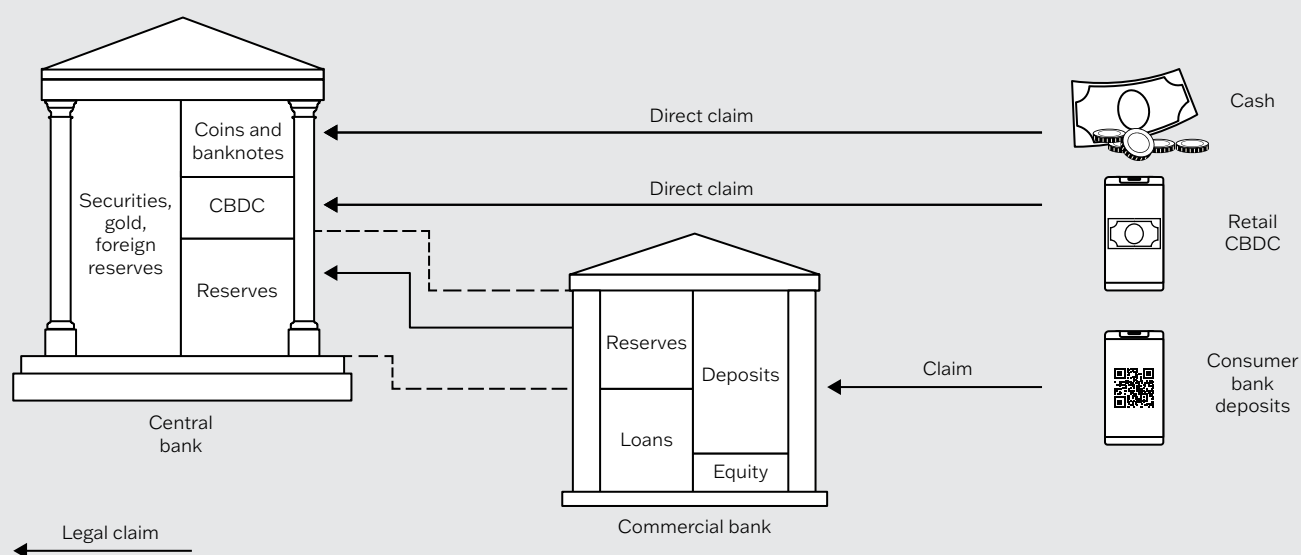
Central bank digital currencies (CBDCs) are an opportunity for the monetary system to overcome such shortcomings of private-sector solutions. CBDCs can be designed for use by financial intermediaries only (wholesale CBDCs) or actors across the economy (retail CBDCs, which represent a direct claim on 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).

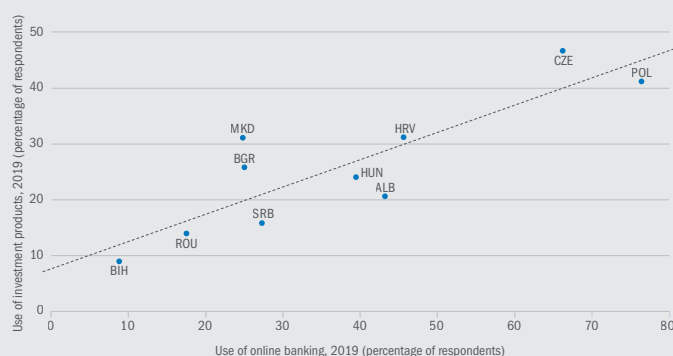
³⁹ See BIS et al. (2021).

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	Contractual 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*** (0.007)	0.055*** (0.006)	0.031*** (0.006)	0.008** (0.004)	0.019* (0.004)	0.011*** (0.003)
Owns mobile	0.008 (0.013)	0.002 (0.011)	0.001 (0.011)	0.001 (0.006)	-0.010* (0.005)	-0.003 (0.004)
Quality and duration of mobile coverage	0.169*** (0.028)	0.129*** (0.022)	0.073*** (0.021)	0.041*** (0.014)	0.005 (0.011)	0.021** (0.009)
Local economic activity	0.012*** (0.004)	-0.002 (0.003)	0.013*** (0.003)	0.004* (0.002)	0.001 (0.002)	0.001 (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)

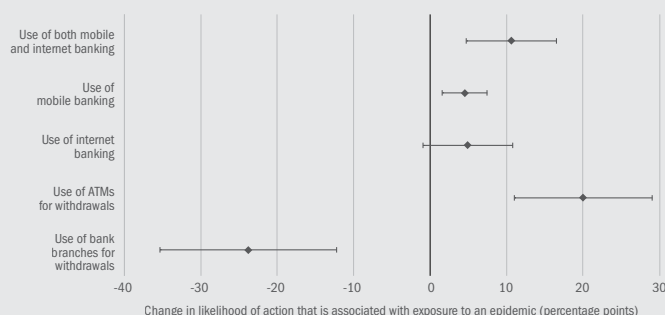
BOX 4.3.**Digital divides during epidemics: evidence from the adoption of fintech**

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).

References

F. Allen, A. Demirgüç-Kunt, L. Klapper and M.S. Martínez Pería (2016)

“The foundations of financial inclusion: Understanding ownership and use of formal accounts”, *Journal of Financial Intermediation*, Vol. 27, pp. 1-30.

R. Auer and R. Böhme (2021)

“Central bank digital currency: the quest for minimally invasive technology”, BIS Working Paper No. 948.

R. Auer, G. Cornelli and J. Frost (2020)

“Rise of the central bank digital currencies: drivers, approaches and technologies”, BIS Working Paper No. 880.

R. Auer, P. Haene and H. Holden (2021)

“Multi-CBDC arrangements and the future of cross-border payments”, BIS Paper No. 115.

G. Barba Navaretti, G. Calzolari

and A.F. Pozzolo (2017)

“FinTech and Banks: Friends or Foes?”, *European Economy – Banks, Regulation, and the Real Sector*, Vol. 3, No. 2, pp. 9-30.

R. Bartlett, A. Morse, R. Stanton

and N. Wallace (2021)

“Consumer-lending discrimination in the FinTech Era”, *Journal of Financial Economics*, forthcoming.

T. Beck, A. Demirgüç-Kunt and

R. Levine (2007)

“Finance, inequality and the poor”, *Journal of Economic Growth*, Vol. 12, No. 1, pp. 27-49.

BIS (2021)

“CBDCs: an opportunity for the monetary system”, *Annual Economic Report*, Chapter III, Basel.

BIS, IMF and World Bank (2021)

“Central bank digital currencies for cross-border payments: Report to the G20”.

C. Boar and A. Wehrli (2021)

“Ready, steady, go? – Results of the third BIS survey on central bank digital currency”, BIS Paper No. 114.

D. Bonfim, G. Nogueira and

S. Ongena (2021)

“‘Sorry, we’re closed’, bank branch closures, loan pricing, and information asymmetries”, *Review of Finance*, Vol. 25, No. 4, pp. 1211-1259.

A. Boot, P. Hoffmann, L. Laeven

and L. Ratnovski (2021)

“Fintech: What’s Old, What’s New?”, *Journal of Financial Stability*, Vol. 53, Article 100836.

M. Brennan (2020)

“COVID-19 and remote work: An update”, Gallup, 13 October. Available at:

<https://news.gallup.com/poll/321800/covid-remote-work-update.aspx> (last accessed on 15 September 2021)

M. Bruhn and I. Love (2014)

“The real impact of improved access to finance: Evidence from Mexico”, *The Journal of Finance*, Vol. 69, No. 3, pp. 1347-1376.

G. Buchak, G. Matvos, T. Piskorski

and A. Seru (2018)

“Fintech, regulatory arbitrage, and the rise of shadow banks”, *Journal of Financial Economics*, Vol. 130, No. 3, pp. 453-483.

K.S. Cameron and R.E. Quinn (2006)

Diagnosing and Changing Organizational Culture, Jossey-Bass, San Francisco.

CGAP (2018)

“Digital Credit Market Monitoring in Tanzania”, Washington, DC.

S. Chen, S. Doerr, J. Frost,

L. Gambacorta and H.S. Shin (2021)

“The fintech gender gap”, BIS Working Paper No. 931.

L. Chiou and C. Tucker (2020)

“Social distancing, internet access and inequality”, NBER Working Paper No. 26982.

S. Claessens, J. Frost, G. Turner

and F. Zhu (2018)

“Fintech Credit Markets around the World: Size, Drivers and Policy Issues”, *BIS Quarterly Review*, September.

G. Cornelli, S. Doerr, L. Gambacorta

and O. Merrouche (2021)

“Inside the Regulatory Sandbox: Effects on Fintech Funding”, BIS Working Paper No. 901.

G. Cornelli, J. Frost, L. Gambacorta,

R. Rau, R. Wardrop and T. Ziegler

(2020)

“Fintech and Big Tech Credit: A New Database”, BIS Working Paper No. 887.

G. Corrado (2020)

“Institutional quality and access to financial services: evidence from European transition economies”, *Journal of Economic Studies*, Vol. 47, No. 6, pp. 1363-1376.

S. Coury, J. Huang, A. Kumar, S. Prince,

A. Krivkovich and L. Yee (2020)

“Women in the Workplace 2020”, McKinsey/LeanIn.Org, 30 September.

Available at: www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace (last accessed on 15 September 2021)

F. D’Acunto, N. Prabhala and

A. Rossi (2019)

“The promises and pitfalls of robo-advising”, *The Review of Financial Studies*, Vol. 32, No. 5, pp. 1983-2020.

R. De Haas, M. Millone and

J. Bos (2021)

“Information sharing in a competitive microcredit market”, *Journal of Money, Credit and Banking*, Vol. 53, No. 7, pp. 1677-1717.

EBRD (2015)

Transition Report 2015-16 – Rebalancing Finance, London.

EBRD (2020)

Transition Report 2020-21 – The State Strikes Back, London.

C. Farrell (2020)

“How the coronavirus punishes many older workers”, PBS, 7 May. Available at: www.pbs.org/wnet/chasing-the-dream/stories/how-coronavirus-punishes-older-workers (last accessed on 15 September 2021)

FCA (2017)

“Regulatory sandboxes lessons learned report”, London. Available at: www.fca.org.uk/publication/research-and-data/regulatory-sandbox-lessons-learned-report.pdf (last accessed on 15 September 2021)

S. Foley, J.R. Karlsen and T.J. Putnirš (2019)

“Sex, Drugs, and Bitcoin: How Much Illegal Activity Is Financed through Cryptocurrencies?”, *The Review of Financial Studies*, Vol. 32, No. 5, pp. 1798-1853.

A. Fuster, P. Goldsmith-Pinkham, T. Ramadorai and A. Walther (2021)

“Predictably Unequal? The Effects of Machine Learning on Credit Markets”, *The Journal of Finance*, forthcoming.

L. Gambacorta, Y. Huang, Z. Li, H. Qiu and S. Chen (2020)

“Data vs collateral”, CEPR Discussion Paper No. DP15262. Available at: <https://ssrn.com/abstract=3696342> (last accessed on 15 September 2021)

J. Grashuis, T. Skevas and M.S. Segovia (2020)

“Grocery shopping preferences during the COVID-19 pandemic”, *Sustainability*, Vol. 12, No. 13, Article 5369.

A. Grohmann, T. Klühs and L. Menkhoff (2018)

“Does financial literacy improve financial inclusion? Cross-country evidence”, *World Development*, Vol. 111, pp. 84-96.

J.V. Henderson, A. Storeygard and D.N. Weil (2012)

“Measuring Economic Growth from Outer Space”, *American Economic Review*, Vol. 102, No. 2, pp. 994-1028.

IEA (2019)

“Bitcoin energy use – mined the gap”, 5 July, Paris. Available at: www.iea.org/commentaries/bitcoin-energy-use-mined-the-gap (last accessed on 15 September 2021)

IFC (2017)

“Digital Financial Services: Challenges and Opportunities for Emerging Market Banks”, EMCompass Note No. 42, Washington, DC.

M. Kaffenberger and E. Totolo (2018)

“A Digital Credit Revolution: Insights from Borrowers in Kenya and Tanzania”, CGAP working paper, October.

L. Klapper (2020)

“COVID-19 shows why we must build trust in digital financial services”, World Economic Forum COVID Action Platform, 17 December. Available at: www.weforum.org/agenda/2020/12/covid-19-trust-in-digital-financial-services (last accessed on 15 September 2021)

C. Ma, J.H. Rogers and S. Zhou (2020)

“Global economic and financial effects of 21st century pandemics and epidemics”, *Covid Economics*, Vol. 5, pp. 56-78.

D.P. Morgan, M.L. Pinkovskiy and B. Yang (2016)

“Banking deserts, branch closings, and soft information”, Federal Reserve Bank of New York working paper.

H.-L.Q. Nguyen (2019)

“Are credit markets still local? Evidence from bank branch closings”, *American Economic Journal: Applied Economics*, Vol. 11, No. 1, pp. 1-32.

K. Petralia, T. Philippon, T. Rice and N. Véron (2019)

“Banking Disrupted? Financial Intermediation in an Era of Transformational Technology”, Geneva Report on the World Economy No. 22, ICMB/CEPR.

S. Qi, R. De Haas, S. Ongena and S. Straetmans (2021)

“Move a little closer? Information sharing and the spatial clustering of bank branches”, CEPR Discussion Paper No. 15829.

S.L. Rhine, W.H. Greene and M. Toussaint-Comeau (2006)

“The importance of check-cashing businesses to the unbanked: Racial/ethnic differences”, *The Review of Economics and Statistics*, Vol. 88, No. 1, pp. 146-157.

E. Richardson, D. Aissat, G.A. Williams and N. Fahy (2020)

“Keeping what works: Remote consultations during the COVID-19 pandemic”, *Eurohealth*, Vol. 26, No. 2, pp. 73-76.

L. Saad and J.M. Jones (2021)

“Seven in 10 U.S. white-collar workers still working remotely”, Gallup, 17 May. Available at: <https://news.gallup.com/poll/348743/seven-u.s.-white-collar-workers-stillworking-remotely.aspx> (last accessed on 15 September 2021)

O. Saka, B. Eichengreen and C.G. Aksoy (2021)

“Epidemic Exposure, Fintech Adoption, and the Digital Divide”, NBER Working Paper No. 29006.

R. Stulz (2019)

“FinTech, BigTech, and the Future of Banks”, *Journal of Applied Corporate Finance*, Vol. 31, No. 4, pp. 86-97.

H. Tang (2019)

“Peer-to-peer lenders versus banks: Substitutes or complements?”, *The Review of Financial Studies*, Vol. 32, No. 5, pp. 1900-1938.

M. Wechsler, L. Perlman and N. Gurung (2018)

“The state of regulatory sandboxes in developing countries”. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3285938 (last accessed on 15 September 2021)

World Economic Forum (2017)

“Beyond Fintech: A Pragmatic Assessment Of Disruptive Potential In Financial Services”, August.

T. Ziegler, R. Shneor, K. Wenzlaff,

B. Wang, J. Kim, A. Odorovic, F. Ferri de Camargo Paes, K. Suresh, B. Zhang, D. Johanson, C. Lopez, L. Mammadova, N. Adams and D. Luo (2020)

“The Global Alternative Finance Market Benchmarking Report”, CCAF, April.