

Platform-based business models and financial inclusion¹

Karen Crosson (Financial Conduct Authority), Jon Frost (BIS), Leonardo Gambacorta (BIS) and Tommaso Valletti (Imperial College London)

Preliminary version, 5 October 2021

Abstract

New players have entered finance, including fintech and big tech firms with digital platforms in e-commerce, search or social media. Increasingly, incumbent financial institutions are also adopting platform-based business models. Digital platforms can dramatically lower costs and thereby aid financial inclusion, but these same features can give rise to digital monopolies. Platforms operate in multi-sided markets, and rely crucially on big data. This leads to specific network effects, returns to scale and scope, and trade-offs between efficiency and competition, financial stability and market integrity, and data privacy and consumer protection. To reap the benefits of platforms for financial inclusion while mitigating risks, policy makers can choose to: (i) apply existing financial, antitrust and privacy regulations, (ii) adapt old and adopt new regulations, combining an activity and entity-based approach, and/or (iii) provide new public infrastructures such as digital identity and retail fast payment systems. We argue that *ex ante* competition rules, data portability and public infrastructures are particularly promising. Central banks and financial regulators need to coordinate with competition and data protection authorities, and to consider complementarities with antitrust and tax policies.

Keywords: financial inclusion, fintech, big tech, platforms.

JEL classification: E51, G23, O31.

¹ With thanks to Stijn Claessens, Gregory Crawford, Patrizia Baudino, Johannes Ehrentraud, Bryan Hardy, Sebastian Doerr, Jermy Prenio, Marc Hollanders, Nikita Aggarwal, Vikram Haksar, Yan Carriere-Swallow, Ashraf Khan, Tonia Gilbert and numerous colleagues at the Bank for International Settlements (BIS) and Financial Conduct Authority (FCA) for comments. We thank Giulio Cornelli, Alexandra End, Cornelius Nicolay and Huiming Yang for research assistance. The views expressed here are those of the authors and not necessarily of the BIS, FCA or the European Commission (EC). Tommaso Valletti was Chief Economist of the EC at the time of some competition cases discussed below. No confidential information about these proceedings has been disclosed.

1. Introduction

Over the past decade, a variety of new players have entered financial services – including fintech firms (specialised in technology-enabled financial innovation) and big tech firms (large technology companies whose primary activity is platform-based digital services).² The presence of fintech and big tech firms in financial services is growing especially rapidly in emerging market and developing economies (EMDEs). In response, a number of incumbent bank and non-bank financial institutions are also moving to a platform model by making greater use of big data and automation to offer third-party services, such as digital payments, credit insurance and wealth management, to their existing customers.³ This entails a change to the traditional business model, of financial institutions, where firms seek to match different groups of clients in the market.

The move to platform-based business models is changing market structure in financial services. While platforms can harness powerful economic forces to achieve efficiency gains and greater financial inclusion for the unbanked, there are open questions about the level playing field, and new and complex trade-offs between efficiency and competition, financial stability and data privacy (BIS, 2019; Carrière-Swallow and Haksar, 2019; Feyen et al, 2021). Where platforms collect large amounts of data for a variety of different business lines, this may lead to network effects and economies of scale and scope. At the same, big tech firms have the potential to become dominant through the advantages afforded by the so-called data-network-activities (DNA) feedback loop, raising competition concerns.⁴ The heavy use of personal data raises important data privacy issues. Because platform-based business models differ from traditional modes of offering financial services and the rules that govern these, there is the potential for regulatory arbitrage.

Some of these issues may be more pressing in the post-pandemic world. Platforms can help to offer financial services remotely and thus to meet the increasing demands for payments, credit, savings and insurance online and without the risk of physical contact.⁵ This has helped to promote financial inclusion in a world in which more activities moved online. Some firms have even used their platforms and personal data to help combat the pandemic (Cantú et al, 2020). At the same time, issues around privacy and competition have been accentuated. Big tech firms have seen rapid growth in their core business lines, such as e-commerce (Alfonso et al, 2021) and platforms will likely have greater market power and influence going forward. Meanwhile, the economic consequences of the pandemic have put pressure on households and firms that borrow from both fintech and big tech lenders and

² See FSB (2017), Philippon (2020) and Frost (2020) for overviews.

³ See EY (2020). Some institutions, such as BBVA, Santander, HSBC and Citi explicitly refer to their strategy for creating a banking platform to offer third-party services. Meanwhile, payment card networks – which have long operated in multi-sided markets – have acquired other firms in a bid to become “networks of networks”.

⁴ For instance, in the UK, Google and Facebook have already been found dominant in the online advertising market. See UK Competition and Markets Authority (2020): “*Both are now protected by such strong incumbency advantages – including network effects, economies of scale and unmatched access to user data – that potential rivals can no longer compete on equal terms.*”

⁵ During the pandemic, not only face-to-face activities but even physical means of payment have led to concerns about potential transmission of the Covid-19 virus. For a discussion of concerns about viral transmission through cash and the implications for digital payments, see Auer et al (2020a).

from incumbent financial institutions. This has tested new credit models, highlighting potential financial stability issues.

Public authorities across the globe have responded to the entry of fintech and big tech firms, and the growth of platform-based business models with a variety of regulatory and supervisory approaches to harness benefits while mitigating risks. Many countries have set up innovation facilitators, such as sandboxes, hubs and accelerators (see UNSGSA FinTech Working Group and CCAF, 2019; Cornelli et al, 2020b). Others have adopted new licensing regimes and updates to existing regulation to account for new entities and activities (Ehrentraud et al, 2020). In general though, fintech has not yet inspired major modifications to the overall structure of prudential regulation. To date, core rulebooks on prudential safeguards, consumer protection and market integrity have been broadly unaffected. Yet there are growing concerns about policy trade-offs and the level playing field, and some major jurisdictions are moving to more *ex ante*, entity-based policy measures (Restoy, 2021; Crisanto et al, 2021a; b). Platform-based business models could require further policy reforms in the future.⁶ In particular, if platforms are to enhance access to financial services without dominating markets, then proactive policies may be necessary.

This paper discusses the implications of platform-based business models in financial services for financial inclusion, market structure and regulation. We argue that the economic features that make platforms so powerful in lowering costs and supporting financial inclusion are the same features that give rise to digital monopolies. They may raise significant risks to fair competition, and aggravate consumer protection, financial integrity, and financial stability risks, and therefore can create conflicts between various central bank and regulatory objectives. Given the novelty of the challenges and rapid changes in markets, it is critical that authorities learn from one another and from the experience of other industries. With a well-informed, *ex ante* competition policy approach, data portability and appropriate use of public infrastructures, platforms can be harnessed to enhance financial inclusion while maintaining competitive markets and other policy goals.

This paper is organised as follows. Section 2 gives a primer on platform economics to help explain how platforms reduce costs and thus enhance inclusion, but also some of the potential risks and market failures. Section 3 looks at evidence on the impact of platforms on financial inclusion from EMDEs and an advanced economy – the United Kingdom. Section 4 sketches a range of possible policy approaches to reap benefits and mitigate risks of platform-based business models in finance, arguing for *ex ante* competition rules, data portability, public infrastructures and policy experimentation. Finally, section 5 concludes.

⁶ As discussed below, many governments and competition authorities have been reflecting on new tools and/or potential changes to the regulatory regime to ensure that digital platforms can be regulated effectively, with a particular concern being the ability of platforms to leverage into “adjacent” markets. A common proposal in many jurisdictions has been the creation of a specialist digital unit to develop concentrated expertise in digital markets. See for example the advice of the Digital Markets Taskforce to the UK Government in December 2020 recommending the establishment of a Digital Markets Unit. This has recently been established.

2. Platform economics: a primer

Platform-based business models are prevalent in a number of sectors of the modern digital economy, including telecommunications, online (e-)commerce, and increasingly in financial services.⁷ A (multi-sided) platform can be defined as a set of institutional arrangements that brings together two or more different types of economic agents and facilitates trade between them (Evans and Schmalensee, 2014). The interactions on platforms overcome frictions and generate economic value. Using digital technologies, platforms may lower search frictions and make verification and tracking less costly (Goldfarb and Tucker, 2020).

What is central to platforms is the potential for externalities among the various sides; one side (providers) may attach value to wider acceptance by the other side (users) and bigger networks may entail a higher probability of finding a trading partner. Examples of different sides on platforms include drivers and passengers on a ride-hailing app, and apartment owners and tourists on a hospitality platform. In financial services, they include – increasingly – borrowers and savers on a fintech app, or retail clients and financial service providers on social media, search or e-commerce platforms.

Because externalities such as network effects make the providers' and users' (ie all participants') decisions interdependent, coordination issues arise. Platforms perform an intermediary function that makes it possible to bring participants together and facilitate their interactions. Since network effects, when positive, imply that the value of such interactions depends on the number of participants, platforms take measures to attract a large number of users and encourage participation. The largest digital platforms use massive volumes of (personal) data, which allow for much more efficient matching but also for network effects and "tipping" of markets in favour of dominant platforms (Jullien and Sand-Zantman, 2020). With size also comes market power, and the potential to leverage it.

Features of platform-based markets

Platform dynamics are typically characterised by different phases. In an early phase of market development, there is intense competition where platforms try to differentiate themselves, and at the same time attract as many participants as possible, at least from one side of the market (eg users). Often in this initial phase there is very little monetisation, if any at all, and platforms may even be loss-making. Positive network effects generate "attraction loops", by which higher activity makes it more attractive for each group member to increase her activity level – like the DNA loop noted above. This leads later to winner-takes-all (or winner-takes-most) situations (Belleflamme and Peitz, 2021). Over time, markets with platforms have the flavour of natural monopolies. Once a monopoly position is established, platforms may monetise this by charging higher prices, and the market may become stuck in a sub-optimal equilibrium.

⁷ Payment card networks are one long-standing example of a platform in financial services. Recently, the entry of fintech and big tech firms, and new strategies by incumbent financial institutions, have led to a proliferation of digital platforms in other areas of finance including, asset management, credit and insurance.

In typical natural monopolies, increasing returns are due to supply-side economies of scale. In contrast, in platform markets, increasing returns can also arise from the demand side: when a platform grows by attracting more users, it is not (just) that the average cost per user goes down, but also that the average revenue per user goes up – because some users are willing to pay more to be on a bigger platform. Of course, increasing returns on the demand side and the supply side may also complement each other. Additionally, there may also be returns to scope, ie benefits to platforms that have multiple business lines, in particular because of their control over massive amounts of (personal) data on users. The characteristics leading towards natural monopolies can reinforce each other. For instance, the use of artificial intelligence (AI) involves high fixed costs, and it makes more sense to invest in a strong AI team if there are a variety of applications for them to work on.

Competition between platforms has several key features, which are already apparent in the early work of Arthur (1989). A first feature is path dependence, ie the final outcome depends on the way early adoption builds up. A second feature is lock-in effects: on the demand side, users are reluctant to switch between platforms, implying that a latecomer platform finds it difficult to overcome the gap with the incumbent, and that this gap grows over time. A third feature is a potential inefficiency, as the platform that “wins” the market may not be the one that is inherently superior. A lack of competition coming from the first two features may lead to an inferior service or provider becoming entrenched.

Counterbalancing forces to market concentration

Although positive externalities such as network effects can drive markets towards monopoly structures, there exist other forces that can counterbalance this tendency. Some of these forces arise from competitive strategies enacted by rivals, while others rely on some degree of regulatory intervention.

Starting with the former (market forces), the winner-takes-all or winner-takes-most tendency can be moderated if competitors pursue differentiation strategies. A smaller platform can compensate the lower network benefits that it generates by offering better quality services and services that cater to particular consumers’ tastes and are sufficiently differentiated from those of its competitors. For instance, a social media platform may differentiate itself from competitors by targeting a certain type of social interaction (eg professional networking or photo sharing). A platform offering banking services may distinguish itself by specialising in high privacy protection (eg private banking for high net-worth individuals), or in developing services uniquely catered to the needs of an underserved societal group (eg migrants sending cross-border remittances). This may allow for multiple players in the market, though there may not be much competition for individual users.

Multi-homing, that is, the possibility of users to utilise more than one platform at the time, also plays a central role in mitigating the tendency for network effects to lead to winner-takes-all situations.⁸ Multi-homing, intuitively, allows agents to benefit from all available externalities and potentially the services of all available platforms. Multi-homing sounds very appealing and promising, but it is often not easy to achieve in practice. One reason has to do with consumer behaviour: users might be able to compare several options when joining a certain platform service, but then opt

⁸ For the example of the credit card industry, see Rochet and Tirole (2008). The term “multi-homing” is borrowed from the internet literature and refers to users’ participation in multiple platforms.

for only one solution; think for instance of a phone and internet bundle. Most people do not own several subscriptions and may show inertia in switching. In many platform environments, users seem to be affected by several behavioural biases, such as not looking for alternatives to their default suggestions. This creates considerable frictions to a multi-homing environment. Another reason might be related instead to less innocent strategies put in place by incumbent platforms to make multi-homing particularly costly to users.⁹

As a side remark – but an important one – single or multi-homing refers to a particular group of users, not necessarily to the whole platform in a multi-sided market. For instance, there are instances where for various reasons one side of the market single-homes while the other side will want to or need to multi-home. For instance, we may use a single credit card, own a single phone or browse one preferred online newspaper, while merchants need to accept most credit cards, individuals receive calls from multiple providers and advertisers want to show their ads in multiple news outlets. This can generate a situation of so-called “competitive bottlenecks”, in the sense that the side that needs to multi-home has no other way than using the platform on which the particular single-homing buyer is active. Platforms therefore do not compete for this side (the “bottleneck” feature) but may compete for the other side. For instance, credit card providers may offer rewards to entice retail users, while levying high interchange fees on merchants. This situation has generated many regulatory interventions, most notably mobile termination rates in telephony, and interchange fee caps for credit cards.

These observations lead to the second type of force that can mitigate concentration and monopolies, namely regulation. The most important regulatory policy is arguably to enforce interoperability. Platforms are interoperable if the users of one platform are able to interact with the users of another platform. Interoperability plays a similar role to multi-homing, in that the implications of choosing a particular platform do not prevent users from interacting with users on the other platform. In an important sense, interoperability allows us to keep most of the efficiencies of platform economics (positive externalities), but ensures that these externalities are available to all at the *industry* level, and do not accrue uniquely to a single firm, leading to dominance. The most salient case possibly comes from telecoms: we can call anyone, independently from the device, operating system and telecom operator. Additionally, thanks to regulatory interventions in many jurisdictions, when we change device, operating system or telecom operator, we do not lose our phone number or contact numbers and can port them across platforms. This is why, despite network externalities playing a big role in telecoms, we still are able to witness some degree of competition among telecoms operators.

In financial services, for example, interoperable payment systems can facilitate competition and lead to greater efficiency in payments, both domestically and across borders. Regulatory interventions can help to open “closed-loop” payment systems like those of AliPay, WeChat Pay and M-Pesa and to allow for a level playing field (BIS, 2020). ‘Open Banking’, which allows users to securely share banking data with third

⁹ For instance, Google is used as a search engine by well over 90% of Europeans. This may well relate to Google search being a high-quality search engine. However, Google (which also owns the Android operating system) made it extremely difficult for a competing search engine such as Microsoft’s Bing to be installed on Android devices by way of bundling practices and contractual arrangements with phone manufacturers. These practices were sanctioned by the European Commission with a fine of over €4bn euros. Notice that Google also pays an undisclosed amount to Apple in order to be installed also as search engine on iOS devices.

parties through application programming interfaces (API) pursuant to the Second EU Payment Services Directive can allow competitors to offer services based on the same user data (Open Banking in the UK is discussed in more detail in Section 3).

Yet given the sensitivity of retail transaction data, it is important that interoperability goes hand-in-hand with adequate protections to ensure privacy. In some countries in which central banks have contributed to public infrastructures, as in India, this has gone along with rules regarding how data are collected and whether providers have control over them (D'Silva et al, 2019; Carrière-Swallow et al, 2021). In these cases, it is often possible for users in different networks (eg Google Pay and Facebook's WhatsApp Pay) to transact with one another, just as clients using different banks can send and receive transfers across the same payment infrastructure. Customers may also have control over their payment data. A further consideration is defining liability, ie which party is responsible in the case of a data breach. Finally, interoperability may have to be supported by competition (antitrust) policy and other policy tools in the hands of various public authorities. Indeed, interoperability is one of the key proposals in the Digital Markets Act (DMA), a legislative proposal of the European Commission to deal with dominant digital companies (defined as "gatekeepers"), discussed in section 4.

Implications of platforms in financial services

Overall, in financial services, platforms may enhance efficiency in key respects. In particular, they can use big data and new digital technologies to lower the cost of financial services for users and serve previously unmet customer demands. This could allow services to achieve a large scale very rapidly, and thus to achieve powerful benefits for financial inclusion. For example, Philippon (2020) constructs a model of fintech platforms offering robo-advice. A new technology lowers the fixed cost per customer of providing services (possibly to zero, as robo-advisors operate online and do not need staff to interact with a customer), but maintain a high fixed cost overall (the cost of developing good algorithms). This should lead to a net positive for consumers – what we could term "*value-creating innovation*", which adds to overall consumer surplus. It may even benefit poorer consumers disproportionately, as they will be served at lower marginal cost and cross-subsidised by wealthier consumers. However, the model also recognises the potential for big data to lead to biases, new forms of discrimination and exclusion (see also Morse and Pence, 2020). One implication of the platform-based business model is that firms earn relatively more fee income rather than, say, net interest margins. Fee income often fits closely with the "matchmaking" business model, and it does not require a balance sheet, with the need for market funding, financial regulation and supervision. For these firms, a key part of their franchise value is the value of their network and data.

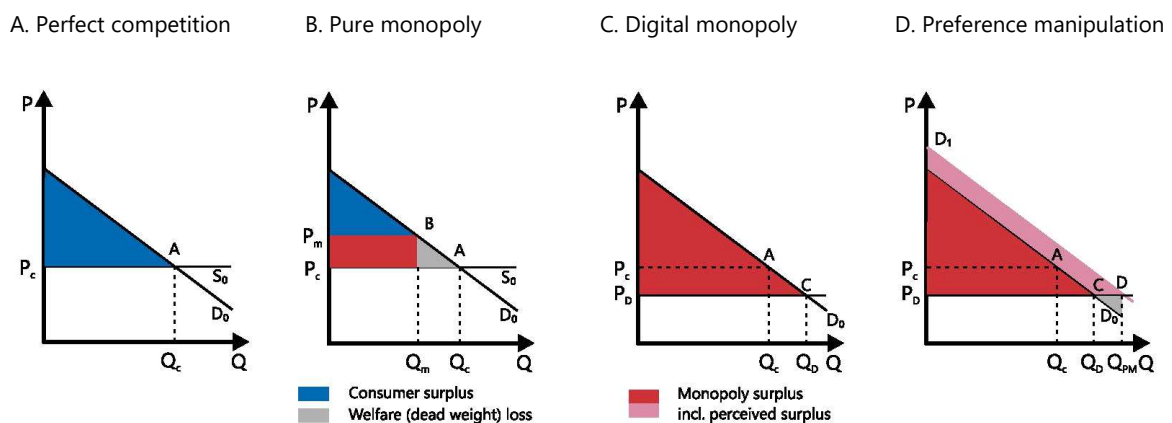
Given these features, new platforms could also introduce new risks associated with market power and data privacy. In particular, the high fixed costs of developing a successful platform may lead to more concentrated market structures. Overall, there is the potential for: (i) monopolistic behaviour and price discrimination, including through the use of big data; (ii) anti-competitive behaviour, such as creating barriers to entry and 'enveloping' competitors; (iii) algorithmic biases and exclusion; and (iv) violations of data privacy. While a platform could thus use its network and big data to enhance convenience and lower costs for users, it can also use this to capture economic rents and impose externalities on others.

As an illustration, Graph 1 compares the consumer surplus, monopoly surplus and welfare under different market structures.¹⁰ The classic model of perfect competition is given in panel A: the market clears at point A, where the (downward-sloping) demand curve meets the (horizontal) supply curve, at marginal cost (P_c). Consumers who value the product (in this case a financial service) at more than the market price obtain a consumer surplus (denoted in blue). The classical pure monopoly is given in panel B: a monopolist sets the price at a higher level, P_m , above marginal cost, thus leading to a lower quantity being consumed (Q_m) and a monopoly surplus (denoted in red). For digital platforms, big data may help to predict the willingness of individual users to pay for services very accurately, allowing platforms to engage in price discrimination, ie charge the highest price that each user would be willing to pay. With sophisticated algorithms, a monopolistic platform could identify each consumer's reservation price, and set a personalised price just below it to capture rents. This may be called "*value-extracting innovation*". Compared to perfect competition or pure monopoly without the use of big data, a digital monopoly (panel C) offers higher rents to the platform. Crucially, if the platform has lower costs per user, it may be able to serve the clients with a low reservation cost, at price P_D – thus bringing new (previously unserved) users into the financial system. In this market structure, some (eg wealthier) users will pay higher prices for the same service than other (eg lower-income) users, thus increasing the overall quantity of services provided and enhancing financial inclusion. At the same time, the platform will capture a large monopoly surplus.

Furthermore, there may be the potential for digital platforms to offer financial services to a greater extent than would be economically efficient ("*value-destroying innovation*"). In cases where preferences can be manipulated, ie platforms can entice users to overestimate the benefits from services or to pay even more than their reservation price (eg by sharing valuable personal data), such users could be even worse off. In this case, overall welfare could be lower (panel D). Such manipulation might arise by capitalising on known behavioural biases. Such advantages could also be obtained by an incumbent, for instance, by not allowing a competitor to emerge.

Illustrative market structures: from competition to market manipulation

Graph 1



Source: Boissay et al (2021); authors' elaboration.

¹⁰ This example draws on Boissay et al (2021), with a few modifications relevant to our later discussion.

The point here is that the information in the hands of a specific platform provider might have dramatic implications for consumers, according to the underlying market structure. To the extent that over time we are getting closer and closer to algorithms that can 'learn' about individual preferences, one can imagine – prospectively at least – approaching the text-book case of first-degree price discrimination, that is, each consumer is a relevant market. To the extent that competition exists for this consumer, this can imply extremely intense rivalry, so that the consumer benefits the most. Conversely, the worst situation for a consumer is one where only one platform knows this detailed information, and its rivals do not. This leads, in principle, to a case where the entire consumer surplus is extracted by a dominant platform.

While this latter situation may sound just like a hypothetical and academic scenario, it may nevertheless be important to pause and think, in practice, how big data could change the very nature of competition in the financial sector, particularly in services like credit and insurance. The premise of competition in credit and insurance is typically one of imperfect and incomplete information, where the customer knows something about her characteristics and potential risky behaviour that financial institutions do not know, and they try to elicit this information over time and via contractual incentives. Imagine now that a platform firm, like Google, enters the insurance market. Google would know information about each customer, such as browsing behaviour, apps downloaded and used, videos watched, e-mails written (or drafted but unsent!), and much more. For instance, Google might know that an individual goes on gambling websites. This information may put Google in a special position vis-à-vis potential competing insurers that are unable to access similar information. (In this example, Google may determine that accessing gambling sites correlates with riskier behaviour in other domains and choose not to sell insurance to the individual, leaving it to the pool of customers available to competitors, which therefore deteriorates). Data protection laws may prevent or curtail Google's ability to exploit wider information it holds about individuals,¹¹ but clearly potential competition considerations may arise. Competition may no longer take place between similarly imperfectly informed providers and an originally level playing field could be tilted in favour of one firm only. The use of wider personal data may be efficient, but we still recall that in panel C, consumers enjoy a lower consumer surplus than in the other panels.

More generally, big tech platforms such as Google, Facebook, Amazon, Alibaba and Tencent have the incentive and ability to expand into other businesses, especially other platform markets, in order to acquire the data generated in those markets. The same may hold for larger fintech firms and incumbents that have a range of business lines and platform models. They have accumulated large datasets about individual consumers that they can combine with payments data in order to deliver products that traditional banks cannot replicate, as in the insurance example above. Banks then risk being 'enveloped' (de La Mano and Padilla, 2018), where the platform operator typically bundles services that cannot be replicated by traditional players, ultimately

¹¹ For instance, in the European Union, the General Data Protection Regulation (GDPR) limits the use of personally identifiable information, particularly 'sensitive' information such as health data, and gives users rights inter alia to securely share information with other firms if they so choose (so-called "right to data portability", Art 20 GDPR). There is considerable debate, however, as to whether the GDPR is currently being enforced in an effective way in Europe.

leading to market tipping in the banking sector, too.¹² In principle, financial services could also help platform operators to tip other markets. For example, if a consumer is buying a car or a refrigerator, and a platform operator offering financial services like loans or insurance knows consumer preferences and creditworthiness in real time, this may help it to tip these markets, as well. A platform operator may also steer users toward its own (or its preferred partners') financial services, for instance by putting these offers at the top of a list of offers.¹³

Finally, given the centrality of personal data in platform-based services and business models, there is the potential that, even in competitive markets, those users who are not willing to provide such data may be excluded from potential benefits such as quicker and cheaper credit or insurance products. New research shows, for instance, that women are generally less willing to share personal data than men in exchange for better offers on financial services (Chen et al, 2021). Similar findings hold for older users (Carlin et al, 2019). If data on these users are unavailable, there is the risk that providers of financial services – whether new fintech or big tech platforms, or incumbents using digital technologies – will consider these users to be higher-risk. In this way, the move to digital platforms could exacerbate financial exclusion, social inequality and the 'digital divide', by further excluding already less-advantaged social groups.

3. The experience to date with platform-based finance and financial inclusion

Empirical evidence to date suggests that new platforms in finance have helped to advance financial inclusion overall, in some cases dramatically. In particular, mobile money and other platform-based services have already led to impressive gains in access to payment services, credit, insurance and wealth management, especially in EMDEs. There have also been positive signs on inclusion in advanced economies, including the UK.

Evidence on platforms and inclusion from EMDEs

At the global level, the proportion of adults with an account with a financial institution or mobile money service rose from 51% in 2011 to 69% in 2017 (World Bank, 2018). Mobile money platforms played a particularly crucial role in increasing access in sub-Saharan Africa, using telecommunications networks to offer low-cost payments and other financial services by phone to large numbers of users. As of 2019, a full 79% of

¹² Envelopment refers to entry by one platform provider into another provider's market by bundling its functionality with that of the target, so as to leverage shared user relationships. See Eisenmann et al (2011).

¹³ As an additional example, in credit, one of the biggest drivers of insolvency are divorce proceedings. This is generally not known and hence cannot be used by traditional banks. Yet big tech providers may be able to infer from browsing behaviour, e-mails, transaction or geolocation data if an individual is having an affair, if a couple is in marriage counselling or if they are likely to be divorced in the near future. This knowledge, gleaned from big data and machine learning, and perhaps not even clear to the (human) staff of a platform provider, can give an incomparable advantage to platform lenders. These providers may automatically decline from showing a credit product to that individual, meaning that this potential borrower ("lemon") is left for traditional competitors. The level playing field may then be compromised and competition would suffer.

adults in Kenya had a mobile money account (CBK-KNBS-FSD, 2019). Mobile money platforms have proliferated across Africa, and a growing ecosystem of fintech platforms and incumbent financial institutions use mobile money networks to reach their customers (CCAF, 2020).

In China, digital platforms have enabled dramatic bounds in financial inclusion, with support from public policy and regulation (Hua and Huang, 2020; Luohan Academy, 2019). Ant Group (1.3 billion users) and Tencent (900 million users) offer low-cost payments, credit, insurance and savings products to hundreds of millions of users, leveraging their parent groups' activities in e-commerce and social media, respectively. Recently, further platforms like Pinduoduo (680 million users), Meituan (480 million users) and JD.com (440 million users) have rolled out competing payment products. In lending, empirical evidence suggests that big tech lending has helped to overcome local credit supply frictions and increase credit access for small firms (Hau et al, 2020). Big tech credit has also reduced the need for costly collateral, and hence the relationship between lending and asset prices (Gambacorta et al, 2020). In investment, Ant Group offers what was, until January 2020, the largest money market fund (MMF) in the world, Yu'eobao ("Leftover treasure"), while Tencent offers users access to MMFs through its Licaitong platform. The Chinese big tech platforms have become major providers of insurance products, for instance through their "mutual aid" offerings, which allow small users to pool costs from unexpected health emergencies – an activity outside of existing frameworks for health insurance in China. In late 2020, proposed guidelines by the China State Administration for Market Regulation (SAMR) and China Banking and Insurance Regulatory Commission (CBIRC) set out measures to limit monopoly risks and increase retention requirements for lending (see section 4).

In India, platforms have become major players in payments, building on public infrastructures like the digital ID system Aadhaar (1.3 billion users as of September 2021) and retail fast payment system Unified Payment Interface (UPI) (D'Silva et al, 2019). Notably, UPI is a platform operated by a consortium of incumbent banks and the central bank, yet it has allowed for greater competition and interoperability between bank and non-bank payment providers. Google processed 820 million transactions in October 2020 through its Google Pay offering; Walmart's PhonePe, introduced by the e-commerce platform Flipkart, became the largest payment provider on UPI with 835 million transactions (Singh, 2020). Amazon Pay, Ant Group-backed Paytm and Facebook's WhatsApp Pay are also significant players in payments. A range of P2P platforms operate in credit markets, and both Amazon and Google have partnerships with financial institutions to offer credit through their platforms. Overall, the combination of public infrastructures and privately operated platforms by fintech firms, big tech firms and incumbent financial institutions has helped India to increase access to transaction accounts from 10% in 2008 to over 80% of Indian adults today. Survey evidence shows that 87% of digitally active Indian adults used fintech services as of 2019 (EY, 2019).

Progress has been similarly impressive in other Asian countries, where big tech, fintech and incumbent-run platforms are proliferating rapidly. In Indonesia, for instance, ride hailing apps like Grab and Go-Jek have also become large providers of payments and other financial services, focused particularly on retail users. In Thailand, one incumbent financial institution – Kasikornbank – has increasingly partnered with both fintech and big tech providers, and non-financial firms, to offer third-party services to its clients. It has also taken efforts to serve the visually impaired and the elderly through a mobile banking interface that uses voice and vibration cues

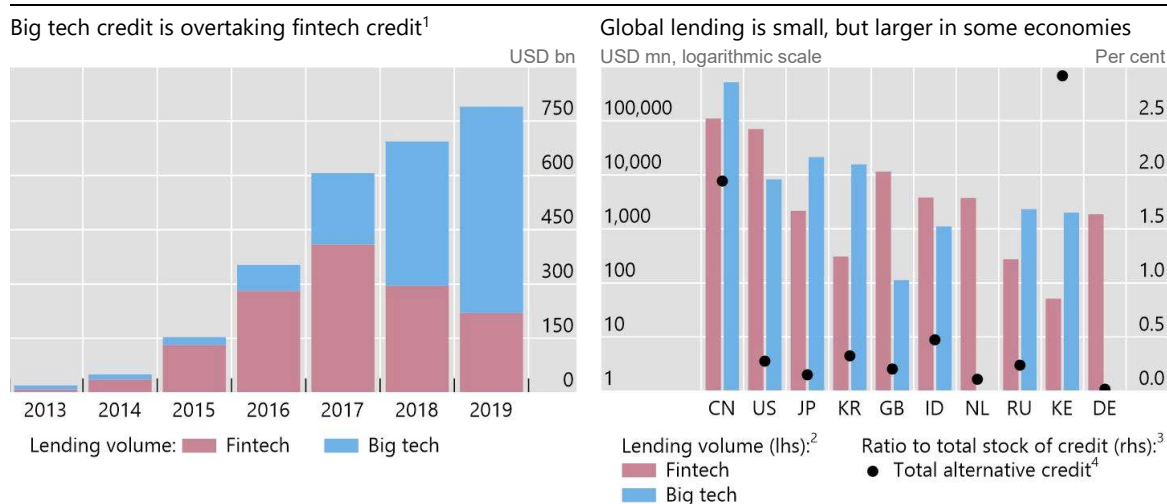
(Banchongduang, 2016). In the Philippines, platforms have dramatically reduced the cost of onboarding new clients. This became particularly relevant when the Covid-19 pandemic broke out; thanks to digital platforms, over 4 million users were able to remotely open an account in March and April 2020, alone (De Vera-Yap et al, 2020).

In Latin America, meanwhile, platforms have in some cases been effective at reaching the informal sector. In Argentina, credit from e-commerce platform Mercado Libre was able to serve borrowers who would otherwise lack access to bank credit (Frost et al, 2019). In Peru, the publicly run *Billeteria Móvil* (BIM) platform has allowed for interoperability between e-money providers, which has facilitated government transfers to informal workers and filled gaps in inclusion in rural areas (Del Carpio Ponce, 2018; Sotomayor et al, 2018).

Platforms in finance have thus proven to be remarkably scalable. For instance, fintech credit platforms, which connect borrowers and savers directly, have emerged in nearly every major economy around the world. Lending volumes are generally larger where existing banking sector mark-ups are higher and regulation is more conducive (Claessens et al, 2018; Rau, 2020; Beaton and Bazarbash, 2020). Some have argued that fintech credit and other forms of crowdfunding can play an important role in financial inclusion if an enabling and safe environment is in place (Jenik et al, 2017). Meanwhile, big tech is scaling even more rapidly. In sub-Saharan Africa, Asia, and Latin America, telecoms, e-commerce platforms and ride-hailing apps are offering an increasingly wide range of financial (and non-financial) services, and collecting ever more data through the data-network-activities feedback loop. In addition to their large foothold in payments, big tech firms are becoming increasingly important in credit markets (Graph 2, left-hand panel). Many big tech lenders lend to small and medium-sized enterprises (SMEs), using the data from e-commerce and other online activities to more accurately predict default (Frost et al, 2019). Among EMDEs, lending by big tech platforms is particularly relevant in China, Kenya, Indonesia and Russia (right-hand panel).

Global big tech credit is booming, overtaking fintech credit

Graph 2



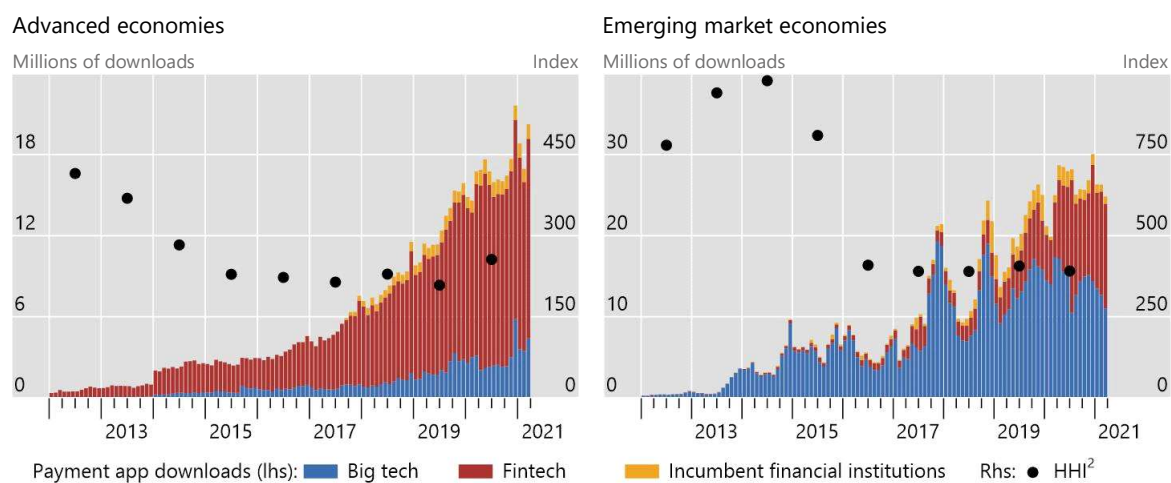
¹ Fintech credit is lending facilitated by electronic (online) platforms that are not operated by commercial banks. Big tech credit is credit extended or facilitated by large companies whose primary activity is digital services (big tech firms). ² Data for 2019. ³ Domestic credit provided by the financial sector. Data for 2018. ⁴ Total alternative credit is defined as the sum of fintech and big tech credit.

Source: Cornelli et al (2020).

The dramatic adoption of fintech and big tech is also visible in data on app downloads, aggregated by Sensor Tower from the Google Play and Apple App stores (the two dominant platforms for smartphone apps). In advanced economies, fintech payment apps have seen rising adoption, especially since 2014, while big tech payment apps have ticked up since 2019, including during the Covid-19 pandemic (Graph 3, left-hand panel). In EMDEs, big tech payment apps have seen several discrete waves of adoption and dramatically greater take-up over time. Notably, there is also greater concentration among finance apps in EMDEs, as measured by the Herfindahl-Hirschmann Index (HHI) for downloads (right-hand panel). In both AEs and EMDEs, downloads of payment apps offered by incumbents has been much lower during the same period.

Downloads of payment apps by fintech firms, big tech firms and incumbents¹

Graph 3



HHI = Herfindahl-Hirschman Index of market concentration.

¹ Downloads of all payment apps among the top 50 finance apps as classified by Sensor Tower. "Fintech" refers to apps by new entrants specialised in financial technology; "big tech" refers to apps by large technology companies whose primary activity is digital services, rather than financial services, and "incumbent financial institutions" refers to apps from commercial banks, insurers, card networks and other financial institutions. ² Yearly average; calculated on the top 50 finance apps as classified by Sensor Tower.

Sources: Sensor Tower; authors' calculations.

Evidence on platforms and inclusion from the UK and other advanced economies

It is not only in EMDEs that fintech, big tech and incumbent platforms are contributing to financial inclusion. There are also key examples from advanced economies, where access to transaction accounts, credit and other services is higher than EMDEs, but certainly not universal. In particular, the UK provides an interesting case study for development of platform-based offerings and fintech solutions, including some innovations that can improve financial inclusion. As an economy with a high degree of innovation¹⁴ and a regulatory approach that explicitly targets greater competition

¹⁴ For instance, the world's first fintech credit platform – Zopa – was launched in the UK in 2006. London is home to large incumbent financial institutions in banking, insurance and asset management, and recently, the UK is home to a large and diverse ecosystem of fintech providers, as well as hosting several international big tech firms.

and better consumer outcomes, the UK can provide insights that may be relevant for other economies, whether advanced, emerging or developing.

Open Banking was introduced in the UK in 2018, as the local implementation of the EU-wide Second Payment Services Directive (PSD2), with the aim of stimulating increased competition and innovation in the financial services industry. Customers can register with banks or authorised organisations (third-party providers) and instruct their existing bank to let them access their payment account details via a secure system. Over 200 firms regulated by the Financial Conduct Authority (FCA) are now enrolled in Open Banking in the UK. Among them are a number of fintech firms developing innovative solutions targeted at helping lower-income, financially vulnerable individuals or traditionally underserved groups.

Some of these innovations are designed to help underserved groups to manage their cash flow more effectively or improve how they save. For example, apps may help individuals to save and invest small amounts with each spending transaction,¹⁵ set aside a portion of their salary for saving of bill pay¹⁶ or advise clients on how much and where to save.¹⁷ Other fintech firms are exploiting Open Banking to help individuals build out their credit profiles and access financing more easily. These platform-based models may help users to build a credit history,¹⁸ gain access to mortgage loans¹⁹ or protect themselves from financial fraud and scams.²⁰

Beyond Open Banking powered tools, the UK's fintech ecosystem has generated other examples of platform-based innovation designed to broaden access to financial services for underserved users. This includes ultra-short term car insurance,²¹ support to homeless individuals for opening a basic bank account²² and using cash to buy

¹⁵ UK-based Moneybox helps individuals save and invest by exploiting Open Banking to monitor a person's spending, round up their purchases (eg on a coffee) to the nearest British pound, and then move the "spare change" into savings or investments for the individual.

¹⁶ Wagestream is an Open Banking-powered tool to enable employees at registered firms to access a portion of their salary as it is earned (eg on a weekly basis) and then budget more effectively by allocating their earnings to certain bills or save directly from their pay. They can also access financial education resources.

¹⁷ Plum offers a savings app that links to a person's bank account, analyses their income, expenses and spending habits and helps to set aside an affordable amount for savings. It can also help people review their spending, understand where they may be overpaying on bills and engage a utility switching service.

¹⁸ Canopy lets users leverage Open Banking to track successful rental payments and have these automatically counted on their credit reports. This can help those with lower income and/or limited credit histories build up their credit scores and overcome "thin file" problems in accessing credit.

¹⁹ Mojo is an online mortgage broker combining credit and open banking data to improve access to mortgage lending by generating a MortgageScore for them, giving them advice to improve this and support to compare deals across lenders and understand the best option for them.

²⁰ Kalgera is using Open Banking to safeguard elderly and vulnerable people from financial fraud and scams in a way that allows them to retain their autonomy. The app alerts authorised relatives or carers to unusual activity on the individual's accounts, but without sharing account details or enabling them to move money.

²¹ Cuvva provides ultra-short term car insurance (eg for a few hours) to enable users to borrow or pool friends' cars. To achieve this, Cuvva queries various data sources to check driving licence data, the Claims and Underwriting Exchange, and automated fraud protection, and integrates with Facebook so that customers can see which of their friends have cars to borrow. The FCA's Innovation Hub supported the firm to understand how its new model could fit into the regulatory framework. It is now authorised and operational.

²² ProxyAddress, a UK start-up, has just launched a pilot to enable homeless individuals to open a basic bank account by providing them with a proxy 'fixed address' for use in the on-boarding process. The

items from online merchants.²³ In each case, start-ups use a platform-based model and big data to make available a service that may otherwise be too costly or subject to uncertainty to be performed.

The impact of these innovations is visible in aggregate indicators of inclusion such as the FCA Financial Lives Survey. Between April 2017 and February 2020, the proportion of adults who used a mobile app to undertake day-to-day banking activities rose by 17 percentage points, to 59%. The rise was relatively larger for women, and was also apparent for users with characteristics of vulnerability in the areas of health, life events, resilience and capability (Graph 4, left-hand panel). The share of adults who are digitally excluded, meaning poor or non-existing digital skills as assessed in the survey, fell in the same period (right-hand panel).

Innovative platform-based approaches can also be seen in other advanced economies. In the United States a number of non-bank financial services providers, such as Kabbage, LendUp and Petal, are using cash-flow data in order to provide unsecured, short-term credit to consumers and small and medium-sized businesses who otherwise would struggle to access loans due to lack of traditional credit history. FinRegLab studied six of these providers empirically, finding that the cash-flow metrics used had predictive power for credit risk and the participants were being served who historically would have faced constraints on their ability to access credit.²⁴ One study suggests that fintech credit platforms tend to have greater activities in localities underserved by traditional banks (Jagtiani and Lemieux, 2018). Meanwhile, big tech platforms are becoming increasingly active in payments and credit markets. Amazon lends to small businesses through its merchant sellers programme (Amazon, 2018). Google has announced co-branded accounts with eight US banks through Google Pay, aiming to attract new users while building on existing bank systems (Moeser, 2020).

Meanwhile, some big tech platforms explicitly emphasise the benefits of their products for financial inclusion.²⁵ Some have proposed new initiatives in payments such as stablecoins, often explicitly referring to the challenges of financial inclusion and cross-border remittances.²⁶ It is too early to assess the extent to which these initiatives will deliver on financial inclusion goals, or whether inclusion is merely being used as part of the marketing. Indeed, similar to the term “greenwashing” for firms that overstate their environmental contributions, some industry specialists refer to “inclusion washing” in financial services. In EMDEs, where access to financial services is very low, welfare gains for financial inclusion could be quite large. In advanced

aim is to enable customers at risk of financial exclusion to maintain access to a safe repository of funds, and an ability to receive wage payments which can support their transition out of homelessness. The firm has been accepted into the FCA regulatory sandbox.

²³ One new UK-based start-up is developing technology to help people use cash to buy items from online merchants. While cash use is declining, cash remains an important payment method for many, including some vulnerable consumers and small businesses. This product may help to allow users who prefer or depend on cash to participate in e-commerce and the digital economy more generally.

²⁴ FinRegLab, “The use of cash flow data in underwriting credit: empirical research findings” July 2019, https://finreglab.org/wp-content/uploads/2019/07/FRL_Research-Report_Final.pdf

²⁵ See eg on Ant Financial <https://www.businesswire.com/news/home/20200115005313/en/Ant-Financial-Debuts-World's-Leading-Fintech-Conference>, and on Google: https://pay.google.com/intl/en_in/about/.

²⁶ See eg Libra: https://libra.org/en-US/wp-content/uploads/sites/23/2019/06/LibraWhitePaper_en_US.pdf.

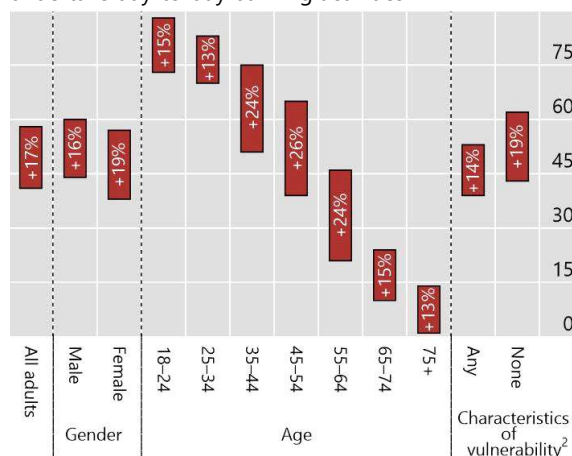
economies, where financial services are widely available and especially credit markets are already very deep, such benefits may be smaller.²⁷

Use of mobile apps for banking in the UK is rising, as digital exclusion declines

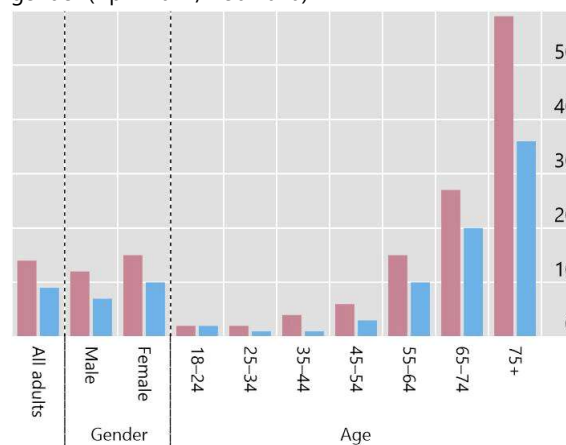
In per cent

Graph 4

Increase in share of adults who used a mobile app to undertake day-to-day banking activities¹



Share of adults who are digitally excluded by age and gender (April 2017/ Feb 2020)³



Percentage increase, 2017–2020

2017 2020

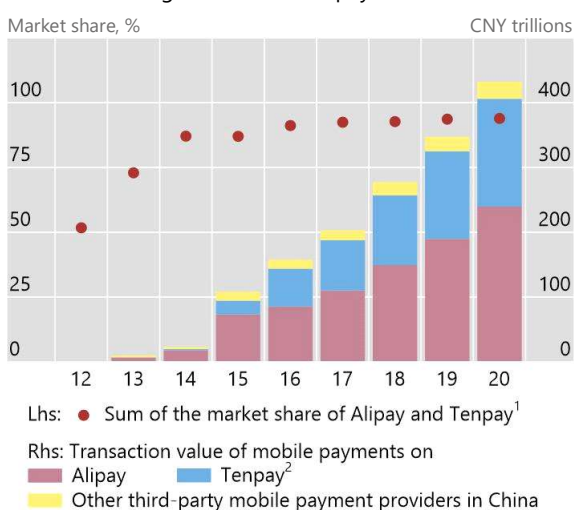
¹ Share of all UK adults who have undertaken day-to-day banking activities in the last 12 months (April 2017: 2,472 respondents / February 2020: 4,089 respondents), excluding 'don't know' responses (1%/0%). ² Derived through an algorithm processing the survey results, to identify whether respondents display at least one of the four drivers of vulnerability, namely health, life events, resilience and capability. For more details, see <https://www.fca.org.uk/publication/research/financial-lives-survey-2020.pdf>. ³ All UK adults (April 2017: 12,865 respondents / February 2020: 16,190 respondents).

Source: UK FCA Financial Lives Survey (FLS), April 2017 / February 2020.

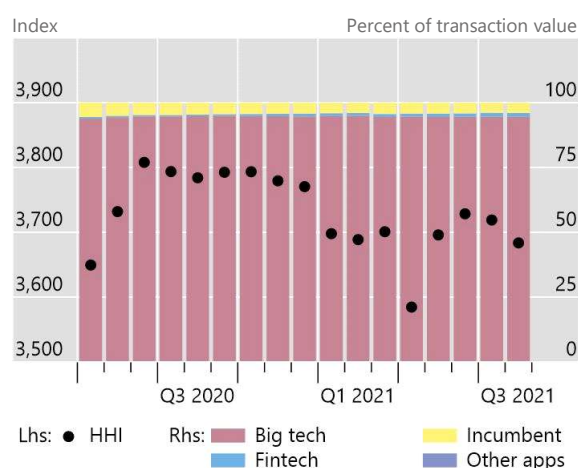
Evidence on platforms and concentration

In financial services, the tendency toward greater market concentration through platforms is already visible. In particular, some big tech players have already achieved dominant market positions, particularly in payments in EMDEs. The two big tech platforms Alipay and WeChat Pay have grown rapidly and jointly control 94% of the Chinese mobile payments market (Graph 5, left-hand panel). In India, on UPI, there is somewhat more competition, but two big tech providers control 85% of the market by transaction value (right-hand panel), and a similarly high proportion by transaction volume (number of transactions). In many countries in sub-Saharan Africa, mobile money operators have become systemically important providers.

²⁷ For a discussion of the link between financial inclusion and macroeconomic goals in EMDEs and advanced economies, see Sahay et al (2015).

Share of the "Big Two" in mobile payments in China¹

Market shares in India's UPI



HHI = Herfindahl–Hirschman Index of market concentration.

¹ Market shares for 2012 are estimated based on market evidence. ² Tenpay includes WeChat Pay and QQ Wallet.

Sources: analysys.cn; Statista, Industries; National Payments Corporation of India (NPCI); A Carsten, S Claessens, F Restoy and H S Shin (2021), "Regulating big techs in finance", *BIS Bulletins*, no 45; authors' calculations.

Globally, the recent spike in merger and acquisition activity by large digital payment firms (Graph 6, left-hand panel) suggests that there are trends toward growing concentration in payment markets. In this figure, the size of the bubble represents the market capitalisation of the acquiring company, while the height in the graph represents the deal size. It is notable that some of the largest deals have been horizontal acquisitions, ie the acquiring of direct competitors by card networks and payment processors (blue dots). In other cases, vertical acquisitions have taken place (red dots). These deals allow payment firms to now perform "in-house" activities for which they previously required vendors – implying a greater bundling of payment services. Such M&A deals (shown in blue in the right-hand panel) are generally small compared to the overall market capitalisation of the platform companies (shown in red). Yet deals were particularly large in 2019, when companies operating digital payment platforms spent nearly 10% of their market value on acquiring other companies. This related in part to "mega-deals" such as those by FIS and Worldpay, Fiserv and First Data, and Global Payments and TSYS. In 2020 and 2021, such activity has slowed again.

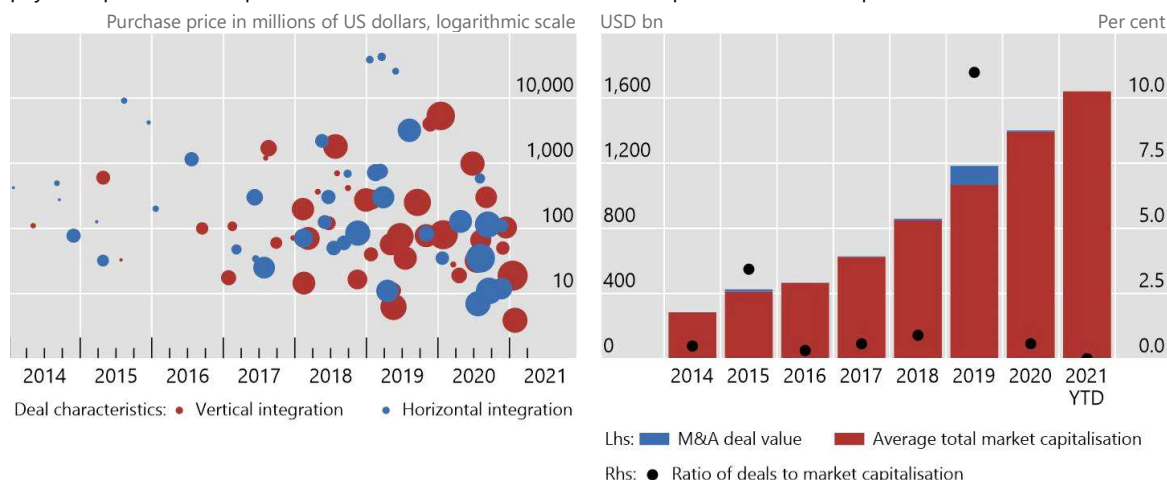
There is mounting evidence that M&A deals may influence the incentives for new entry into financial services, particularly if large companies acquire platform providers before they can build a sufficiently large network (Kamepalli et al, 2020; Cornelli et al, 2021). Moreover, there is also the potential for big tech platform providers to halt their own innovation efforts when acquiring a competitor with similar capabilities – so-called "reverse killer acquisitions" (Caffarra et al, 2020).

Payment platforms have embarked on a buying spree¹

Graph 6

Merger and acquisition (M&A) activity by selected global payment platforms has proliferated since 2017

Total M&A volume spiked in 2019, reaching over 10% of overall platform market cap



¹ For 2020, data up to 31 January 2021. Each dot in the left-hand panel represents an M&A deal by Ant Financial, Fidelity National Information Services (FIS), FISERV, Global Payments, Mastercard, PayPal, Square or Visa as collected by PitchBook and Refinitiv Eikon. This excludes divestitures and intra-company operations. M&A deals are classified as “vertical” when the acquiring and the target firm operate at different stages along the same payment chain, as determined by company reports. In “horizontal” deals, the acquiring and target firm are direct competitors in at least one key business line. The size of each dot is proportional to the acquiring company market capitalisation on the day of the deal or, in the case of Ant Financial, the valuation of Ant Financial as of end-2018, multiplied by changes in the market capitalisation of Alibaba Holdings relative to end-2018. The same sample is used in the right-hand panel.

Sources: BIS (2020): “Central banks and payments in the digital era”, *Annual Economic Report*, ch 3, pp 67–96, June; authors’ calculations.

Platform models by incumbent financial institutions

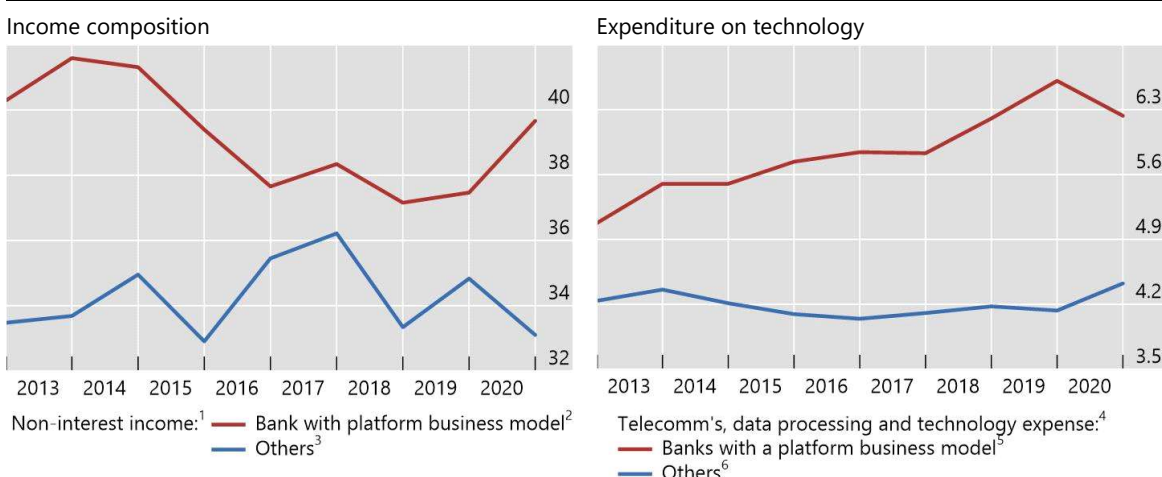
As discussed above, a number of incumbent financial institutions have moved increasingly away from a traditional, vertically integrated business model and toward a model that resembles the digital platforms of fintech and big tech providers. In particular, the growth of “banking-as-a-service” (BaaS) entails offering a range of third-party services to users, thus serving as a matchmaker between clients and external (often fintech) providers. This can imply new revenues from fees, rather than net interest income. But it requires strong investments in digital technology to collect user data and improve offers toward users that are comparable with the sophisticated, personalised offers of fintech and big tech platforms.

Banks with a platform-based model may thus see a shift in the source of their revenues and in the required investment in digital technologies. Unfortunately, an objective classification of banks with a platform model is not available, and research on this shift in banking business models is scarce. Nonetheless, a simple comparison of prominent banks that note publicly that they use a platform or BaaS strategy reveals noticeable differences with international peers. Platform-based banks (denoted in red in Graph 6, left-hand panel) derived nearly 40% of their revenues from fees and other non-interest income in 2020, as compared to 33% for peers. They invested about 50% more than peers on communications, data processing and technology relative to overall expenditure.

Revenue mix and IT investment of banks adopting a platform-based model

In per cent of total revenues

Graph 7



¹ Defined as total revenue minus net interest income. ² Based on a sample including BBVA, Capital One, Citibank, Deutsche Bank, HSBC, Kasikornbank, Santander, Standard Chartered and Wells Fargo. ³ Based on a sample of 258 banks with total assets above 50 USD bn. ⁴ Expenses paid for communications, data processing and technology such as computers, software, information systems and telecommunications, as a proportion of overall expenditure. ⁵ Based on a sample including BBVA, Capital One, Citibank, Deutsche Bank and Wells Fargo. ⁶ Based on a sample of 99 banks with total assets above 50 USD bn.

Sources: S&P Market Intelligence; authors' calculations.

4. Policy issues and options to reap benefits to inclusion while mitigating risks

For public policymakers around the world, financial inclusion is a key policy goal – alongside mandates for financial stability, safety and soundness and consumer protection. Digital innovation has the potential to support inclusion, in particular access to safe transaction accounts that can serve as the basis for other financial services (CPMI and World Bank Group, 2020). As platform-based business models become increasingly widespread in finance, there is the potential for fintech firms, big tech firms and incumbent financial institutions to harness platforms to bring new and underserved groups into the financial system, and for competing providers to provide cheaper and more tailored services. In some cases, digital technologies can play a powerful role in reducing costs and broadening access. In other cases, the causes of a lack of access are institutional, not technological; for instance, existing laws and regulation may not provide the private sector with the correct incentives to innovate and include underserved groups. Where platforms are able to establish and entrench a dominant position, they may extract rents and fail to provide low-cost services for underserved groups.

A key insight from both the theoretical and empirical literature is that platforms may lower costs for the providers, but may not effectively enhance financial inclusion on their own accord. Private platform operators pursue profit maximisation, subject to the constraints posed by regulation. To achieve tangible benefits for access to

financial services, a “push” from policy may be necessary. Measures to encourage interoperability, and complementary measures around supporting infrastructure and supporting consumer engagement and decision making, are crucial. Meanwhile, to prevent platforms from achieving a dominant market position or abusing sensitive user data, financial regulators may need to revisit existing rules and coordinate with other public sector authorities, notably competition and data protection authorities.

In what follows, we discuss three types of approaches that policymakers may take. A first is to allow for private sector innovation – perhaps with “soft” guidance from authorities that innovation should aim to reach underserved groups in society – and simply to apply existing financial regulations, and antitrust and privacy rules. This may be insufficient given the range of new issues that platforms raise. A second approach is to update existing regulatory frameworks in these areas to address the specific risks presented by digital platforms and to more proactively drive financial inclusion. There are challenges in this area, as business models are changing quickly in some cases and regulation seeks to be as future-proof and ‘technologically neutral’ as possible. Yet *ex ante* competition rules and requirements for data portability may be particularly effective. A third approach is to build public infrastructures that private innovation can build on top of. This can include digital ID, retail fast payment systems and other reforms. Each are discussed in turn. Of course, especially the third approach can complement either of the first two.

Apply existing financial regulation, competition and data privacy rules

A first approach is to simply apply existing financial regulation, competition and data privacy rules to platforms (fintech, big tech and incumbents). Indeed, many authorities explicitly adopt a “same business, same risks, same rules” approach, and make clear to new entrants, or to incumbents responding to new entrants, that financial activities are subject to the same rule regardless of which institution is behind them. In particular, frameworks for licensing, regulatory reporting, deposit insurance, capital and liquidity requirements, etc continue to apply as much to a fintech or big tech platform as to a traditional bank (see eg Crisanto et al, 2021a;b). Meanwhile, a bank offering third-party services to its own clients maintains its responsibility for complying with all relevant requirements.

Yet this approach may not always be sufficient to ensure the public interest. In particular, financial regulation and competition law may not always be fast or agile enough to prevent concentration in fast-moving platform markets.²⁸ Moreover, problems could result if some activities do not fit neatly into existing frameworks and in those cases in which platforms do not provide services directly, or leverage their market dominance in adjacent markets. A silo mentality among some regulators may allow for some activities – and risks – to fall into the cracks of existing regulation and supervision.

In particular, there are questions as to how to harness the power and incentives of platform models while addressing other public policy goals like fair competition and privacy / data protection. The entry of platforms could enhance competition in

²⁸ In the UK, for example, the Digital Markets Taskforce has suggested that an *ex ante* regime is needed to prevent powerful digital firms from exploiting their positions as well as to drive vibrant competition and innovation. See UK CMA (2020a; b). Penrose (2021) has argued that competition policy decisions need to be faster and more predictable in the digital era. The EC Google Shopping case took seven years to come to a decision (now under appeal), and the resulting remedies have not yet been formally accepted.

the short run, but if not correctly managed, then competition could be lower in the longer run as big tech firms grow and become systemically important (FSB, 2019). Existing approaches to measure market dominance, based for instance on excessive pricing or measures of market share, may not always capture modern forms of market dominance – which may include anticompetitive practices to build market share, or serving as a vendor and competitor to the same firm (Khan, 2017). Where platforms engage in price discrimination, this may not be measurable to the regulator, and it may not be clear which market to use to measure market shares.

Moreover, there may be trade-offs between some policy goals (Carrière-Swallow and Haksar, 2019; Feyen et al, 2021). For instance, allowing for greater user of personal data may benefit efficiency, but could be detrimental to privacy. As an example of the potential trade-off, platforms providing access to previously underserved consumers (eg consumers with “thin files” in a credit scoring context) may depend on more personal data or a wider variety of data from individuals in order to provide a service viably (eg to price credit risk accurately). However, inadequate coordination between existing regulatory frameworks in many jurisdictions – particularly data protection and financial regulation – means that there are unsatisfactory mechanisms in place for navigating these normative trade-offs (Aggarwal, 2021).

Finally, there is a general issue of level playing field between traditional banking institutions and platform-based firms given the possible information advantages of the latter (Padilla and de la Mano, 2018; Stulz, 2019). An activity-based regulatory approach can ensure that the same activities are subject to the same rules, regardless of provider. Yet there may be the need to complement this with an entity-based approach, particularly when platforms become very large or systemically important (Restoy, 2021; Carstens et al, 2021). This brings us to the next potential set of policy options.

Update existing rules

A second approach is to adapt old and adopt new financial, antitrust and privacy regulation. Some jurisdictions have already moved to update regulations to adapt to fintech and big tech entry.²⁹ This has included defining new types of licenses (eg for virtual banks), enhancing competition through application programming interfaces (APIs) and other tools to enhance data portability, and developing new ex ante regimes and data protection frameworks – which often extend beyond financial services. This section gives a brief overview. As discussed in section 2, a particularly promising approach is to enforce interoperability. The box gives inspiration from the European Union, where rules had to be adapted due to the emergence of new technological platforms in other sectors such as telecommunications.

In financial regulation, a number of authorities have adapted rules to stipulate how digital platforms can enter banking and other financial services. In South Korea, China, Hong Kong and Chinese Taipei, authorities have introduced virtual banking licenses that allow for digital-only banks with targeted regulatory requirements; in many cases, reaching underserved population segments is an explicit policy goal of such initiatives. In Kenya and many African economies, authorities have tailored regulatory frameworks to account for mobile money, thus bringing the financial activities of telecoms platforms into existing frameworks of financial regulation. In

²⁹ For an overview of approaches by banking regulators, see BCBS (2018).

Mexico, authorities passed a dedicated fintech law that includes financial inclusion as an explicit policy goal. In some cases, these frameworks have been adapted over time (Bourreau and Valletti, 2015). In late 2020, in response to the growth of an “originate-to-distribute” model by big tech platforms, the China Banking and Insurance Regulatory Commission (CBIRC) adapted rules on online lending and introduced a 30% retention requirement on new loans.

Notably, many regulatory initiatives relating to platforms in finance explicitly require data portability. As discussed in section 2, data portability can be particularly promising as it can promote interoperability and allow users to “multi-home” on different platforms. Open banking requirements in e.g. the EU, UK, India and South Africa allow users to port their financial data between banks and non-bank (platform) providers (BCBS, 2019). These initiatives can allow for greater user control over personal data, and for greater competition between providers. With the ability to initiate payments from non-bank providers, or to use bank transaction data to access credit, portability frameworks can enhance access to payment and credit services, the number of available providers and the cost of services. We stress, however, that data portability must be carefully assessed against the risks to users’ privacy; else there is considerable risk of a “race to the bottom” with lack of privacy and an explosion of negative (data) externalities for consumers.

In competition policy, meanwhile, some jurisdictions have recently implemented broader measures – beyond financial services – aimed to regulate platforms *ex ante* in the digital era. In the UK, the Digital Markets Taskforce has recommended the creation of a Digital Markets Unit (now established in shadow form) with new powers to support greater competition in digital markets. The Taskforce has proposed that there should be an *ex ante* code of conduct for the most powerful of digital firms. In the EU, the proposed Digital Markets Act and Digital Services Act, proposed in December 2020, would define new categories of “very large online platforms” and “gatekeepers” and subject these to specific *ex ante* requirements against self-preferencing and other anticompetitive behaviours. In the United States, the House of Representatives’ Subcommittee on Anti-trust, Commercial, and Administrative Law released a list of recommendations to regulate big tech platforms so as to reduce anti-competitive behaviour. In China, the State Administration for Market Regulation in November 2020 published draft guidelines to prevent monopolistic behaviour by internet platforms, promote fair market competition and safeguard the interest of consumers. Together, these measures show that a more proactive, entity-based approach to antitrust policy for platforms is being adopted globally, in many cases defining new frameworks and institutions to keep markets competitive.

Existing and planned European interoperability policies

The EU has a long history of using interoperability as a policy tool to overcome network effects and high switching costs in concentrated markets such as telecommunications, and foresees its use in a wide range of future digital services:

- The Access Directive (2002/19/EC) aims to “establish a regulatory framework... for the relationships between suppliers of networks and services that will result in sustainable competition, interoperability of electronic communications services and consumer benefits”. (§1)

- The Framework Directive (2002/21/EC) requires Member States to encourage the use of communications standards where required “to ensure interoperability of services and to improve freedom of choice for users”. (§17)
- The European Electronic Communications Code (EECC, 2018/1972) aims to “implement an internal market in electronic communications networks and services that results in the deployment and take-up of very high capacity networks, sustainable competition, interoperability of electronic communications services, accessibility, security of networks and services and end-user benefits” (§1(2)(a)). It includes provisions on instant messaging (“number-independent interpersonal communications service”) (§61), which are yet to be used by the competent national authorities. In particular, authorities may impose, “in justified cases, where end-to-end connectivity between end-users is endangered due to a lack of interoperability between interpersonal communications services, and to the extent necessary to ensure end-to-end connectivity between end-users, obligations on relevant providers of number-independent interpersonal communications services which reach a significant level of coverage and user uptake, to make their services interoperable”.
- Competition law enforcement by the European Commission required Microsoft to provide a choice of web browsers in its Windows operating system, and to allow workgroup software to network Windows PCs; and Google to provide a choice of default search engine in its Android browser, and to allow alternate specialised search engines to bid for inclusion in its main results page.
- The Digital Future Communication explicitly mentions interoperability as part of the policies on 5G and 6G; digital health; eID; supercomputing; quantum technologies; blockchain; secure, pan-European cloud capacities; and exchange of electronic health records.
- The Communication on A European Strategy for Data states that data interoperability is key for the exploitation of data value, as well as a tool for increased competition by making it easier to switch between cloud providers.
- The European Commission is supporting the Member States to ensure their coronavirus contact tracing apps are interoperable, enabling travellers to be notified following a foreign trip if they were significantly exposed to someone who later tested positive.
- The commonly-called Platform to Business Regulation (2019/1150) also provides important underpinnings, relating to transparency and fairness of all “intermediation services” and search engines linking businesses and corporate websites with consumers, including on access to data.

Some types of interoperability have been imposed ex post, eg following investigation by the European Commission. Yet many competition economists judge these detailed and highly fact-specific cases too slow (seven years, in some cases), unpredictable, and narrow to provide the broader rules needed for effective digital competition (Furman et al, p.55).

The recent major reviews of platform competition for the UK government, DG Competition and US Stigler Center have all found the use of investigations followed by ex post remedies too slow to cope with these fast-moving technologies and markets. The UK Furman review concluded: “The key limitation of using market investigations as the legal basis for a pro-competition approach is that its remedies are largely static. Binding orders cannot be revised and updated as the nature of solutions needed changes... Relying on this model alone, under the powers currently available, is not sufficient in digital markets when technologies change but market power is durable. Specific rules imposed as a remedy following a market investigation may quickly go out of date. What is instead needed is an ongoing, dynamic counterparty to market participants, adjusting solutions in response to innovations and market dynamics” (Furman et al, p. 79). Regulations can set ex ante rules, while still leaving open the option for later enforcement of standard competition law.

Finally, in data protection, a policy area that extends well beyond financial services, several jurisdictions are actively redefining rules in light of the growing use of personal data by platforms. Along with health data, financial data are often explicitly singled out as a sensitive area where special attention is warranted. The European General Data Protection Regulation (GDPR), California Consumer

Protection Act (CCPA) and the proposed Personal Data Protection law in India are just a few examples of frameworks that give users data protection rights and impose obligations on providers to limit the (mis)use of personal data, including punitive sanctions for infringement. Data protection regulation frameworks are important for safeguarding consumer privacy and thereby preserving user trust; indeed, empirical evidence shows that even the poorest users in developing countries value their privacy and are willing to pay to preserve it (Fernandez Vidal and Medine, 2019). Again, data portability is often a key element of these regulatory frameworks, with the aim of enabling users to port their data between different providers – thus reaping the benefits for (financial) inclusion while mitigating anti-competitive effects due to data hoarding by platform providers, and more fundamentally, respecting their fundamental right to privacy and data protection by allowing users to better control how their data are used.

Provide public infrastructures

Very often, private sector platform services are built on top of a public sector infrastructure, such as government digital identity (ID) initiatives, enhancements to real-time gross settlement systems (RTGS) and retail fast payment systems (FPS). Such infrastructures can help to facilitate entry and ensure greater competition between platform providers.

As one particularly salient example, authorities in India have worked in the past years to build several key public infrastructures that have achieved impressive results in inclusion. The Aadhaar digital ID infrastructure, the UPI for payments and the further architectures for data sharing and consent are collectively referred to as the “India Stack” (D’Silva et al, 2019). Notably, the India Stack has been particularly helpful in allowing large digital platform providers to compete on an equal footing with banks and other non-bank payment services providers – harnessing the low costs and network effects of their platforms while preventing concentration of data and market power. One estimate is that the cost of opening a new account has fallen from USD 15 to 7 cents, allowing much wider and more efficient onboarding (Ibid). To promote competition, the National Payments Corporation of India (NPCI), which operates UPI, recently moved to cap the market share of any third-party application provider to 30% of the overall volume of transactions in any three-month period (NPCI, 2021).

A number of further jurisdictions have designed RTGS systems to allow access by non-banks, including large platform providers. Examples include China, Hong Kong and Mexico. By allowing non-banks to access such core systems, central banks can promote greater competition and retail services built on settlement in central bank money.

Central banks are also playing an active role in the operation and oversight of retail FPS. In Mexico, for instance, the central bank has launched the new Cobro Digital (CoDi) system. In Brazil, the central bank has launched the so-called PIX system (Alfonso et al, 2020). These retail fast payment systems have allowed for a dramatic increase in the speed of domestic payments, and a substantial reduction in costs. Moreover, by bringing together bank and non-bank payment service providers on one platform with common standard, they too are promoting a competitive level playing field and countering the risk of “closed-loop” systems. Evidence suggests that this has been a powerful force for financial inclusion; for instance, in a sample of 28 countries around the world, the only two countries in which women were at least as

likely to use fintech services as men – India and Peru – both featured public payment infrastructures including a retail FPS (Chen et al, 2021).

Finally, retail central bank digital currencies (CBDCs) can be seen as public infrastructures on a continuum with retail FPS.³⁰ CBDC projects like the Sand Dollar in the Bahamas aim explicitly at enhancing financial inclusion, and authorities in the United States have noted the potential of the digital dollar proposal to benefit financial inclusion.³¹ A key difference between CBDCs and retail FPS is that CBDCs are a liability of the central bank, rather than a liability of a bank or payment service provider. Yet CBDCs, too, can be designed in such a way that private payment service providers, including big tech and fintech firms, offer retail services to the public. Indeed, in China, platform providers such as Ant Group, Tencent, Pinduoduo and others are offering payment services as part of the CBDC pilot of the People's Bank of China, and most of the advanced CBDC research and development projects around the world involve private sector parties for retail-facing services (see Auer et al, 2020b).

Domestic and international policy coordination

Each jurisdiction will seek to tailor approaches based on their policy preferences, institutional framework and capacity. Nonetheless, since the technologies behind platforms, and many platforms themselves, are global, there may be commonalities across countries and the potential for peer learning. International cooperation can support this process of learning from other authorities.

At both the domestic and international level, it will be particularly crucial for central banks and financial regulators to work with competition and data protection authorities. Because central bank policies may impact on competition and data privacy, and because actions in these areas may impact on core mandates of financial authorities (including mandates for financial inclusion in many jurisdictions), early dialogue is important to ensure consistency and coherence of policy approaches. Given the role of big tech platforms in particular in other sectors, and their macroeconomic relevance, coordination with policy areas like telecommunications and tax policy will also be important.

5. Conclusion

Platform-based business models are changing market structure in financial services. Fintech and big tech entrants have already made substantial inroads in some market segments, and incumbent financial institutions are responding by increasingly moving closer to a platform model, themselves. By their very nature, platforms are highly scalable, making use of network effects and economies of scale and scope in multi-sided markets. In some cases, this has allowed them to lower costs and achieve impressive gains in financial inclusion. In other cases, it has allowed them to serve

³⁰ CBDCs can be defined as a digital payment instrument, denominated in the national unit of account, that is a direct liability of the central bank. See Group of central banks (2020).

³¹ In February 2021, for instance, Treasury Secretariat Janet Yellen noted: *"We do have a problem with financial inclusion. Too many Americans really don't have access to easy payment systems and bank accounts. This is something that a digital dollar, a central bank digital currency, could help with."* See Condon (2021).

existing customers with new, more personalised offers. Yet often, these gains have been accompanied by pressing risks, particularly from market dominance, data privacy and financial stability given the potential for systemic importance of platform providers.

A key insight from the experience to date is that platforms may not enhance financial inclusion of their own accord. Simply allowing entry by digitally savvy providers with low costs does not mean that they will necessarily serve the unbanked, uninsured and those without access to credit or savings products. Even when they do, they may not deliver the lowest cost service or beneficial outcomes for consumers. Indeed, a “push” from policy may be needed to ensure that innovation actually benefits financial inclusion and to protect a competitive environment that protects consumers, and does not necessarily clash with financial stability, price stability, or financial integrity. This may need to be accompanied by policies to improve access to digital infrastructure and to support consumer engagement and decision making.

Going forward, it is important to carefully assess the dual risks of market concentration and abuse of (personal) data by digital platforms. Regardless of the approach, it will be necessary for central banks and regulators, within their legal mandate, to work closely with competition and data protection authorities, and likely other public sector bodies, building on existing coordination and information-sharing mechanisms. There is also great value in peer learning across borders. While mandates and market developments differ, authorities can learn much from those who share their path.

References

- Aggarwal, N (2021). "The norms of algorithmic credit scoring," *The Cambridge Law Journal* vol 80, no 1, pp 42–73.
- Alfonso, V, C Boar, J Frost, L Gambacorta and J Liu (2021), "E-commerce in the pandemic and beyond", BIS Bulletin no 36, January.
- Alfonso, V, A Tombini and F Zampolli (2020), "Retail payments in Latin America and the Caribbean: present and future", BIS Quarterly Review, December.
- Amazon (2018), "Small Business Impact Report", 3 May.
- Arner, D, R Buckley, D Zetsche and R Veidt (2020), "Sustainability, fintech and financial inclusion", *European Business and Organization Law Review*.
- Arthur, W (1989), "Competing Technologies, Increasing Returns, and Lock-In by Historical Events", *The Economic Journal*, vol 99, no 394, pp 116–31.
- Auer, R, G Cornelli and J Frost (2020a), "Covid-19, cash and the future of payments", BIS Bulletin 3, March.
- (2020b), "Rise of the central bank digital currencies: drivers, approaches and technologies", BIS Working Paper no 880, August.
- Banchongduang, S (2016), "Banking app to aid the visually impaired", The Bangkok Post, 23 November.
- Bank for International Settlements (BIS) (2019), "Big tech in finance: opportunities and risks", BIS Annual Economic Report, Ch. III, 23 June.
- (2020), "Central banks and payments in the digital era", BIS Annual Economic Report, Ch. III, 22 June.
- Basel Committee on Banking Supervision (2018), "Sound Practices: implications of fintech developments for banks and bank supervisors", February.
- (2019), "Report on open banking and application programming interfaces", November.
- Beck, T (2020), "Fintech and Financial Inclusion: Opportunities and Pitfalls", ADBI Working Paper, no 1165, Tokyo: Asian Development Bank Institute, July.
- Belleflamme, P and M Peitz (2021), *The Economics of Platforms*, Cambridge: Cambridge University Press.
- Boissay, F, T Ehlers, L Gambacorta and HS Shin (2021), "Big techs in Finance: on the new nexus between data privacy and competition" in R Rau, R Wardrop and L Zingales (eds.), *The Handbook of Technological Finance*, London: Palgrave Macmillan.
- Bourreau, M and T Valletti, "Competition and Interoperability in Mobile Money Platform Markets: What Works and What Doesn't?", *Communications & Strategies*, n. 99, 11-32, 2015.
- Caffarra, C, G Crawford and T Valletti (2020), "'How tech rolls': Potential competition and 'reverse' killer acquisitions", voxEU, May.
- Cantú, C, G Cheng, S Doerr, J Frost and L Gambacorta (2020), "On health and privacy: technology to combat the pandemic", BIS Bulletin no 17, May.

- Carlin, B, A Olafsson and M Pagel (2019), "Generational differences in managing personal finances", *AEA Papers and Proceedings* vol 109, pp 54–59.
- Carrière-Swallow, Y, and V Haksar (2019), "The Economics and Implications of Data: An Integrated Perspective", IMF Departmental Paper no 19/16, September.
- Carrière-Swallow, Y, V Haksar, and M Patnam (2021), "India's Approach to Open Banking: Some Implications for Financial Inclusion", IMF Working Paper no 21/52, February.
- Carstens, A, S Claessens, F Restoy and HS Shin (2021), "Regulating big techs in finance", BIS Bulletin no 45, August.
- Chen, S, S Doerr, J Frost, L Gambacorta and HS Shin (2021), "The fintech gender gap", BIS Working Paper no 931, March.
- Committee on Payments and Market Infrastructures (CPMI) and World Bank Group (2020), "Payment aspects of financial inclusion in the fintech era", April.
- Condon, C (2021), "Yellen Signals Interest in Backing Digital-Dollar Research", Bloomberg, February.
- Cornelli, G, 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.
- Cornelli, G, S Doerr, L Franco and J Frost (2021), "Funding for fintechs: patterns and drivers", BIS Quarterly Review, September.
- Crisanto, J, J Ehrentraud and M Fabian (2021a), "Big techs in finance: regulatory approaches and policy options", FSI Brief no 12, March.
- Crisanto, J, J Ehrentraud, A Lawson and F Restoy (2021b), "Big tech regulation: what is going on?", FSI Insights no 36, September.
- D'Silva, D, Z Filkova, F Packer and S Tiwari (2019), "The design of digital financial infrastructure: lessons from India", BIS Paper no 106.
- De Vera-Yap, C, R Barbosa-Salva, G Cainglet, L Cerrero, S Padilla, E Suficiencia, R Tomas and V Valero (2020), "Financial Digital Rails and Financial Inclusion", in Bangko Sentral ng Pilipinas, *BSP Unbound: Central Banking and the COVID-19 Pandemic in the Philippines*.
- Del Carpio Ponce, P (2018), "Modelo Peru: A Mobile Money Platform Offering Interoperability towards Financial Inclusion", International Finance Corporation (IFC) EMCompass, no 54.
- Digital Competition Expert Panel (2019), "[Unlocking Digital Competition](#)", March.
- Ehrentraud, J, D García Ocampo, L Garzoni and M Piccolo (2020), "Policy responses to fintech: A cross-country overview", FSI Insights, January.
- Eisenmann, T, G Parker and M van Alstyne (2011), "Platform Envelopment", *Strategic Management Journal*, 32: 1270–85.
- Evans, D and R Schmalensee (2014), "The Antitrust Analysis of Multi-Sided Platform Businesses", in R Blair and D Sokol (eds.), *The Oxford Handbook of International Antitrust Economics*, vol 1, Oxford: Oxford University Press.
- EY (2019), "Global FinTech Adoption Index 2019", September.
- (2020), "A vision for platform-based banking", February.

Fernandez Vidal, M and D Medine (2019), "Is Data Privacy Good for Business?", CGAP Focus Note, Consultative Group to Assist the Poor, Washington, DC, December.

Feyen, E, J Frost, L Gambacorta, H Natarajan and M Saal (2021), "Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy", BIS Paper no 117.

Financial Stability Board (2017), "Financial stability implications from fintech: regulatory and supervisory issues that merit authorities' attention", June.

--- (2019), "FinTech and market structure in financial services: Market developments and potential financial stability implications", February.

Frost, J (2020), "The economic forces driving fintech adoption across countries", BIS Working Paper no 838, February.

Frost, J, L Gambacorta, Y Huang, HS Shin, and P Zbinden (2019), "BigTech and the changing structure of financial intermediation", *Economic Policy*, vol 34, no 100, pp 761–99.

Frost, J, L Gambacorta and HS Shin (2021), "From financial innovation to inclusion", *Finance & Development*, March.

Gambacorta, Y Huang, Z Li, H Qiu and S Chen (2020), "Data vs collateral", BIS Working Paper 881, September.

Goldfarb, A and C Tucker (2019), "Digital Economics", *Journal of Economic Literature*, vol 57, no 1, pp 3–43.

Group of central banks (2020), "Central bank digital currencies: foundational principles and core features", Joint Report, no 1, October.

Hau, H, Y Huang, H Shan and Z Sheng (2020), "FinTech Credit and Entrepreneurial Growth", Working Paper.

Hua, XP and YP Huang (2020), "Understanding China's fintech sector: development, impacts and risks", *The European Journal of Finance*.

Jagtiani, J and C Lemieux (2018), "Do fintech lenders penetrate areas that are underserved by traditional banks?", *Journal of Economics and Business*, vol 100, pp 43–54.

Jenik, I, T Lyman and A Nava (2017), "Crowdfunding and Financial Inclusion", Consultative Group to Assist the Poor (CGAP) Working Paper.

Jullien, B and W Sand-Zantman (2020), "The Economics of Platforms: A Theory Guide for Competition Policy", Toulouse School of Economics Digital Center Policy Paper.

Kamepalli, S K, R Rajan and L Zingales (2020): "Kill zone", NBER Working Paper, no 27146.

Khan, L (2017), "Amazon's Antitrust Paradox", *Yale Law Journal*, vol 126.

Lamoreaux, N (2020), "The Problem of Bigness: From Standard Oil to Google", *Journal of Economic Perspectives*, vol 33, no 3, pp 94–117.

Luohan Academy (2019), "Digital Technology and Inclusive Growth", Annual Report, January.

Moeser, M (2020), "Google Pay overhaul adds in-app banking with Citi, Stanford FCU and others", PaymentsSource, November.

National Payment Corporation of India (NPCI) (2021), "Standard Operating Procedure (SOP) – Market Share Cap for Third Party Application Providers (TPAP)", Circular, March.

Padilla, J and M de la Mano (2018), "[Big Tech Banking](#)", *Journal of Competition Law & Economics*, vol 14, no 4, pp 494–526.

Penrose, J (2021), "Power to the people: independent report on competition policy", February.

Philippon, T (2020), "On fintech and financial inclusion", BIS Working Paper no 841, February.

Restoy, F (2021), "Fintech regulation: how to achieve a level playing field", FSI Occasional Paper no 17, February.

Rochet, JC and J Tirole (2008), "Tying in two-sided markets and the honor all cards rule", *International Journal of Industrial Organization*, vol 26, no 6, pp 1333–47.

Sahay, R, M Čihák, P N'Diaye, A Barajas, S Mitra, A Kyobe, Y Mooi and S Yousefi (2015), "Financial inclusion: can it meet multiple macroeconomic goals?", IMF Staff Discussion Note no 15/17.

Singh, M (2020), "Walmart's PhonePe zips past Google Pay in India as UPI tops 2B monthly transactions", TechCrunch, November.

Sotomayor, N, J Talledo and S Wong (2018), "Determinants of financial inclusion in Peru: Recent Evidence from the Demand Side", SBS Working Paper, DT/06/2018.

Stulz, R (2019), "[FinTech, BigTech, and the Future of Banks](#)", Fisher College of Business Working Paper no. 2019-03-020.

UK Competition and Markets Authority (CMA) (2020a), "Online platforms and digital advertising: Market study final report", 1 July.

--- (2020b), "[Advice of the Digital Markets Taskforce: A New Pro-Competition Regime for Digital Markets](#)", December 8 2020.

United Nations Secretary-General's Special Advocate for Inclusive Finance for Development (UNSGSA) FinTech Working Group and Cambridge Centre for Alternative Finance (CCAF) (2019), "Early Lessons on Regulatory Innovations to Enable Inclusive Fintech: Innovation Offices, Regulatory Sandboxes, and Regtech", February,

World Bank (2018), "The Global Findex Database: Measuring Financial Inclusion and the Fintech Revolution", April.

Zetzsche, D, W Birdthistle, D Arner and R Buckley (2020), "Digital Finance Platforms: Toward a New Regulatory Paradigm", *University of Pennsylvania Journal of Business Law*, vol 23, no 1.