

Finance, Competitiveness, and Innovation Global Practice, World Bank
Financial Institutions Group, International Finance Corporation

Fintech and the Future of Finance Overview Paper



WORLD BANK GROUP

Fintech and the Future of Finance

Overview Paper



WORLD BANK GROUP

© 2022 International Bank for Reconstruction and Development / The World Bank
1818 H Street NW,
Washington DC 20433
Telephone: 202-473-1000;
Internet: www.worldbank.org

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent.

The World Bank does not guarantee the accuracy, completeness, or currency of the data included in this work and does not assume responsibility for any errors, omissions, or discrepancies in the information, or liability with respect to the use of or failure to use the information, methods, processes, or conclusions set forth. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Nothing herein shall constitute or be construed or considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.



Rights and Permissions

The material in this work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given.

Any queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2625; e-mail: pubrights@worldbank.org.

Contents

Foreword	vii
Acknowledgements	ix
Acronyms	x
Executive Summary	1
1. Introduction	8
1.1 About the Fintech and the Future of Finance Flagship Report	8
1.2 Conceptual Framework	9
1.3 Fintech: What it is and Why it Matters	10
2. Fundamental Drivers of Fintech	17
2.1 Key Technologies: Connectivity and Computing Power	17
2.2 Impact of Technology	18
2.2.1 Unbundling and Reconfiguration of Value Chains	18
2.2.2 New Entrants	19
2.3 Impact of Economic Forces: Scale Economies, Frictions, and Re-Bundling	20
3. Market Outcomes	22
3.1 Impact Across Infrastructure, Business Models and Products, Players, and Market Structure	22
3.2 Financial Infrastructure	26
3.3 New Business Models and Products	27
3.4 New Players: Entry, Concentration, and Competition	30
3.5 Implications for Market Structure	33
3.6 Emerging Risks	35
4. Core Policy Objectives and Evolving Tradeoffs	37
4.1 Main Policy Challenges	37
5. Regulation and Supervision	41
5.1 Recent Developments	41
5.1.1 Regulatory Stance	41
5.1.2 Typology of Regulatory Responses	43
5.1.3 Specific Activities	44
5.2 Data Issues	46
5.3 Competition Issues	47

5.3.1	Big Tech	47
5.3.2	Open Banking	48
5.4	Looking Ahead	49
5.4.1	Regulatory Implications	50
5.4.2	Supervisory Implications	54
5.4.3	Winding Down	55
5.4.4	Implications for Financial Infrastructure	56
6.	Conclusion	58
Appendix 1: COVID-19 Acceleration of Fintech Use		60
Appendix 2. Overview of Recent Market Developments		62
	Fintech Activity Index	62
	Payments	63
	Credit	64
	Remittances	65
	Crypto-Assets and Decentralized Finance	65
	Transformation of Incumbents and B2B Services	67
	Financial Infrastructure Operators	69
	Platform Models and Embedded Finance	70
	SME Finance	70
Appendix 3: Open Banking Framework in Select Countries		72
Appendix 4: Principles for Ethical Use of AI and Data Analytics		74
Appendix 5: Executive Summaries of Technical Notes		75
Bibliography		94

List of Figures

Figure 1.	Conceptual Framework for Fintech: Interactions between Markets, Policy, and Development	1
Figure 2.	Growth in Mobile Money Accounts and Transactions (By Volume and Value) Between 2017 and 2020	11
Figure 3.	Use of Digital Payments and Fintech Credit	13
Figure 4.	Global Big Tech Credit Is Booming, Overtaking Fintech Credit	14
Figure 5.	Growth in Fintech Investments over the past Decade	15
Figure 6.	Equity Investments in Fintech Companies (Index)	16
Figure 7.	Customer Relationships in the Next Five Years	20

Figure 8.	Market Outcomes in Digital Money and Payments	23
Figure 9.	Market Outcomes in Digital Lending	35
Figure 10.	Expected Shifts in Market Concentration, by Subsector	31
Figure 11.	Expected Evolution of Customer Relationships: Traditional FIs versus New Types of Providers (Views by Sector/Type of Respondent)	32
Figure 12.	Expected Evolution of Customer Relationships: Single Core Relationship versus Multiple Providers (Views by Type of Respondent)	32
Figure 13.	Business Risks and Opportunities from Fintech and Digital Transformation (Views by Responding Institution Type)	33
Figure 14.	Potential Barbell Financial Services Market (Illustrative)	34
Figure 15.	Policy Trade-Offs Due to Fintech Developments	40
Figure 16.	Do Regulators Enable Innovation by Incumbents and New Entrants? By Region	42
Figure 17.	Areas in Which Regulators Have Modified Their Regulatory and Supervisory Approach to Facilitate the Development of Fintech And/or Develop Supervisory Capacity. By Country Income Level	44
Figure 18.	Areas in Which Regulators Have Modified Their Regulatory Frameworks to Address Emerging Risks from Fintech Activities. By Country Income Level	45
Figure 19.	Open Banking Heat Map	49
Figure 20.	The Fintech Regulatory Decision Tree	51
Figure 21.	Worldwide Downloads of Financial Apps during the Pandemic	61
Figure 22.	Use of Digital Channels for Sales and Customer Origination	68

List of Boxes

Box 1.	Fintech and the Future of Finance Technical Notes	9
Box 2.	Fintech and the COVID-19 Pandemic	29
Box 3.	The World Bank Group–IMF Bali Fintech Agenda	37
Box 4.	World Development Report 2021: Data for Better Lives	47
Box 5.	The Public Policy Implications of Crypto-Assets and Stablecoins	52

Foreword

The monumental challenges we face today, from COVID-19 to the war in Ukraine, have reminded us that throughout history, turbulent times are often accompanied by innovation.

The technology-enabled innovation in financial services —known as fintech—is one such example, accelerating rapidly as pandemic shutdowns amplified its importance for maintaining business activity and financial services during a time of social distancing.

Every day, headlines attest to the seismic shifts that fintech is bringing to the financial services industry, driven by a dramatic expansion of internet access and smart phone usage, combined with lower-cost computing and data storage. As financial products, payments, business models evolve—even the concept of money itself—so too are market players and the structure of the markets in which they compete. Large telecom and information technology companies, retail chains, along with small start-up companies, are joining traditional banks and non-financial institutions in providing services.

Digital financial services can play a significant role in maintaining active credit markets to support a resilient and inclusive recovery, leveraging data, analytics, and new business models such as embedded finance. It can also create new opportunities to make the global financial system more efficient and inclusive by overcoming geographic and physical obstacles to services, and by making information more widely available to consumers and providers.

Policymakers globally have embraced fintech development to promote innovation and growth of the digital economy. But for regulators and supervisors, digital transformation has also created challenges to balance innovations with safeguarding competition, financial stability and integrity, consumer protection and data privacy.

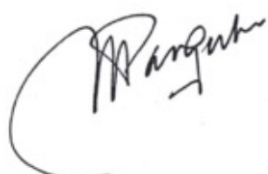
To help inform policy makers in navigating a complex financial system, this report explores the digital transformation underway in financial services and the implications of fintech on market outcomes, as well as regulation and supervision. It looks at the range of new market providers, business models, and products which have amplified the need for updated legal, regulatory and supervisory frameworks.

This work builds on the World Bank Group's efforts to support financial innovation at all levels. The World Bank has been supporting governments adapt regulatory frameworks, modernize systems and other financial infrastructure, and ensure high standards of consumer protection. The IFC has been investing in a diverse group of private-sector fintech providers for over a decade, promoting the growth of responsible inclusive finance providers that serve tens of millions of customers across global emerging markets.

The World Bank Group and the IMF launched the Bali fintech agenda (BFA) in 2018, recognizing the need for regulators and policy makers to actively engage as technology transforms finance, to take advantage of new efficiencies and opportunities to broaden financial access and achieve financial inclusion, while safeguarding financial stability and consumer protection.

As efforts continue to recover losses from ongoing crises, expanding access to financial services is one way to support businesses and communities get back on track. For poor people and micro enterprises, the use of basic services such as transaction accounts enables them to send and receive payments securely and gain access to savings, credit and insurance products that can help them plan for hard times, invest in their futures and grow their businesses.

We hope that this report will be a useful guide for policymakers around the world as they seek to manage longstanding risks and maximize the economic and social benefits of financial innovation.



Mari E. Pangestu

Managing Director of Development Policy and Partnerships
World Bank

Acknowledgements

This Overview Paper distills the key findings and messages of a series of technical notes developed for the “Fintech and the Future of Finance” report, a joint effort by the World Bank and the International Financial Corporation (IFC).

This project was led by Erik Feyen and Harish Natarajan (both World Bank) and Matthew Saal (IFC) under the overall guidance of Jean Pesme, Mahesh Uttamchandani, and Anderson Caputo Silva (all World Bank) and Paulo de Bolle and Martin Holtmann (both IFC). Alfonso Garcia Mora (IFC, formerly World Bank) provided guidance at inception and during earlier stages of the report.

The team of authors of the technical notes comprised Tatiana Alonso Gispert, Oya Ardic, Gian Boeddu, Pierre-Laurent Chatain, Jennifer Chien, Dorothee Delort, Tatiana Didier, Matei Dohotaru, Karl Driessen, Erik Feyen, Jose Antonio Garcia Garcia Luna, Ivor Istuk, Ruth Llovett Montanes, Harish Natarajan, Ana M. Carvajal, Danilo Palermo, Ariadne Plaitakis, Guillermo Rabadan and Arpita Sarkar (all World Bank) Robert Paul Heffernan, Luis Maldonado, Matthew Saal, Miguel Soriano, Ghada Teima and John Wilson (all IFC) and Giulio Cornelli, Jon Frost, Leonardo Gambacorta and Tara Rice (all Bank for International Settlements).

The team appreciates comments provided on this Overview Paper by Bob Cull and Martin Raiser (World Bank), Andi Dervishi, Neil Gregory, Hans Koning, and Nathalie Louat (IFC), and Aditya Narain (IMF).

The team thanks Machimanda A. Deviah (World Bank) for editorial assistance, Maria Lopez (World Bank) and Sensical Design for design and layout, Elizabeth Price, Melissa Knutson and Nandita Roy (all World Bank) and Henry Pulizzi and Elena Gox (both IFC) for communications support, and Michael Geller and Arpita Sarkar (both World Bank) for overall coordination.



Acronyms

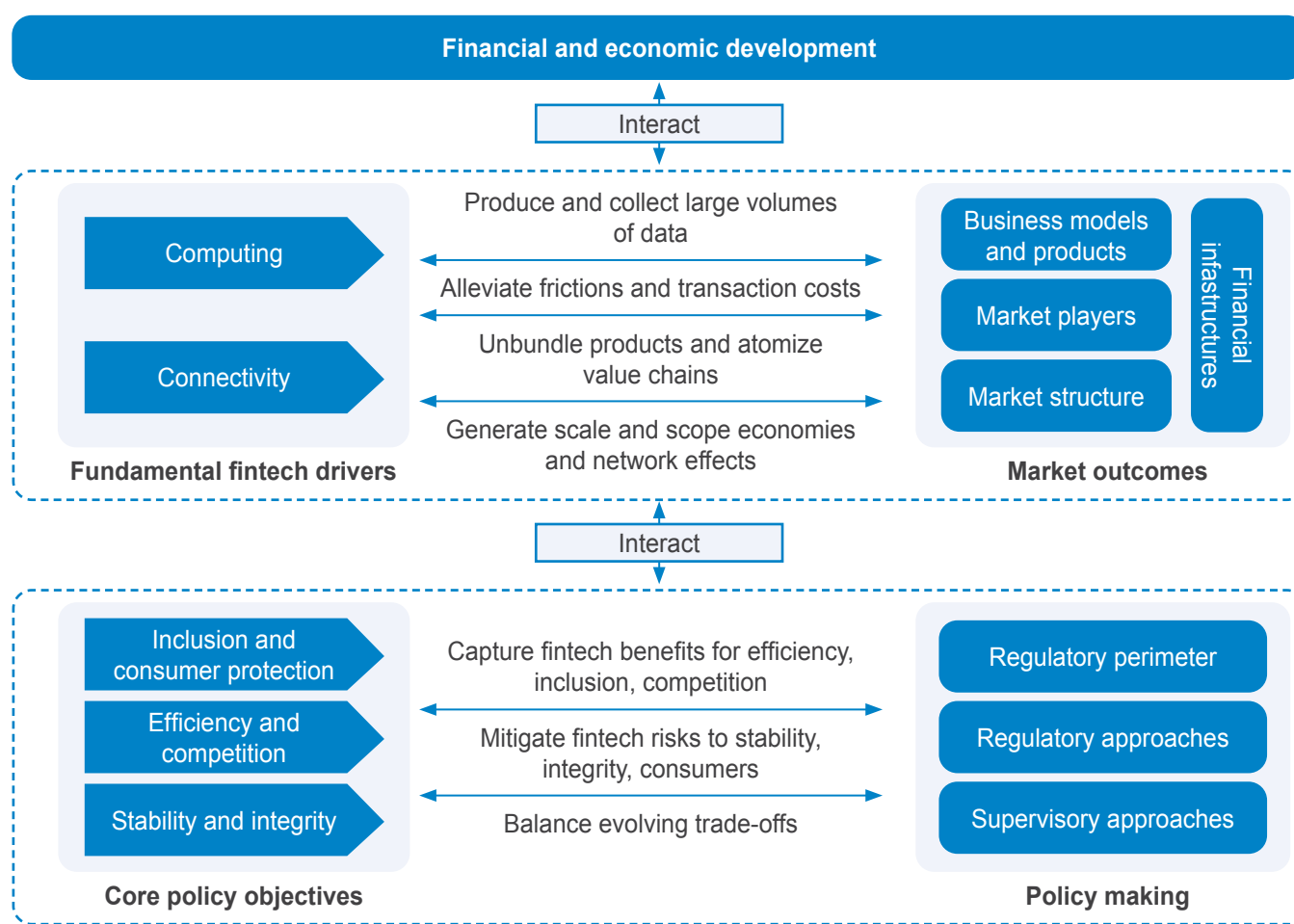
AI	Artificial intelligence
AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
API	Application programming interface
B2B	Business-to-business
BIS	Bank for International Settlements
CBDC	Central Bank Digital Currency
CCAF	Cambridge Center for Alternative Finance
CPMI	Committee on Payments and Market Infrastructures
DeFi	Decentralized finance
DLT	Distributed Ledger Technologies
eKYC	Electronic know your customer
EMDE	Emerging Markets and Developing Economies
FI	Financial Institution
FPS	Fast payment systems
FSAP	World Bank-IMF Financial Sector Assessment Program
FSB	Financial Stability Board
FX	Foreign exchange
G20	Group of Twenty
G2P	Government-to-person
GPFI	Global Partnership for Financial Inclusion
GSMA	GSM Association
ICT	Information and Communications Technology
IFC	International Finance Corporation
IMF	International Monetary Fund
LGBTQ	Lesbian, gay, bisexual, transgender, and queer or questioning
MFI	Microfinance Institution
NBFI	Non-banking financial institution
P2P	Peer-to-peer

SMEs	Small and medium enterprises
SWIFT	The Society for Worldwide Interbank Financial Telecommunication
USSD	Unstructured Supplementary Service Data

Executive Summary

The ongoing digitization of financial services and money creates opportunities to build more inclusive and efficient financial services and promote economic development. Countries should embrace these opportunities and implement policies that enable and encourage safe financial innovation and adoption. Technological advances are blurring the boundaries of both financial firms and the financial sector. New infrastructures, providers, products, business models, and market structures are shaping market outcomes in profound ways. As such, it is necessary to ensure that market outcomes remain aligned with core policy objectives as the financial sector continues to transform and policy tradeoffs evolve. This flagship report explores the implications of fintech and the digital transformation of financial services for market outcomes on one side, and regulation and supervision, on the other, and how these interact. This Overview Paper provides a high-level perspective for senior policy makers and is accompanied by a set of notes that focus in detail on selected salient issues for a more technical audience. Figure 1 below lays down a conceptual framework for fintech, and the interactions between markets, policy, and development.

Figure 1. Conceptual Framework for Fintech: Interactions between Markets, Policy, and Development



Source: Authors' elaboration.

The Fundamental Drivers of Fintech

Technology-enabled innovation in financial services, fintech, is re-shaping financial products, payments, business models, market players, market structure and even money itself. The adoption of fintech was accelerated by the COVID-19 pandemic. Fintech adoption can further financial development by promoting core policy objectives such as financial stability, integrity, inclusion, efficiency, innovation, and competition, and provide firm foundations for the digital economy to flourish. Fintech-enabled business models and products can support economies to become more resilient and promote an equitable recovery from the COVID-19 pandemic (World Development Report 2022). At the same time, a balanced policy approach is required to also mitigate various risks related to, among others, financial stability and integrity, consumer and investor protection, and data privacy.

The two fundamental drivers of this wave of fintech are ubiquitous connectivity through mobile, internet-connected devices and communication networks, and low-cost computing and data storage. Together these enable new business models for the delivery of technology, such as cloud computing. Applications leveraging these advances, such as e-commerce and mobile apps, create reams of Big Data about users and transactions. Low-cost computing and storage allow that data to be mined for insights. Data and connectivity can alleviate key frictions in the provision of financial services, such as information asymmetries and transactions costs, and have enabled a wide range of data-driven process automation and product applications, from credit and insurance underwriting to investment robo-advisors. Data-driven business models are able to scale rapidly, leveraging positive feedback loops from customer activity that generates data that is used to provide additional services, which in turn generate more user engagement and data. Lenders that previously relied on a borrower's credit history or collateral to fill information gaps about cash flows and ability to repay can use data-driven credit scores and real time payments data on cash flows to extend credit to previously underserved individuals and small and medium enterprises (SMEs), reaching them at lower cost through mobile channels.

These drivers enable the reconfiguration of the value chains that produce financial services. Transaction costs and barriers to information flows have long defined the scope of what was produced within a single firm; reduced transaction costs and friction-free information flows allow a reconfiguration of financial services value chains and product bundles. Connectivity and data exchange allow a product or service to be broken up into distinct components (atomization), which can be offered by different providers and recombined in new ways. Account opening, for example, has moved from a single-provider service delivered at the bank branch using its own front and back office, to a range of potential configurations: an account at a bank might be opened through the physical locations or the mobile app of a partner such as a retailer or an e-commerce platform, with ID verification provided by a specialized fintech, the ledger sitting on an outsourced cloud-based IT infrastructure, and customer service provided by an off-shore call center. That account might be branded as a product of the bank or might be delivered by the partner as a service 'powered by' with the consumer barely aware of the underlying financial institution.

The ability of customers and providers to access information and move funds more easily has enabled the unbundling of financial services: specialized providers offer single products and customers are able to choose a set of service providers that collectively meets their needs. Rather than using the deposit, payment, and loan products of a single institution, the customer can choose to keep deposits in one (or more), shop around for the best loan offer, and use different payments providers for different uses—paying bills, splitting a restaurant bill, or sending money overseas. Customers can now assemble their own set of services and bundle them at the level of app icons on a smartphone screen. Critically, the same advances in computing power, data, and connectivity allow services providers, who do not own the whole customer financial relationship (as banks once did), to provide single solutions and new packages of financial services, or rebundle financial services with other business or commercial activities.

Atomization, unbundling, and rebundling are re-shaping business models and product economics as well as the provider landscape. An account holder might choose a 3rd party application for remote access to an account, effectively

separating the account-holding institution from the end product and user interface—and much of the consumer value creation. Economy-wide trends such as wider use of application programming interfaces (APIs) in technology architecture and the rise of multi-party platforms in e-commerce, logistics, and other sectors further enable information exchanges and the rebundling of financial services, which are being embedded into non-financial products and workflows. The introduction of variable and on-demand (cloud-based) infrastructure, automation, remote channels, and capital-light and embedded business models is reducing costs to customers. The new array of customer-facing providers will, however, take some of the margin that was previously earned by banks, even where regulation may still require that a bank sit behind the product.

Market Outcomes

While the digital transformation of the financial sector remains a work in progress, it is already changing financial infrastructure, products, and business models, bringing new entrants and reshaping incumbents and market structure. Customer behavior is changing and competition increasing. There is potential to vastly improve financial inclusion, particularly in EMDEs, by overcoming physical and geographic barriers to access and closing the information gaps for credit and other products. Incumbents and entrants alike assign strategic priority to digitizing customer channels, internal processes, and product adoption. Market outcomes will ultimately depend on a variety of factors including scale and scope of economies, customer preferences for choice versus convenience, and the policy framework, including regulatory approaches to licensing, data, and competition.

Digital transformation both creates a need for new infrastructure—such as fast payment systems, digital ID, and data exchange platforms—to support the other market outcomes, and also provides new ways to meet that need. The impact of changing financial infrastructure may be largest in EMDEs, where prior infrastructure is most lacking. Financial infrastructures are no longer the sole purview of the central bank, incumbent payment system operators, and authorized credit bureaus or asset registries. In more developed markets, advances in connectivity between bank systems has enabled faster payments and these are now increasingly being adopted in EMDEs as well. Further, in EMDEs, mobile money systems are filling a gap in access to retail accounts and payments, enabling individuals to easily transact at a distance, and digital payments acceptance by SMEs. Mobile money systems have become a significant component of the payments landscape and are taking on some functions usually associated with financial infrastructure. In India and Estonia, government-provided digital IDs have become part of the foundational infrastructure for access to financial and other services. In most markets, digital ID-verification services are layered on top of existing non-digital government IDs by private sector innovators. Technology has expanded the potential coverage and impact of existing infrastructures such as credit information and collateral registries. Further, technological developments have opened the door for new quasi-infrastructure solutions including innovative providers of alternative data credit scoring and industry-led factoring and reverse factoring platforms. As technology enables a broader range of providers to offer financial services, the role of both traditional financial infrastructures and quasi-financial infrastructures become essential to new entrants and incumbents seeking to participate in the market; giving rise to potential challenges related to competition, pricing, and fair access.

Technology enables providers to serve and profit from broader markets as well as defined market segments. Digital channels enable providers to reach a broader market without high-cost branch infrastructure. The low-cost reach of digital banks paired with customer access to digital search enables focused providers to find and serve a dispersed niche customer segment. Automated data-driven processes can serve low-value/high volume segments efficiently and profitably. Products can be configured and tailored to meet specific needs of a particular consumer or business segment, enabling, for example, the provision of products like trade finance, invoice discounting, and FX services to SMEs that were once reserved for high volume large corporates. The growth of affinity digital banks serving the specific needs of segments such as freelancers and gig workers, musicians, or LGBTQ customers, demonstrates that eliminating geographic constraints and product tailoring can enable assembly of a viable customer base within even a narrow market

segment. These business model and product innovations are building on mobile access to drive meaningful financial inclusion, making available a wider range of products and services appropriate for previously excluded retail and SME market segments.

While technology has enabled niche providers to be economically viable, even in the digital age, classic economies of scale and scope remain strong forces, and convenience and trust matter to consumers. Economies of scale, scope, and network effects in customer acquisition and servicing, and data production and use increasingly drive digital business models. These forces confer advantages on providers with larger customer bases, such as big tech platforms. Scale and scope economies encourage a re-bundling of financial services, and allow diversified fintech and big tech companies, and other new players to deepen their inroads in core financial products. Furthermore, while unbundling gives users more choice, there can be time, effort, and monetary costs to assembling individual financial services from different providers. Simplicity, convenience, and trust therefore continue to be prized by consumers; these factors favor brand names and large players offering a broad range of products. Providers will optimize across their comparative advantages in technology, skills, reputation, capital, customer base, and other assets to determine how to position along the spectrum from single service within a product value chain, to single product, to broad multi-product player.

Strategic positioning as either a focused niche provider or as a large, multi-product provider could lead to a “barbell” market structure outcome. The resulting market configuration would be one of large banks and fintech and big tech firms co-existing with a competitive tail of targeted niche firms. Many firms are taking strategic decisions consistent with this market path, as evidenced by continued entry of new players alongside the trend to re-bundling, including fintech firms seeking banking licenses. Ecosystems in which small providers can thrive by connecting independently to customers or through partnerships with platforms for whom they fill product or service gaps, can enable persistence of this bi-modal market.

Crypto-assets, including stablecoins and decentralized finance (DeFi), as an emerging industry and asset class, offer new opportunities, but also significant challenges. Technology is blurring one of the last functional boundaries, the distinction between an individual and a financial intermediary. Distributed Ledger Technologies (DLT) underpin new decentralized financial infrastructures that reduce or remove the role of intermediaries, enabling users to interact directly on a peer-to-peer basis and providing open-source platforms that anybody can use and build upon, spurring innovation and network effects and giving rise to new, interoperable financial services and vibrant ecosystems. Crypto-assets, including stablecoins, and DeFi are DLT-based decentralized forms of digital value and financial services that aim to serve a range of economic functions. They hold promise for financial innovation, inclusion, efficiency, capital formation, and transparency. For example, they could improve the speed and cost of cross-border payments and remittances, which are key for EMDEs. However, these new technologies carry significant risks related to, among others, financial integrity, consumer and investor protection, financial stability, fair competition, and monetary sovereignty.

Policy Objectives and Role for Policy Makers

Allowing fintech developments to be driven solely by market forces may ultimately not serve core policy objectives. These objectives include promoting financial innovation, efficiency, and inclusion, while mitigating risks associated with financial stability and integrity; cyber and operational risks; data, consumer and investor protection; fair competition; and (cross-border) regulatory arbitrage. Technology enabling niche providers targeting a particular product or segment to be economically viable does not ensure open and competitive markets. The tendency to market concentration in particular due to economies of scale and network effects in data, raises concerns about potential anti-competitive conduct, but may also deliver inclusion and efficiency, particularly in developing economies that do not benefit from competitive and inclusive financial sectors. A concentrated provider or a big tech crossing over into finance may provide financial services otherwise unavailable. Consumers can benefit from a wave of fintech-induced innovation and competition even as markets become

more concentrated. Proper policy safeguards hence become increasingly important for maintaining fair competition and preventing abuse of market power. Similarly, crypto-assets and DeFi ecosystems could reduce costs and spur innovation, but they currently lack transparency and adequate investor/consumer and financial integrity protections.

Policy tradeoffs evolve as countries rise on the fintech adoption ladder to ensure market outcomes remain aligned with core policy objectives. At lower levels of fintech development, providing basic policy support for innovation and mitigating immediate risks, such as illicit activity and protection of customer funds, may yield good short-term outcomes as policy makers aim to reap innovation, inclusion, and efficiency gains. Consumers have benefited from a wave of fintech-induced innovation and competition even as markets have become more concentrated. Policy makers however need to be aware that adoption can increase rapidly and hence will need to improve their monitoring tools and be ready to step in. Strengthening or clarifying policy frameworks and improving financial infrastructures become increasingly important to continue to safely support fintech adoption, as fintech reaches more consumers, increases volume and dependence on user data, and as certain providers reach scale.

EMDEs have adapted regulatory and supervisory frameworks in response to fintech developments, although market participants indicate there is scope for improvement. Various EMDEs have sought to bring fintech activities within the regulatory perimeter by applying or adapting existing regulatory frameworks or developing bespoke regulations or sandboxes to promote safe innovation. Some countries have done so after a period of observing industry developments and letting some fintech activities go unregulated. This may entail risk. Countries also feel the need to evaluate the appropriateness of their supervisory frameworks as the financial sector undergoes digital transformation. And, according to market participants, supervisors will need to catch up, particularly in EMDEs. The approach to dealing with fintech failures needs strengthening in many EMDEs, although special wind-down procedures are only indicated in cases where the provider has systemic relevance. Many advanced economies are adopting comprehensive data protection and privacy frameworks, while EMDEs typically lag.

Policy makers have taken a cautious stance regarding crypto-assets. Jurisdictions aim to provide an environment for safe innovation and adoption and are clarifying existing legal, regulatory, and supervisory approaches, or creating new ones; although some jurisdictions have limited or banned some or all crypto-assets activities. In light of their supra-national and decentralized nature, crypto-assets pose domestic and international regulatory arbitrage risks. Various standard-setting bodies are applying general and transparent principles to provide guidance, set minimum requirements, and promote cross-border collaboration. In doing so, there is a need to focus on economic functions, using a “same risk, same activity, same treatment” approach while aiming for simplicity to ensure a future-proof, technology-neutral stance. However, this remains a work in progress and many national authorities still lag behind in upgrading their policy frameworks and address regulatory fragmentation.

Some types of crypto-assets notably global stablecoins have the potential to attract broad public usage as a means of payments including in the De-Fi ecosystems. In this context, public authorities are exploring issuing Central Bank Digital Currencies (CBDCs). Widespread adoption of crypto-assets could challenge the primacy of public money with implications for, among others, monetary policy and financial stability. Some authorities have also noted the concentration, data protection, and privacy risks that large-scale payment service providers can pose, particularly the ones employing a data monetization-led business strategy. It is perceived that a CBDC, being a digital version of fiat currency, could imbue public money with the necessary digital features and enable it to provide a safer and efficient alternative to society, while promoting competition and innovation. The perceived potential of CBDCs to advance financial inclusion is also of interest to some public authorities, notably the EMDEs. CBDCs however are not a panacea for financial inclusion since key behavioral, technological, and infrastructural barriers faced by other digital payment solutions may remain in place.

Several jurisdictions and international standard-setting bodies are studying design options and developing roadmaps to introduce CBDCs. The scale and pace of adoption and implications are not fully clear at this point, but the general thrust appears to position CBDCs as co-existing with other forms of money and payment

mechanisms. CBDCs could be limited for use by regulated financial-sector players—wholesale or open-to-all retail CBDCs. Wholesale CBDCs, given their limited use, do not pose any significant policy challenges. A retail CBDC may however adversely impact bank funding and credit intermediation, impact monetary stability, distort the level playing field, and raise financial integrity and data privacy challenges. As such, careful attention needs to be given to various implementation options related to, for example, distribution, wallet limits, privacy features, onboarding, and verification mechanisms. At the time of this report writing The Bahamas, Eastern Caribbean Central Bank and Nigeria have already launched retail CBDCs, with a few more in advanced stages—China, Ghana, and Jamaica have launched large-scale live testing. The guidance emerging from standard-setting bodies, notably BIS-CPMI, calls for striking a balanced approach. This would likely translate to retail CBDCs being distributed through regulated banks and payment service providers, being interoperable and co-existing with private money, and come with transaction limits and restrictions on cross-border usage.

Policy makers are also actively pursuing other avenues to advance the reach and efficiency of payment systems.

The reform actions being pursued include, inter alia, implementation of fast payment systems, expanding access to payment systems to non-bank entrants, promoting open banking, extended hours of operations, and expanding direct access to central bank settlement services to non-bank institutions. These could also enable smoother introduction of CBDCs later.

The cross-sectoral nature of fintech has profound implications for regulatory frameworks. The growing diversity of financial service providers resulting from atomization and unbundling requires re-evaluation of the regulatory perimeter. In this regard, regulators are confronted with three questions—what to regulate, when to regulate, and how to regulate. Finance has long been intertwined with other commercial activities. Long standing practices related to payment terms for account payables implicitly include credit extension. The terms of such credit may come under commercial conduct codes, but is generally not part of financial sector regulation. Further, given atomization and unbundling, multiple financial and non-financial entities are often involved in the production of financial services. Bringing every other instance of finance and all entities involved in the production of financial services under the financial sector regulatory perimeter would not be viable in most markets. At the same time, addressing conduct-related risks might necessitate defining a wider financial sector regulatory and oversight perimeter. The potential “bar-bell” market outcome requires financial sector regulators to take an active role in collaboration and co-ordination with competition authorities to lower the barriers to entry and keep the market contestable even when there could be natural tendencies for a concentrated market in some financial services.

These regulatory challenges in turn have implications for supervisory frameworks. The expansion of the regulatory perimeter will have a knock-on effect on supervisory approaches and stretch supervisory capacities. Establishing a risk-based framework to prioritize supervisory actions and calibrate supervisory intensity becomes relevant. Further, supervisors will need to marshal new skills through strategic staffing, partnerships, and industry collaborations. Strengthening and expanding data-sharing and collaboration frameworks among domestic authorities and at the international level are important. As the fintech market evolves, ensuring an orderly exit of unviable market players could become critical necessitating strengthening of wind-down processes and tools and financial sector safeguards.

Lastly in this context, the design and governance of financial infrastructures become a key policy lever to fully harness efficiency gains and safeguarding competition. Several financial infrastructure components will become central to the financial services chain. Ensuring open, fair, and transparent access to these infrastructures become critical to provide a level playing field and allow new entrants a fair chance to compete with incumbents. Payment systems, credit reporting systems, and secured transaction registries are particularly relevant. In addition, increasing reliance on remote provision of services and data-driven processes, require new types of financial infrastructure to emerge—for example, digital ID, data-exchange hubs, and gateways to data held with governments.

In conclusion, the ongoing digital transformation presents a paradigm shift that has various policy implications, including:

- Foster beneficial innovation and competition, while managing the risks.
- Broaden monitoring horizons and re-assess regulatory perimeters as embedding of financial services blurs the boundaries of the financial sector.
- Be mindful of evolving policy tradeoffs as fintech adoption deepens.
- Review regulatory, supervisory, and oversight frameworks to ensure they remain fit for purpose and enable the authorities to foster a safe, efficient, and inclusive financial system.
- Anticipate market structure tendencies and proactively shape them to foster competition and contestability in the financial sector.
- Modernize and open up financial infrastructures to enable competition and contestability.
- Ensure public money remains fit for the digital world amid rapid advances in private money solutions.
- Pursue strong cross-border coordination and sharing of information and best practices, given the supra-national nature of fintech.

1. Introduction

1.1 About the Fintech and the Future of Finance Flagship Report

Digital transformation is re-shaping the market outcomes of the financial services industry. Fintech supports growth and poverty alleviation by strengthening financial development, inclusion, and efficiency and providing the financial services that are required for the digital economy to flourish. To reap these benefits, authorities will need to shape regulatory and supervisory approaches to harness these opportunities while ensuring that core policy objectives, such as stability, integrity, consumer protection, and competition, continue to be met as the digital transformation of the financial sector continues.

Digital finance has enabled providers to leapfrog legacy channels and products, particularly in EMDEs. Financial markets have seen the entry of standalone consumer fintech firms, new B2B services, and big tech firms. Incumbents have also embraced technology as a strategic priority to improve their products, lower costs, and compete. Adoption and further innovation have accelerated due to the COVID-19 pandemic, with increased digitization across many sectors, including finance, as businesses and individuals adapted to social distancing and hygiene protocols, and sought efficient and effective ways to connect remotely to government and business services (see appendix I). The pandemic thus reinforced what was already a clear trend of rapid advances in technology reshaping the economic and financial landscape globally (IMF and World Bank 2018, Pazarbasioglu et al. 2020).

This report responds to increasing demand from policy makers for guidance as their financial sectors transform. It explores how fintech is re-shaping the structure of financial services, the implications of fintech in key product areas and for different customer segments, and potential regulatory responses. Two key questions guided these explorations:

1. What are the most important likely *market outcomes* in terms of (i) types of financial services providers, (ii) types of business models, products, and services, (iii) market structure, and (iv) infrastructures in the financial sector in EMDEs over the next five to ten years?
2. What *policy responses* might shape or change these outcomes in support of policy objectives and priorities, given EMDE conditions and constraints?

This Overview paper is intended as a non-exhaustive, non-technical narrative of the most salient developments and policy issues. It is aimed at senior policy makers and practitioners and draws from the set of eight technical notes (box 1) that make up the overall report. In-depth descriptions of developments, trends, and policy recommendations can be found in those notes. Appendix V contains all the executive summaries of the technical notes.

Box 1. Fintech and the Future of Finance Technical Notes

Data trends and market perceptions

1. Global Patterns of Fintech Activity and Enabling Factors (*Fintech Activity note*) by Tatiana Didier, Erik Feyen, Ruth Llovet Montanes, and Oya Ardic
2. Fintech Market Participants Survey (*Fintech Market Participants Survey*) by Erik Feyen, Harish Natarajan, Guillermo Rabadan, Robert Paul Heffernan, Matthew Saal and Arpita Sarkar

Policy issues

3. Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy (*Market Structure note*) by Erik Feyen, Jon Frost, Leonardo Gambacorta, Harish Natarajan, and Matthew Saal
4. Regulation and Supervision of Fintech: Considerations for EMDE Policymakers (*Regulation note*) by Tatiana Alonso Gispert, Pierre-Laurent Chatain, Karl Driessen, Danilo Palermo and Ariadne Plaitakis with contributions from Ana M. Carvajal and Matei Dohotaru
5. Consumer Protection Implications of Fintech (*Consumer Protection note*) by Gian Boeddu and Jennifer Chien

Specific fintech products

6. Innovation in Payments: Opportunities and Challenges for EMDEs (*Payments note*) by Dorothee Delort and Jose Antonio Garcia Garcia Luna
7. Fintech and SME Finance: Expanding Responsible Access (*SME note*) by Ghada Teima, Ivor Istuk, Luis Maldonado, Miguel Soriano, and John Wilson
8. What Does Digital Money Mean for EMDEs? (*Digital Money note*) by Erik Feyen, Jon Frost, Harish Natarajan, and Tara Rice

This report builds on prior research and work in this space by practitioners from the World Bank Group and other institutions and firms and is part of an ongoing research, advisory, and investment agenda. Prior work has included, but is not limited to, the Bali Fintech Agenda, advisory and policy work with governments, regulators, and standard-setting bodies, World Bank-IMF Financial Sector Assessment Program (FSAP) analyses of fintech developments, and IFC's accumulated experience as a pioneer investor in emerging markets fintech. This report leverages a unique dataset of fintech adoption metrics, a global survey of banks, MFIs, NBFIs, fintech companies, and others, and the experience of global fintech, finance, and regulatory experts. The World Bank continues to assess fintech developments and advise governments and central banks on fintech issues in coordination with the IMF, FSB, CPMI, G20 GPFI, and other relevant organizations. IFC is complementing its investment in fintech firms and the digital transformation of traditional financial institutions with research and thought leadership on the private sector growth and investment opportunities emerging from fintech adoption, including in areas such as SME finance and embedded finance.

1.2 Conceptual Framework

This Overview paper is framed around the development of and interactions between four key factors that are relevant for fintech (figure 1). The conceptual framework captures the implications of fintech and the digital transformation underway in financial services for market outcomes on one side, and policy making on the other, and how these two sides

interact. The impact of fintech drivers on market outcomes typically requires a policy response to ensure alignment with policy objectives, which in turn shapes market outcomes, producing a feedback loop.

Fundamental technology developments shape market outcomes. Advances in computation and connectivity have produced massive amounts of data and alleviated transaction costs and frictions associated with financial services provision. These technological factors, combined with scale and scope economies and network effects, have profoundly transformed financial sector business models, products, infrastructures, market players, and market structure. These technological innovations are ultimately not purely exogenous, as innovators respond to market conditions and create the next generation of technologies.

Core policy objectives such as financial inclusion, efficiency, and stability drive the formulation of regulatory and supervisory frameworks. We distinguish longstanding policy objectives, but these too are not immutable. For example, financial inclusion and consumer data protection have emerged relatively recently as policy objectives in their own right. The objective of policy makers with respect to financial innovation is to capture the main benefits of fintech while mitigating associated risks. This requires balancing continuously evolving tradeoffs as the sector's digital transformation progresses and market outcomes change.

These dynamics also depend on the stage of fintech development in a country. At lower levels of fintech development, the range of services, scale, and penetration is still limited. This stage requires policy makers' willingness to support innovation and to provide basic legal and regulatory clarity. Addressing data gaps that prevent effective monitoring of risks, safeguarding the most vulnerable customers, and ensuring financial integrity objectives are met are key priorities as risks to financial stability, fair competition, and overall consumer and investor protection are still relatively low. However, as scale, complexity, and interconnectedness and possible concentration increase, more focus is necessary on safeguarding financial stability, data protection, and fair competition. This requires that legal, regulatory, and supervisory frameworks as well as technology and financial infrastructures be reviewed and strengthened to support development of a flourishing fintech ecosystem that remains consistent with policy objectives.

1.3 Fintech: What it is and Why it Matters

There are a number of ways to define fintech. The Bali Fintech Agenda, FSB, and others broadly define fintech as "advances in technology that have the potential to transform the provision of financial services, spurring the development of new business models, applications, and processes, and products." (IMF/World Bank 2018)¹ In the accompanying technical notes, specific technologies are addressed where relevant. The overall focus, however, is on the market trends and regulatory implications of the digital transformation of finance in the context of rapidly digitizing economies rather than on specific technologies that may have currency today and get superseded tomorrow. For that reason, this report starts its analysis with key drivers of change on the technology side and links these to the underlying economics of financial intermediation: the economic frictions that gave rise to intermediaries, and the economic forces that shaped their scope and scale.

Technology can lower costs and increase the speed, transparency, security, and availability of more tailored financial services. Digitization can reduce frictions in each step along the financial service lifecycle, from opening an account to conducting customer due diligence, authenticating transactions, and automating other, product-specific processes, such as assessing creditworthiness. Fintech is therefore characterized by low marginal costs per account or transaction and scale efficiencies. Fintech can also enhance transparency and reduce information asymmetries since digital processes generate a data trail, which can be used to better understand consumers, improve products, manage risks, and promote regulatory compliance.

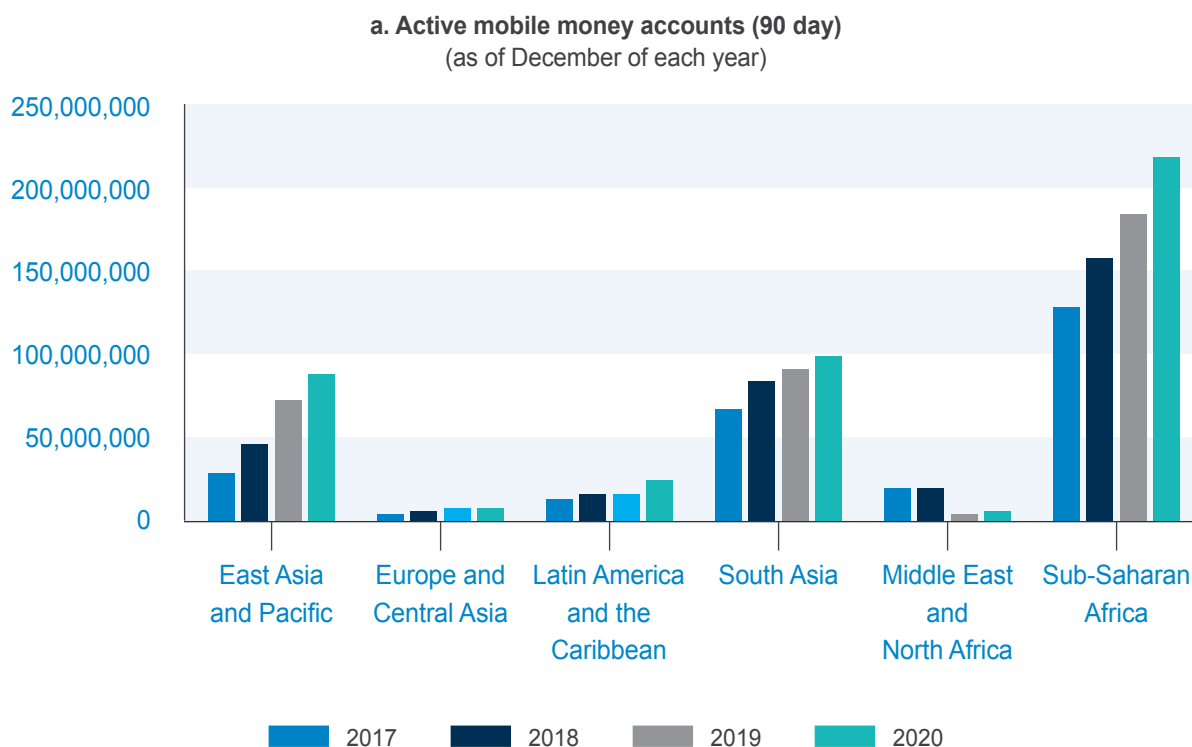
1. See glossary for definitions.

The use of technology in finance has a long history. In fact, since finance involves high-value activities, there has always been an incentive to use the latest technology, whether that was the finest scales to weigh gold pieces or the fastest communication methods of the day, from Rothschild's carrier pigeons to Reuter's telegraph. Digital technology made its way into finance as the second major application of electronic computers after the military. The first wave of financial technology in the 1950s to 1970s saw bespoke mainframe computer systems become part of the fabric of the back office and then gradually the middle and front offices of most large financial institutions. The late 1960s through the 1980s saw the emergence of digital technology companies dedicated to serving financial institutions, including core banking system providers like FIS and Fiserv, and payments networks like Mastercard and SWIFT.

The current wave of fintech innovation is marked by the technology companies increasingly interacting directly with customers and becoming the providers of financial services themselves. This wave leverages the increasingly sophisticated technology that is in the hands of increasingly sophisticated customers, along with innovations in business models, to disaggregate services and offer new reconfigurations of products directly to individuals and business users.

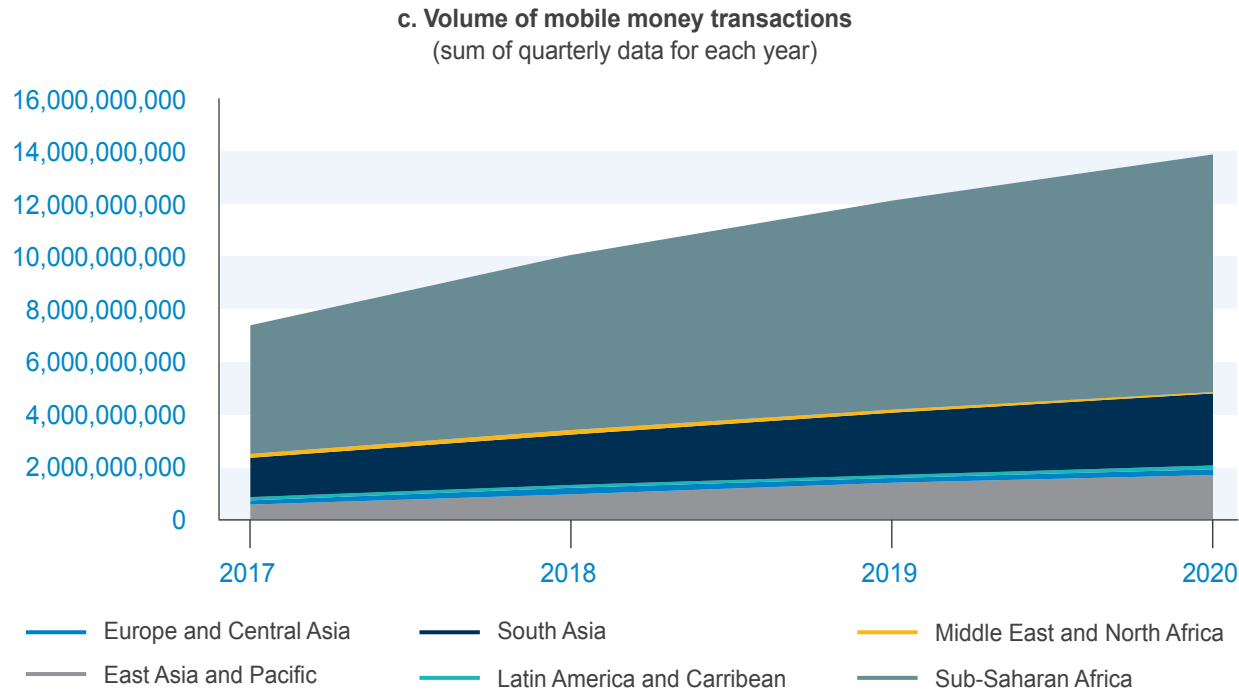
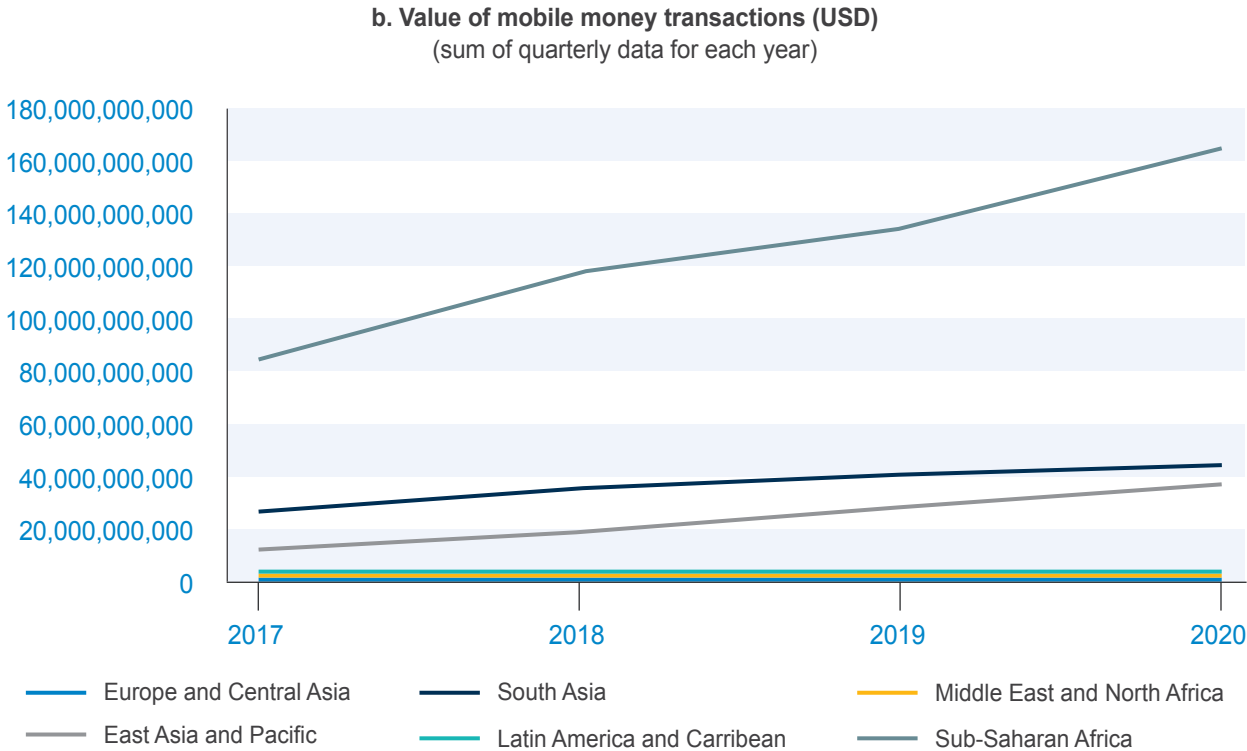
That has resulted in disruptive changes to the market in terms of the pace of technological advances, who is providing financial services, and how consumers use those services and interact with providers. This is evident, for example, in the statistics on global uptake of mobile-money accounts and increases in mobile-money transactions (figure 2). The Global Findex surveys show that mobile-money operators added more than twice as many accounts as banks in sub-Saharan Africa from 2014 to 2017, becoming the key drivers of increased financial access. A significant majority (92 percent) of respondents to the *Fintech Market Participants Survey*² indicated that fintech and digital transformation is a strategic priority at the board level for their organizations.

Figure 2. Growth in Mobile Money Accounts and Transactions (By Volume and Value) Between 2017-2020



2. This survey was conducted from May 2020 to January 2021. 330 market participants from 109 countries responded, including traditional banks, payments/remittance service providers, fintech firms, insurance companies, non-banking companies, tech companies, telecom companies, industry associations and other financial market players. Given the number of respondents, countries, and subsectors, the survey may not be fully representative of every country and institution type. Please see: "Global Market Survey: Digital Technology and the Future of Finance" (Fintech Market Participants Survey) by Erik Feyen, Harish Natarajan, Guillermo Rabadan, Robert Paul Heffernan, Matthew Saal and Arpita Sarkar.

Figure 2 continued



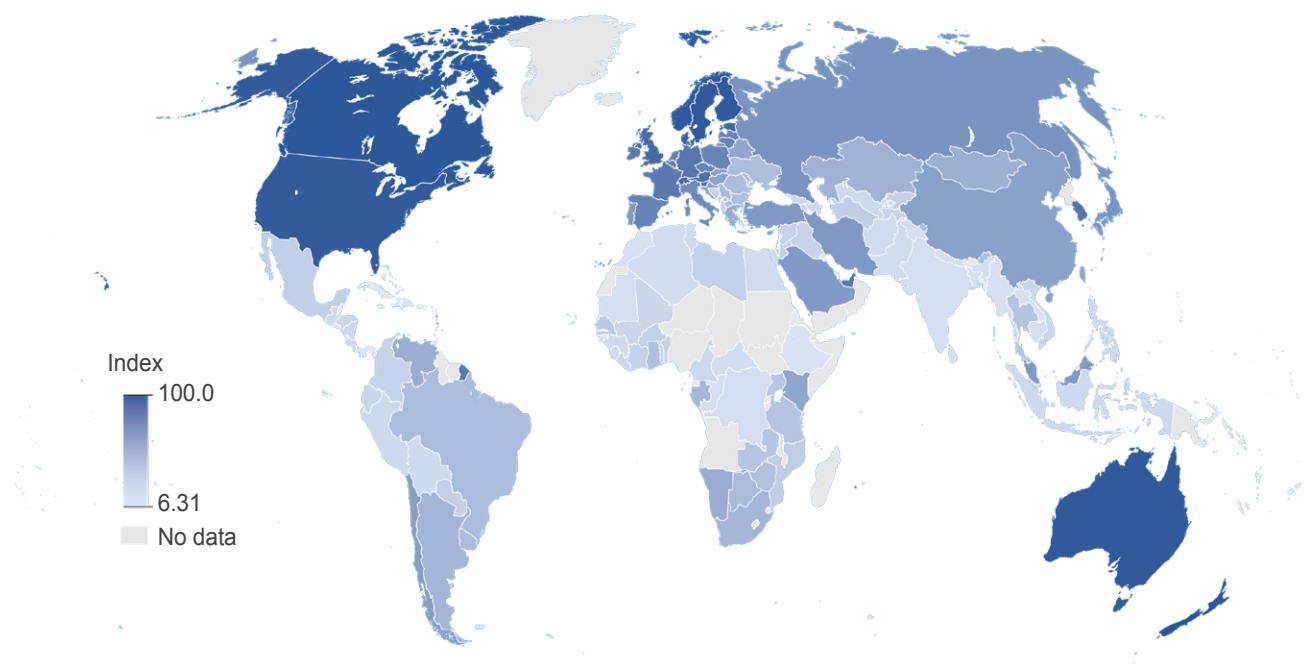
Source: GSMA

Innovation has taken hold across different areas of financial services to different degrees; payments have been at the forefront. Digital payments have become important in all regions and almost all countries, as maps showing the index developed in the *Fintech Activity* note demonstrate (figure 3). In some markets, such as Bangladesh, China, and

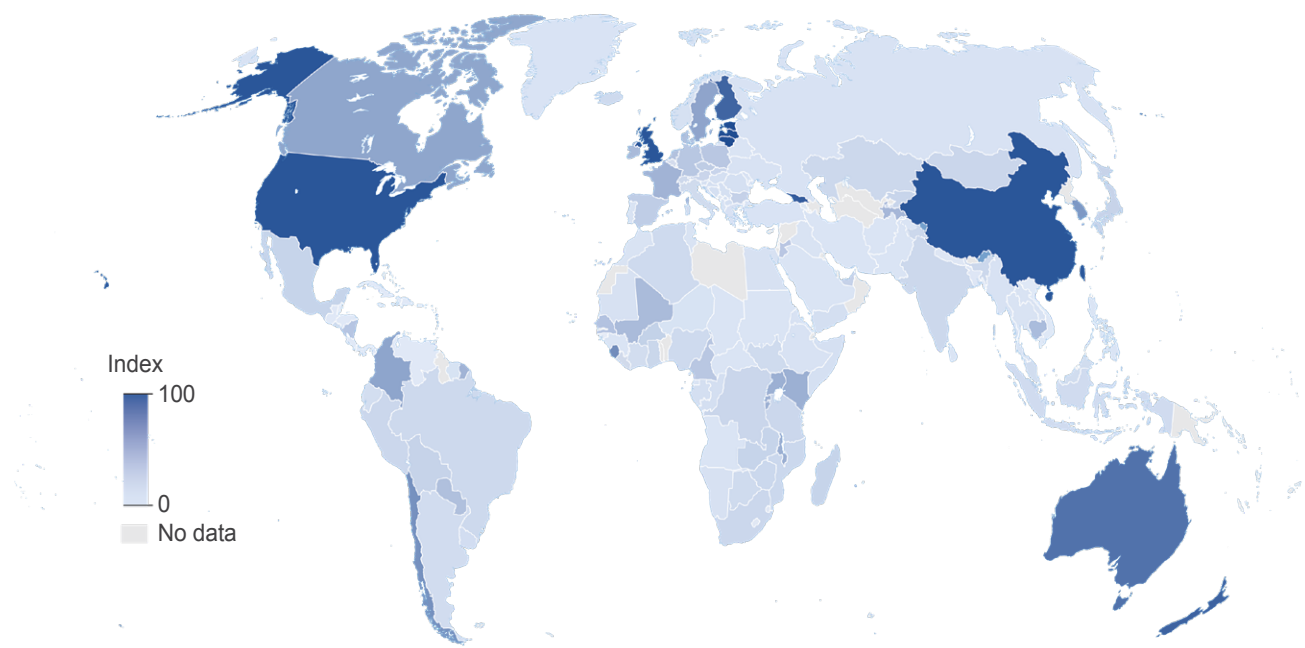
Kenya, a significant portion of payments volume and value are processed through non-bank mobile wallets. In other markets, bank account and card-based systems (most of which link to underlying bank accounts) dominate.

Figure 3. Use of Digital Payments and Use of Fintech Credit

a. Usage of digital payments^a



b. Usage of fintech credit^b



Source: *Fintech Activity note*, World Bank Group

a. This figure shows the index of usage of digital financial services across countries. This index mostly focuses on the usage of digital payments. Countries in grey have missing data for the index.

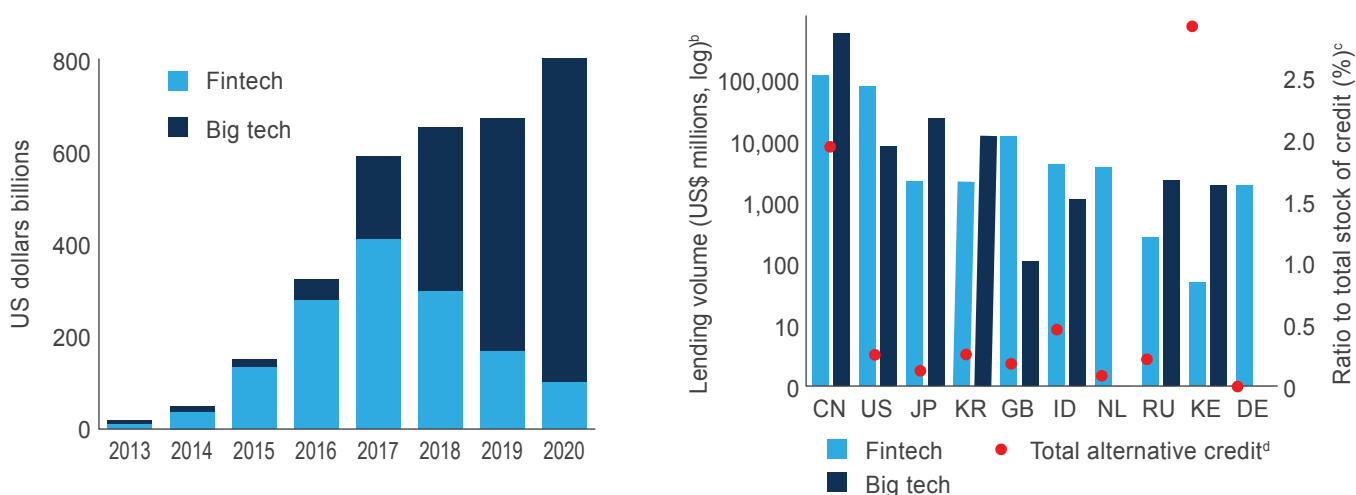
b. This figure shows the index of finance credit across countries. Countries in grey have missing data for the index.

Fintech lending lags payments but is becoming significant. The *Fintech Activity* note index shows Australia, China, Europe, and the U.S. leading, but important levels of activity are emerging in other parts of Asia, Latin America, and Africa. BIS and CCAF estimated that global fintech lending was \$125 billion and big tech lending \$637 billion in 2020 (figure 4).³ While total alternative credit was estimated to be less than 2 percent in any of the major fintech markets, one recent industry analysis projects global fintech lending to rise to \$4.9 trillion by 2030.⁴ Thus alternative credit could soon be a significant portion of credit creation. To the extent that alternative credit grows in part at the expense of traditional credit providers, the relative shift in market share and credit emission to providers outside the traditional regulated banking system would accelerate.

Figure 4. Global Big Tech Credit Is Booming, Overtaking Fintech Credit

Big tech credit grew further during the pandemic^a

These alternative forms of lending are becoming a significant portion of total credit in a few economies



Source: Cornelli, Frost, Gambacorta, Rau, Wardrop and Ziegler (2021); updated estimates.

a. Includes estimates.

b. Data for 2019.

c. Domestic credit provided by the financial sector. Data for 2018.

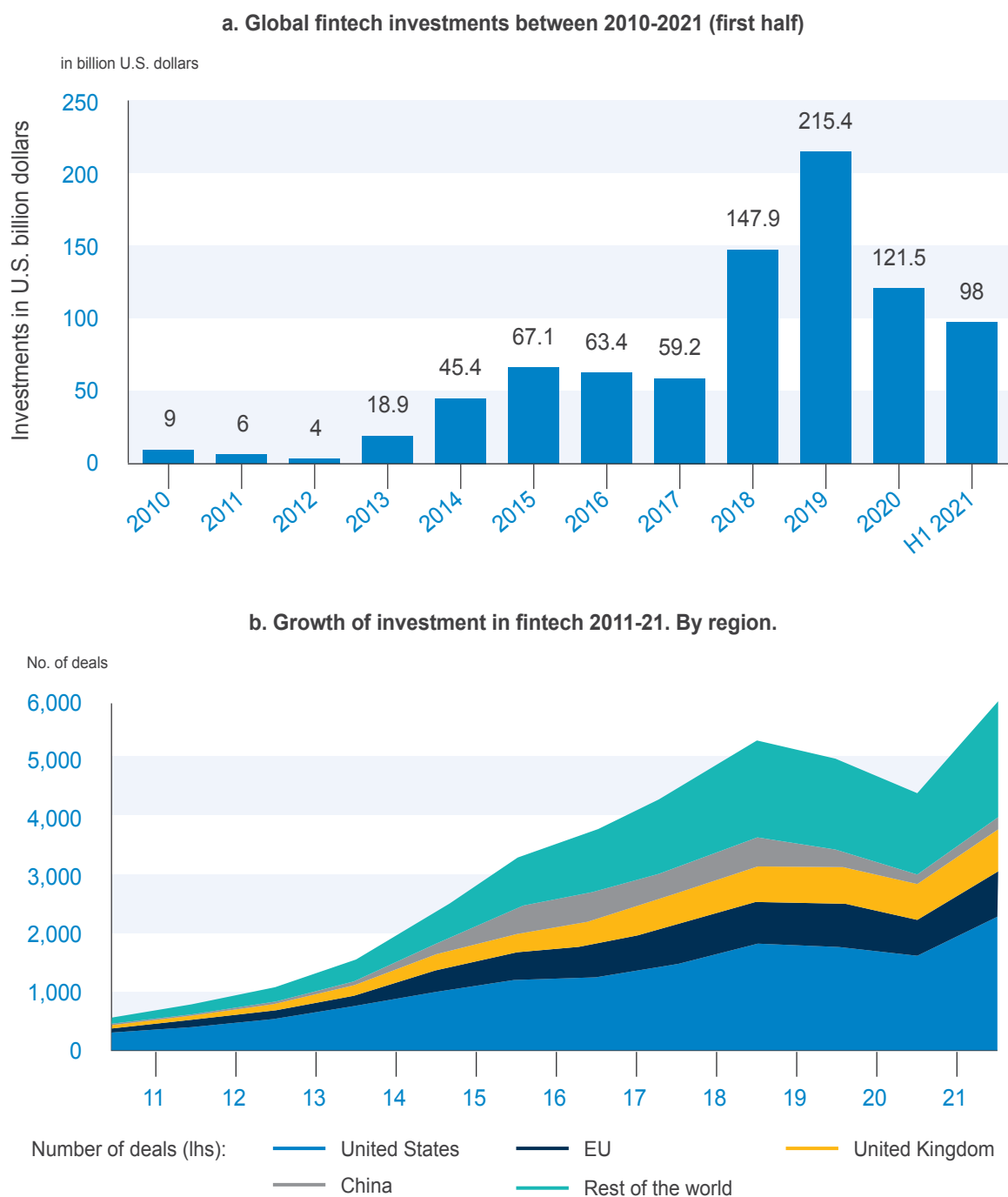
d. Total alternative credit is defined as the sum of fintech and big-tech credit.

The range of players in financial services is increasing rapidly, with increasing sums invested into non-bank fintech players. The total value of fintech investments worldwide rose from under \$10 billion per year prior to 2013 to \$215 billion in 2019 before falling back to 'only' \$122 billion in 2020.⁵ By the first half of 2021, fintech investments were already at \$ 98 billion (figure 5).

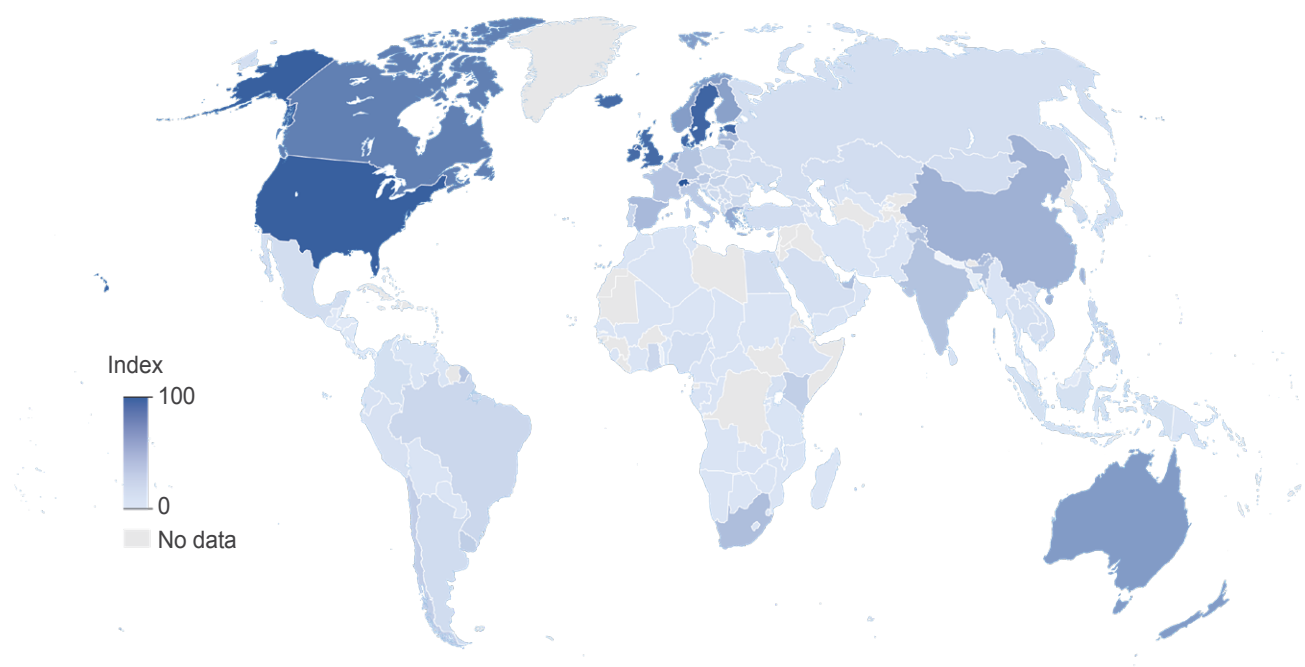
3. [Fintech and big tech credit: A new database](#), BIS Working Papers, Cornelli, Frost, Gambacorta, Rau, Wardrop, and Ziegler, 2020.

4. [FinTech Lending Market to Reach \\$4,957.16 Billion, Globally, By 2030 at 27.4% CAGR: Allied Market Research](#).

5. Statista 2021 [Total value of investments into fintech companies worldwide from 2010 to 2021](#).

Figure 5. Growth in Fintech Investments over the past Decade

Sources: Statista 2022 and Cornelli, Doerr, Franco and Frost (2021).

Figure 6. Equity Investments in Fintech Companies (Index)

Source: *Fintech Activity note*, World Bank Group.

This figure shows the index of equity investments in fintech companies across countries. Countries in grey have missing data for the index.

As these maps show, fintech and digital transformation are relevant across market types. Although developed markets tend to show more activity, there has been very far-reaching impact of financial innovation in many EMDEs. Every regulator concerned with financial stability, financial inclusion, integrity and efficiency of the financial system, competition, consumer protection, or simply with tracking how the macroeconomic levers over money supply and credit are changing, has taken note of the disruptive changes that fintech is bringing to the financial system and the broader economy.

2. Fundamental Drivers of Fintech

2.1 Key Technologies: Connectivity and Computing Power

Digital technology is reshaping financial services by eliminating many of the frictions that drove earlier integrated business models through advances in two key areas: connectivity and computing power. Internet and mobile technology have increased connectivity among consumers, financial services providers, and a range of intermediate service providers and customer interfaces.⁶ Ubiquitous connectivity has eliminated barriers and reduced costs for information transfer and remote interactions; this has been particularly important in EMDEs where mobile connectivity has enabled markets to leapfrog fixed line and branch connection barriers. Basic access through at least a feature phone is available to billions of individuals across markets. Low-cost computing and data storage puts processing power such as smartphones at the end of each of those ubiquitous connection points, enabling complex transactions and services, generating vast amounts of data, and facilitating efficient processing, storage and analysis of that data.

The resulting digitization of a broad range of activities, including finance, is creating massive volumes of data, which can be leveraged to broaden and deepen financial services, and better manage risk. These data emerge from a variety of sources, including the location and usage data from mobile phones, the contact information from social networks, the delivery information from logistics companies, and the sales data from retail outlets and payments networks. This data is being used in a wide range of traditional financial services and new types of businesses to improve credit analysis, process efficiency, risk management, product design, customer service and other areas. Advances in analytics, including artificial intelligence, enable automation, process improvements, and new approaches to risk management.

Ubiquitous connectivity and scalable computing and data storage together enable the development of cloud-based computing and data-storage infrastructure. The result is an ability to increase processing efficiency, to gather and analyze large data sets, to obtain infrastructure on demand, and to reduce the fixed cost barrier to entry in financial services and other industries. Combined with software-as-a-service and cloud-based analytics offerings, niche-focused financial services can be viable at low volumes, and scale as they grow their customer base. Most fintech startups use cloud-based services to keep their own infrastructure cost low and leverage the scalable and data analytics capabilities of the large cloud providers. At the same time, digitization of processes creates more digitally available data, and scalable infrastructure allows storage of reams of data that might otherwise be deleted.

Another result of these technology advances has been the emergence of platform-based business models in e-commerce and social media markets. These businesses leverage the connectivity of individuals and businesses, and the ability to quickly and easily collaborate, discover counterparties, and package and deliver a range of digital and physical goods and services. These business models benefit from strong network effects. Adding users on one side of a platform market (ride-hailing drivers, for example), creates more value to users on the other side (riders). The platform becomes more attractive on the first side (drivers), attracting even more users. In addition to the presence of a diverse

6. Cisco predicts that more than 70 percent of the global population will have mobile connectivity by 2023, and the number of network-connected devices will be three times the population. Fixed broadband speed is expected to almost double, from 60 Mbps in 2020 to 110 Mbps in 2023, with 90 percent of connections faster than 10Mbps. [Cisco Annual Internet Report \(2018–2023\), March 9, 2020.](#)

set of counterparts, more participation allows the platform to mine more data about users, behaviors, and preferences, to create better matches, or better tailor its own products and services. A positive growth spiral can result in a “winner-takes-all” type of outcome, where all market participants want to benefit from the network effects of being on the same platform. The platform operators are embedding financial services to improve the experience of their different “customer constituencies.” For example, ride-hailing services in many countries seek to facilitate access to credit for drivers to purchase and maintain their vehicles and provide payment services to both riders and drivers to improve the safety and efficiency of the payment process. These platform models are also being adopted for price comparison, distribution and origination of financial products like lending, investment, and insurance; in some cases by the same real-sector platforms discussed above.

2.2 Impact of Technology

The technological advances described above have affected every industry, and the impact on financial services has been particularly profound. Many aspects of finance were already digitized behind the scenes; most of the value of global payments flows, for example, were already computer to computer. This wave of technology has resulted in the unbundling of financial products, the reconfiguration of the value chains that produce and deliver financial products and services, and the entry of new providers. The initial impact was disaggregation and atomization at the product level, and the potential for a much more fragmented financial services sector at the provider level. However, as explained below, traditional economic forces that shape industry structure, such as economies of scale and scope, search costs, and transaction frictions, remain relevant, albeit in different forms. These counterbalance the tendency toward fragmentation, and in fact are driving a re-bundling of services and potential acceleration of sector concentration.

2.2.1 Unbundling and Reconfiguration of Value Chains

Application of these technology advances to producing financial services alleviates fixed-cost constraints as well as frictions related to incomplete information and transactions costs. Increased connectivity and cloud-based computing allow new entrants to reach customers without investment in traditional branch and data center infrastructure. Connectivity and vast amounts of user data can increase transparency and trust, and improve credit assessment, thereby reducing the risk cost of lending.

The potential to transfer data between different providers at different points in production of a financial service enables disaggregation and reconfiguration of value chains. Vertical integration of activities within a single firm is a means of avoiding the transaction costs of working across multiple suppliers and producers to assemble product through market-mediated exchanges of goods or services (Coase 1937, Williamson 1975). Digital connectivity and rich data sharing reduce or eliminate many of the transaction and monitoring costs of market-mediated exchanges. A producer can use outsourcing and partnership arrangements to unbundle production and incorporate atomized solutions from specialist providers of component products, sub-processes, or functions. Financial institutions increasingly use specialist providers for customer onboarding, verification and KYC, credit scoring, loan processing, and other services provided under their own brands, and partner with consumer-facing fintech firms and other new brands where they do not have their own products. Interoperable payment systems, APIs, and open-banking protocols has made it even easier to knit together services from different providers. Data, analytics, and automation can result in the market demand being met more fully—that is, create more complete markets—by enabling tailoring of products and services to the needs of well-defined customer segments or even each individual consumer.

Technology developments accompanied by enabling regulatory frameworks have allowed for the separation of payment services from the maintenance of accounts. E-money created a payment service distinct from a bank account, enabling non-bank entities to enter the payment services business. “Open banking” is enabling third-party applications to

initiate payment transactions without even having to maintain any account, taking unbundling even further. This reduces the barriers to entry for new providers, including new platform-based business models;⁷ and enables closer integration between financial services and real-sector economic interactions (embedded finance). The ongoing development of decentralized finance (DeFi) takes this to an extreme by not requiring any account-holding institution.

As a result, it is increasingly easy for customers to engage in horizontal unbundling, by choosing different providers of their preferred sets of services. For example, a consumer may have her salary deposited to a bank account, automatically transfer a portion for day-to-day spend to a neo-bank that offers a card with attractive budget tracking features, use a specialist remittance app for foreign transfers, and invest via one or more other providers, from P2P lending to social stock-picking apps. Internet connectivity reduces the cost of searching for preferred products, and the barriers to moving funds between them. The ease of transferring between accounts and providers allows the customer to re-create the full set of an integrated financial services provider on his or her own smartphone screen.

2.2.2 New Entrants

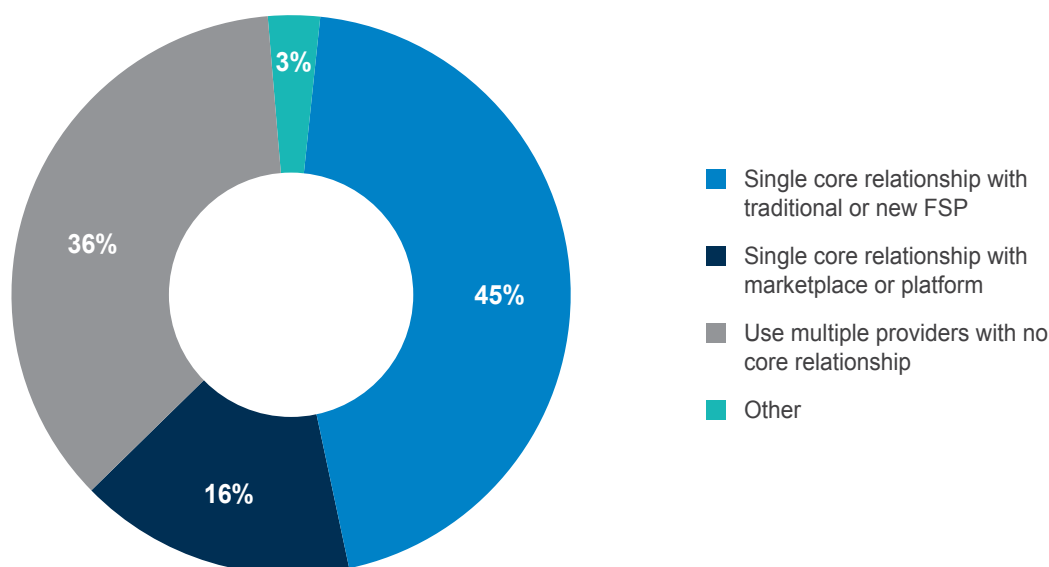
Digital innovation has reduced cost barriers, allowing the entry of more new players. New entrants don't require investment in physical access points such as branches, ATMs, or agents. Although "phygital" combinations of digital and physical infrastructure continue to be needed to serve customers (even crypto-assets users were offered bitcoin ATMs), the increased interoperability and ease of outsourcing arrangements described earlier enable providers without physical networks to partner with others to offer those services where required. Physical networks require scale and capillarity, but a few agent, branch, and ATM networks can serve a market without every provider creating and maintaining one.

The current wave of fintech innovation is marked by entry of, on the one hand, start-ups (fintech firms) and large incumbent technology companies (big tech firms) on the other. The former are often well-resourced given active venture capital interest, but do not have the benefit of an existing customer base and often employ aggressive approaches to take market-share from incumbents on specific products. The latter category has the advantage of having an existing customer base and revenue streams and are able to leverage these to scale rapidly and integrate financial services into their existing products and services. Different types of entrants can have very different implications for market structure, and carry different implications with respect to financial regulation, competition, and consumer protection policies.

Niche providers can offer tailored products and services and find an interested customer base. Although they must still develop a trusted reputation, the elimination of many fixed costs and a reduction in variable and switching costs makes it possible for a low-cost provider to enter the market from an economic viability standpoint. However, risks and economic forces are more stubborn than costs. Credit, liquidity, market, and operational risks can be reduced or transferred, but not eliminated completely. The attack surface for cyber criminals has become larger, as interconnectivity and the disaggregation of services introduces more links to each product chain and user interface.

Respondents to the *Fintech Market Participants Survey* were asked whether they expect retail and SME customers to have a single core financial relationship or use multiple providers with no core relationship. 36 percent of respondents expect customers to use multiple providers with no core relationship, and 16 percent expect that customers will have a core relationship with a marketplace or platform provider (figure 7).

7. On the one hand, enables development of marketplace/platform business models wherein an entity can help customers to seamlessly subscribe to different services from different providers and, on the other hand, enables development of niche back-end service providers who offer the underlying services, such as maintenance of a bank account or interfaces with a payment system, that can be used by others to develop products and services (BaaS)

Figure 7. Customer Relations in the Next Five Years

Source: Fintech Market Participants Survey, World Bank Group.

2.3 Impact of Economic Forces: Scale Economies, Frictions, and Re-Bundling

Amidst the entry of new niche players and shifts in business models, economies of scale and scope remain relevant. The minimum scale for efficient service delivery is now lower for financial service providers that use variable infrastructure services like cloud computing. This however simply shifts the scale effects to the new infrastructure providers; and as such scale remains highly relevant in areas of cloud computing, data processing, and software platforms. In fact, new forms of scale economies have emerged in connectivity (network effects) and data, alongside previously existing economies of scale in capital, including reputation, or “trust capital”. Customer acquisition costs and funding costs on the provider side create economies of scope—a niche provider that has a cost of customer acquisition can only amortize that cost across a limited product set; adding additional products can leverage the existing customer base with lower acquisition costs.

Consumers and other users also experience frictions in the unbundled financial services marketplace. Search, assembly of a package of services, and switching all have costs. For many consumers, there is a cost to the time, effort, and potential confusion of searching for and assembling fragmented services from unbundled providers. Even as operational frictions of moving funds between providers have been reduced, there are still transaction costs in moving funds in many markets. Consumer usage frictions related to finding the right solutions and managing funds across multiple providers remain a barrier to adoption—simplicity and convenience have significant value. Individual and business users may prefer to work with a single platform or provider that offers an integrated suite of financial products and services, even if each individual product may be less well-designed, or marginally more expensive, than those of alternative niche providers. These frictions limit the degree of product atomization, value chain disaggregation, and provider diversity the market will bear.

The combination of scale and scope economies on the provider side, and frictions on the customer side, confer advantages on providers with larger customer bases or more diversified product sets. Scale effects, alongside economies of scope and consumer convenience factors, encourage re-bundling. Incumbent multi-product banks and insurers have some of these scale and scope advantages, if they can improve customer experiences and immediacy. Fintech firms are merging or obtaining banking licenses to broaden their product sets.

This re-bundling is not limited to combining financial services with other financial services; increasingly financial services are being embedded in non-financial activities. Technology-enabled atomization and unbundling of accounts from other services has allowed those services, especially payments, to be conducted through applications and service providers separate from the account-holding institution. These atomized payments services are being embedded into non-financial services, particularly activities conducted through digital platforms. Thus, for example, many ride-hailing services embed a wallet to seamlessly integrate payment into the ride experience. Embedding payments, credit, insurance and investment into ride-hailing, e-commerce, logistics, social media, gaming, and other platforms has enabled big tech firms and others to make deep inroads into financial services.

3. Market Outcomes

3.1 Impact Across Infrastructure, Business Models and Products, Players, and Market Structure

The examples of transformative fintech innovations in payments and lending illustrate how the four dimensions of market outcomes identified in figure 1 are being re-shaped, and some of the policy issues that emerge.

Digital Money and Payments. Globally, an estimated 770 billion digital payments were made in 2020 (CapGemini 2021).⁸ Mobile money transactions alone numbered 41 billion (GSMA 2020) representing a total transaction value of \$767 billion across 300 million active mobile-money accounts.⁹ Sub-Saharan Africa accounted for a bulk of the mobile money transactions in 2020 with 27.4 billion transactions representing a transaction value of \$490 billion across 159 million active mobile-money accounts.¹⁰ Digital payments volumes are growing at around 11 percent a year overall, and at much higher rates in EMDEs (CapGemini 2020). E-money issued by non-banks such as mobile-network operators leveraged the connectivity boom and has enabled millions of users to store value and make transactions from their phones, most notably in sub-Saharan Africa. As users increasingly shift to smartphone use from basic phones, app-based payments can replace USSD interfaces, offering enhanced functionality (including linkage to bank accounts), speed and convenience as well as generating rich data that can be used for further services.¹¹ A next generation of digital money is emerging in the form of crypto-assets and central bank digital currencies (CBDCs). Many EMDEs are looking into issuing CBDCs, in part to support the digital economy, improve payments efficiency, and promote financial inclusion—although CBDCs share many of the same challenges as traditional approaches to reach and serve unbanked customers and as such is not a panacea for these aforementioned policy objectives. Further, in addition to the proven models of e-money and agent-based basic banking models, new developments like fast payments, QR codes, and open banking could provide alternative pathways.

Figure 8 summarizes how the ongoing digital transformation of money and payments is re-shaping the four dimensions of market outcomes shown in figure 1.

8. [World-Payments-Report 2021](#)

9. [State of the Industry Report on Mobile Money 2019](#)

10. [State of the Industry Report on Mobile-Money-2021](#)

11. This transition will take time, due in part to customer familiarity with USSD codes and the tariffs and sometimes limited availability of internet access. A [2021 survey across five developing markets in Africa and Asia](#) found that over 90 percent of transactions continue to be done using USSD codes, despite smartphone penetration rates of 25–40 percent. (Pon, 2021).

Figure 8. Market Outcomes in Digital Money and Payments

Business models and products	Financial infrastructure
<ul style="list-style-type: none"> • E-money spawned a range of new products, from wallets to mobile-lending applications (see below). CBDC will further accelerate payments product innovation including cross-border application. • Third party payment initiation with payment services enabling a non-bank entity to package payment services as part of a broader range of financial and non-financial services. • Lower the cost of payment services to the point where payment is no longer a profit center but an enabler for other services 	<ul style="list-style-type: none"> • Digital money may supplant existing payment system infrastructures with private ledgers processing payments internally (e-money issuers) or public distributed ledgers. • Crypto-assets can bypass existing payment infrastructures, but have in practice created a new layer of exchange infrastructure; whether that is a permanent feature or a transitory phase remains to be seen. • A basic feature phone can replace the need to access a bank branch or traditional payment account or a POS terminal. As broadly available as that may be, a complete shift to digital payments could exclude those lacking network connectivity, or, in the case of more complex products, those lacking a smartphone. • Fast initiation of payments using QR codes and APIs, and faster and round-the-clock processing of payments are creating new payment products for making and receiving payments both in-person, remotely and across-borders.
Market players	
<ul style="list-style-type: none"> • Non-financial companies such as Telcos, big tech platforms, and NBFIs such as PSPs have become significant players in e-money issuance and wallet operation. Increases usage of e-money and third-party payment initiation has created opportunities for a broad range of payment acceptance facilitators. • Organizers of distributed ledgers and exchanges providing on- and off-ramps for cryptocurrencies have become important players in digital money. 	
Market structure	
<ul style="list-style-type: none"> • New entry reduces market power of existing network oligopolies • Network effects lead to concentration • Due to network effects and early mover advantages, e-money has emerged as a monopoly or duopoly in many markets. In others, a multiplicity of wallet providers have entered. • Crypto-assets could in principle offer numerous competing media of exchange and stores of value, but here too network effects have tended to result in a few prominent players. 	

Source: World Bank staff.

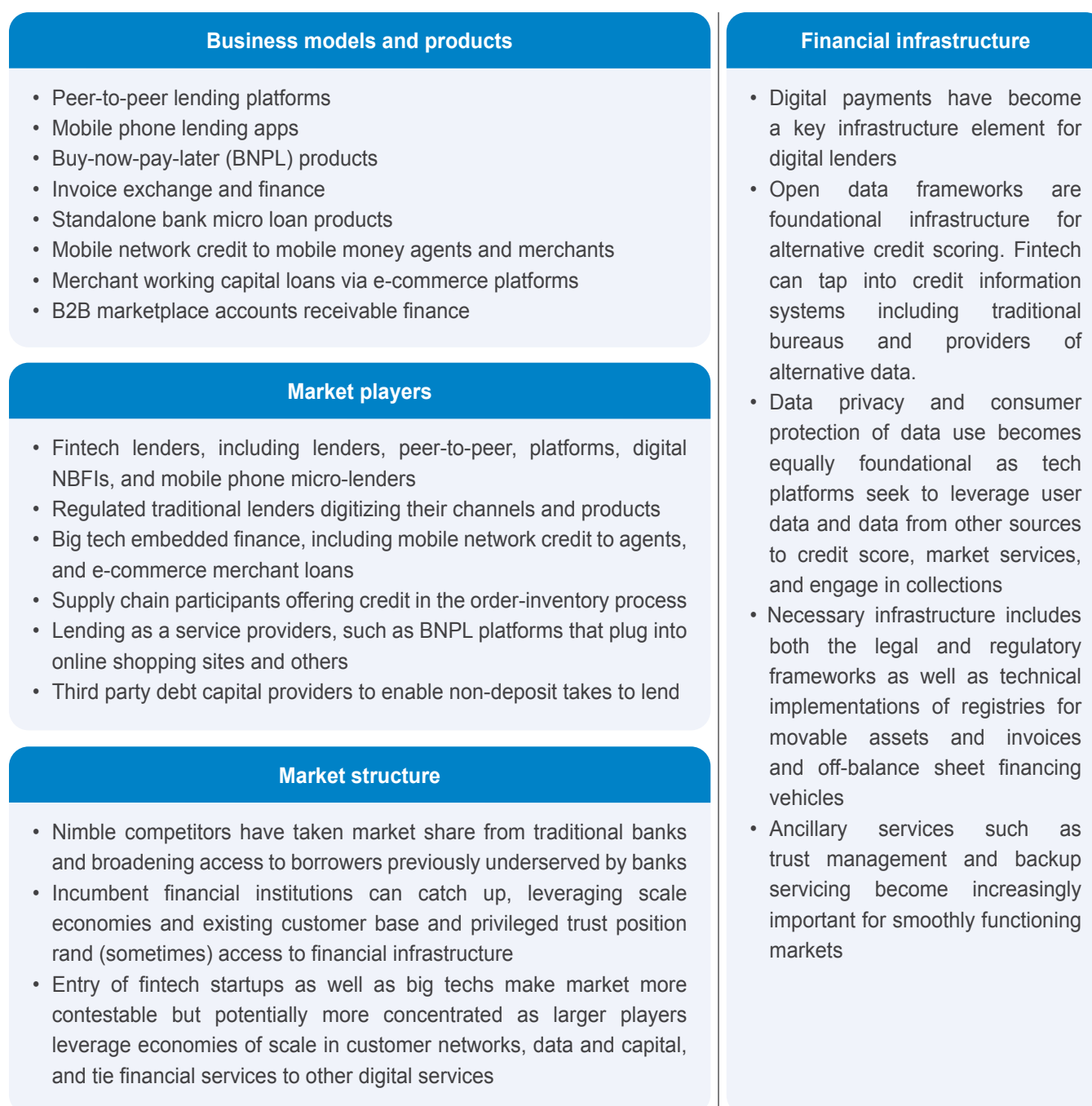
In light of their scale, mobile-money networks raise policy issues related to competition and how authorities would deal with the failure of a large systemically important non-bank e-money issuer. Depending on how it is implemented, a CBDC may adversely impact bank deposits, credit intermediation, and distort the level playing field. In EMDEs, foreign CBDCs could displace local currencies and erode monetary sovereignty.

Digital lending. Credit provision through digital channels and using data driven underwriting and risk management has been an important application of fintech. The flow of digital credit was estimated at almost \$800 billion globally in 2020, with big tech lending platforms representing 70 percent of this lending volume (Cornelli et al. 2021).¹² Peer-to-peer lending was an early alternative credit innovation, which was as much a regulatory arbitrage around non-deposit funding as it was a means to leverage alternative data ('wisdom of the crowd') for underwriting. Digital lenders use enhanced reach and data analytics to increase access to finance to individuals and SMEs previously excluded due to lack of proximity to a branch or lack of credit history. Embedded finance providers ranging from e-commerce and logistics platforms to consumer goods distribution networks are able to leverage transactional data on orders, inventory, sales, or receivables to provide working capital.

The wide range of providers offering alternative credit raises policy issues over how to treat non-bank lenders; such as whether lending is a regulated activity per se or should only be regulated in the context of protecting depositors or investors. It also raises issues with respect to consumer protection of the borrower (for example, fair disclosure and usury limits), and credit information sharing with and by non-bank lenders. New technologies and data-based lending give rise to policy issues with respect to algorithmic bias, digital exclusion, and data privacy. The remote nature of many of these products raises challenges for KYC, gauging product appropriateness, and consumer disclosures and education. Finally, significant growth of digital lending could have implications for monetary policy management if alternative lenders are less directly affected by standard policy levers.

Figure 9 summarizes how the ongoing digital transformation of lending is re-shaping the four dimensions of market outcomes shown in figure 1.

12. [BIS Working Papers No 887. Fintech and big tech credit: a new database](#). Giulio Cornelli, Jon Frost, Leonardo Gambacorta, Raghavendra Rau, Robert Wardrop and Tania Ziegler (with updated estimates for 2021).

Figure 9. Market Outcomes in Digital Lending

Source: World Bank staff.

Beyond these two illustrative examples, other applications of fintech also affect the infrastructure, business models, products, players and market structures in their respective markets. Insurtech is an example. While now a smaller market than digital payments and credit, Insurtech is also shifting the market structure of producers, brokers, and agents, as well as how policies are underwritten and claims serviced, using data and internet-of-things connectivity. Digital wealth management and investment applications have broadened access to products and encouraged more active participation by retail investors in equity, bond, and other markets such as real estate and cryptocurrency. That overall positive impact has also been accompanied by some instances of volume concentrations and market volatility as well as consumer protection lapses. In the B2B fintech space, open banking applications are allowing account-to-account payment providers to replace debit networks and clearinghouse payments processing, and credit analytics innovators are providing banks and other lenders with options to replace both internal processes and traditional scoring services.

3.2 Financial Infrastructure

Financial infrastructure has advanced significantly, alongside physical ICT infrastructure and mobile telephony. While the latter are the embodiment of the fundamental drivers in computing and connectivity, financial infrastructure leveraging these is a critical enabler for fintech products and business models. Fintech activity and financial infrastructure such as payments systems, ID infrastructure, and credit information systems, are increasingly symbiotic.

Agent-based delivery models: The concept of agent-based delivery of financial services in EMDEs developed in part due to the lack of traditional payment system infrastructure like ATMs and the lack of interoperability of ATMs. Once mobile money took hold, agents could be integrated with payment systems.

Faster Payments: Fast payment systems are enabling new business models for payment services. Fast payment systems (FPS) are enable real-time payment to the payee and is accessible through a range of innovative payment channels such as mobile apps and simplified processes (for example, using QR codes). This enables licensed payment-service providers to innovate on the user experience, spur competition between card-based payment services and bank account-based payment services, and enable integration with customers' social and economic lives.

Digital ID: Digital identification enables fintech firms and incumbents alike to implement remote, convenient, and lower-cost customer interactions and data exchange without compromising safety. The *Fintech Market Participants Survey* notes that incumbent and fintech firms alike expect a significant shift of sales, customer onboarding, and customer interactions from physical to online. This requires widespread development and adoption of digital ID services. A well-designed digital ID enables remote identity validation, consent, and document signing. This allows exchange of data held by other financial institutions (for example, bank statements), other businesses (for example, sales or purchase data) and potentially data from government agencies (for example, tax data and demographic information). Such exchanges can enable a financial institution to meet due diligence requirements not just to onboard customers but also to assess creditworthiness and suitability for certain financial services like investment (for example, by validating net worth).

The increasing role of digital identity and data in financial services is motivating development of a new class of financial infrastructures. Digital ID is becoming an integral part of the value chain of many fintech models and as such market infrastructures for facilitating provision and validation of digital IDs is emerging. These take the form of bringing together providers and consumers of digital ID services and enables customers to assert their identity digitally across different service providers in a seamless manner—examples include France Connect, eHerkenning in Netherlands and NDID platform in Thailand. Similarly, as the scale and range of data being used increases, new market infrastructures are needed to orchestrate the consent-based exchange of data. These data exchange platforms are now emerging in many countries as the implementation of open banking/open finance frameworks expand—examples include SGFinDex in Singapore and Data Empowerment and Protection Architecture in India.

Credit information: Credit information systems are fundamental to sound lending, and both benefit from and contribute to trends in data and fintech lending.¹³ Data from credit registries and credit bureaus can ensure sound lending and help prevent over-indebtedness. However, these traditional credit information providers may not have broad coverage of individuals and SMEs, particularly in EMDEs and among previously excluded segments. Fintech solutions using Big Data and advanced analytics have filled that gap, enabling lending to thin-file/no-file borrowers. Broad participation of lenders in modern, open credit information infrastructure facilitates sound digital lending.

Secured assets infrastructures: Digital invoicing, asset registries, and other infrastructure for secured transactions and asset-based lending are increasingly important drivers of fintech lending. Secured lending instruments can reduce credit risk and broaden access to finance beyond those who have traditional collateral (real estate or fixed assets). The introduction of digital asset registries enables fintech lenders to secure loans via automated processes, increasing efficiency and reducing barriers to finance for many borrowers. Lending against digital invoices that have been registered on a central platform opens access to working capital credit for small businesses that might not be creditworthy themselves but are owed a payment by a larger more creditworthy company.

Platform models for the provision of financial services bear strong resemblance to financial infrastructures. Platform-based models are emerging in areas like lending (for example, marketplace lending), investment (for example, mutual fund distribution platforms), insurance (for example, insurance distribution platforms), factoring (for example, national reverse factoring platforms in India and Mexico) and payments (for example, bill-payment platforms and API hubs). These, like a traditional financial infrastructure, serve the industry/market as a whole, facilitate the offering of financial products but itself does not provide it and compete with its participants, and is expected to be seen as neutral with no preference for any particular participant or provider. Accordingly, they also pose similar policy and regulatory issues. As such, it is possible that these would formally get structured as financial infrastructures and might even be integrated into existing ones.

3.3 New Business Models and Products

Reduced economic frictions, ability to reconfigure the value chain, new opportunities for entry, and shifting economies of scale and scope are introducing new products, and business models. Fintech firms are proving nimble at leveraging data, connectivity, and improved processing capacity, and at converting regulatory barriers into solvable technology challenges. Payments benefit strongly from the revolution in connectivity and has seen particularly rapid innovation, including in the area of international remittances. Incumbents have been slower to innovate, but many are catching up, leveraging their advantages in trust capital and regulatory position, and often partnering with fintech companies to use, or provide, B2B services. Big tech firms compound the advantages of fintech firms with large-scale existing customer bases, customer data, and consumer trust. Tech platforms have increasingly embedded financial services into their core offerings. Small businesses have been important beneficiaries of the digital transformation of finance. As small merchants participate more in e-commerce, they develop data trails and may benefit from embedded finance provided by online marketplaces. Separately, digitally-enabled efficiencies, tailoring, and risk mitigation have made SME finance a more viable market, with many fintech firms emerging to serve this segment. These market developments are discussed further in appendix II. A few insights from these developments bear highlighting:

13. In some markets, fintech lenders are been excluded from reporting to registries and from querying; that may be short-sighted since the expansion of lending that is not reported will only reduce the value of the registry data as a picture of the borrower's overall indebtedness.

The atomization of services and recombination of value chains, and the provision of financial services by small focused players and big tech firms alike, calls into question the essence of banking, or what it could be. Is it deposit taking, or maintaining an account ledger, enabling borrowing, or making a credit decision? In a world where each component of a financial service may be provided by a different entity, what matters most and where should regulators focus? Is it on the entity with the customer interface, the balance sheet, the data, the underwriting engine, the payment network, or the servers that are powering all of it? Should the financial sector be considered a distinct sector when finance is embedded in so many other activities? While regulators can mandate that certain activities be conducted only by specific providers, from the customer perspective, traditional financial providers may become less and less visible.

Data-driven business models are able to scale rapidly, but data analytics is not a panacea. The positive feedback loops from customer activity that generates data being used to provide additional services that generate more data, combined with network effects of many digital businesses, can enable rapid growth. This data can be used for targeted marketing, product tailoring, and credit screening. However, despite the thousands of unique data elements many fintech lenders claim to analyze, most models rely on a small subset of those elements that tend to correspond to traditional credit underwriting approaches. Cash flows, consistency of location, performance in repaying an initial small loan may be gathered from mobile-money transactions and GPS data but need to map to current account, address, and credit history. Credit analyses are still better at comparing historical patterns than predicting the future, particularly after a structural break. In an extreme demonstration of this, the COVID-19 pandemic shifted the prospective profitability of whole industries and the incomes of countless businesses and individuals. Lenders who resumed lending without recalibrating their AI models ran into trouble quickly.

Big tech's ability to embed a tailored payment, loan, insurance, or other financial service into any economic, business, or social activity is a powerful disruptor of traditional financial services, and potential driver of financial inclusion. Knowing the transaction context and the history of the borrower, linking a loan to an underlying business activity, having the ability to take repayment directly out of the cash flows, and potentially to sanction a defaulting borrower—such as by limiting access to the marketplace in the case of e-commerce lending—all allow the embedded finance provider to more closely control risk, or to balance credit risk against other business objectives in ways that a bank cannot. This need not require prior credit history.

Embedded finance has intrinsic advantages over third-party lending that enable big tech firms to compete strongly in credit markets. Big tech platforms have customers and their data, control transactions flows, and create enough value from core activities to cross-subsidize credit. In the case of buy-now-pay-later lending, for example, the seller often covers the cost of the short-term credit to the consumer to increase sales. E-commerce platforms make working capital available to merchants to increase the volume of business the merchants do through the marketplaces. This working capital is not provided for free, but it does not have to earn the same net interest margin a bank would require to generate a similar risk-adjusted return on capital, particularly since the bank's risk would be higher as it lacks the contextual data, collections, and sanctions capabilities.

In the aftermath of the COVID pandemic, lenders who are closest to underlying economic activity can contribute to resilience (Box 2). The pandemic disrupted economies in ways that obviate the value of prior credit history; this will slow the resumption of conventional lending. Supply chain finance and embedded finance have more direct visibility to the current activities and cash flows of borrowers and can help manage the risks at every stage, from ex ante credit screening and analysis through disbursement and collections, better than most third-party lenders. This linkage of banking and commerce could play an important role in economic resilience and recovery.¹⁴

14. World Bank, World Development Report 2022, Finance for an Equitable Recovery (forthcoming).

Box 2. Fintech and the COVID-19 Pandemic

The pandemic accelerated adoption of technologies across activities, from remote meetings to tele-health to e-commerce. Financial services providers, like other businesses, were forced to find ways to operate and service clients remotely. The increased use of digital platforms for commerce, logistics, and other activities is generating data, linkages, behaviors, and skills that can enable traditional lenders and new entrants to address some of the challenges of lending into the uncertainties of the recovery phase of the pandemic, including to SMEs.

The GSMA (a mobile network association) reports that the number of registered mobile-money users increased by 13 percent globally in 2020, double the forecasted rate.¹⁵ Growth was attributed in part to pandemic relief, which many governments delivered through mobile payments. For example, digital government-to-person (G2P) payments for garment sector workers in Bangladesh were enabled by opening 2.5 million accounts in less than a month, leveraging prior regulatory changes that allowed remote account opening.

The World Bank's Business Pulse Surveys and Enterprise Surveys documented an increase in the use of digital platforms during the pandemic. Adoption of digital payments in EMDEs surged, as did downloads of digital banking apps (see appendix 1). Digital connectivity to clients and alternative delivery channels changed almost overnight from a "nice to have" to a "must have." More than 80 percent of Fintech Market Participants Survey respondents indicated that COVID-19 had increased the need for fintech and digital transformation. A survey of IFC financial institution clients on the early impacts of COVID-19 found a significant increase in prioritization of digitizing channels and internal processes and data analytics.¹⁶

In Nigeria, LAPO Microfinance Bank was able to leverage its agent network to continue to provide basic services to customers during an early lockdown period that shut down branch operations. After an initial decline in volumes, activity recovered and grew to more than double pre-crisis levels by August 2020. In Colombia, Contactar, a microfinance institution serving rural areas, had seen low digital adoption prior to March 2020. Faced with lockdowns, Contactar expanded its use of local payment agents, internet payments, and WhatsApp client contact; together these efforts increased adoption of alternative channels, maintained customer engagement, and improved loan repayment rates. In Peru, Caja Arequipa introduced the first fully digital loan for microentrepreneurs during the lockdown.

The forthcoming 2022 World Bank World Development Report, *Finance for an Equitable Recovery*, points out that the pandemic rendered most traditional credit data irrelevant, as credit histories did not reflect the pandemic's impact on a borrower's finances. Alternative data such as real-time transactions data from payments, inventory orders, and sales provide more visibility to current business performance and cash flows. Technology-enabled innovations in product design can also help lenders manage the risks of lending into the recovery. Short-term, small-value loans, secured lending, supply chain finance and embedded finance are forms of lending that enable financial services providers to tailor products and services to clients' needs, while managing risk exposure through continuous, real-time monitoring of movable assets, invoices, inventory, orders, sales, payments, and other collateral and data.

Leveraging the data inherent in embedded finance can also improve visibility to borrowers' underlying economic activities. Embedded finance lenders may be motivated to take on more risk than third-party lenders, since the loan generates revenue streams for the lender via the core business transaction. An example is supply chain finance,

15. [Press Release: Mobile Money Accounts Grow to 1.2 Billion in 2020](#)

16. [IFC: The Early Impact Of Covid-19 on Financial Institutions: Insights from a survey of IFC financial institution clients](#)

through which anchor manufacturers were able to shore up their distribution networks during the pandemic, and large buyers ensured that their suppliers had access to finance. Data from the first half of 2020 showed that ten leading global consumer goods manufacturers increased their outstanding debt by \$45 billion in the first half of 2020 to inject working capital into their supply chains, taking on the credit risk of their supply chain counterparties that banks or other lenders may not have been willing to assume.¹⁷

3.4 New Players: Entry, Concentration, and Competition

The sheer number of entrants and innovators is indicative of competitive pressures on traditional providers. By one compilation, in February 2021 there were 26,000 fintech startups globally, up from 12,100 in 2018.¹⁸ While fintech credit is not yet systemic, in certain segments fintech lenders are significant (micro lending in Kenya, retail and small business in China and a number of developed markets). In the year before the pandemic, fintech firms' share of U.S. consumer credit had exceeded the share of traditional banks, 38 percent to 28 percent.¹⁹ Competitive pressure from new entrants could change the behavior of incumbents, who may, for example, take on more risk as they seek to compensate for revenue losses. Supervisors should be attuned to this dynamic.

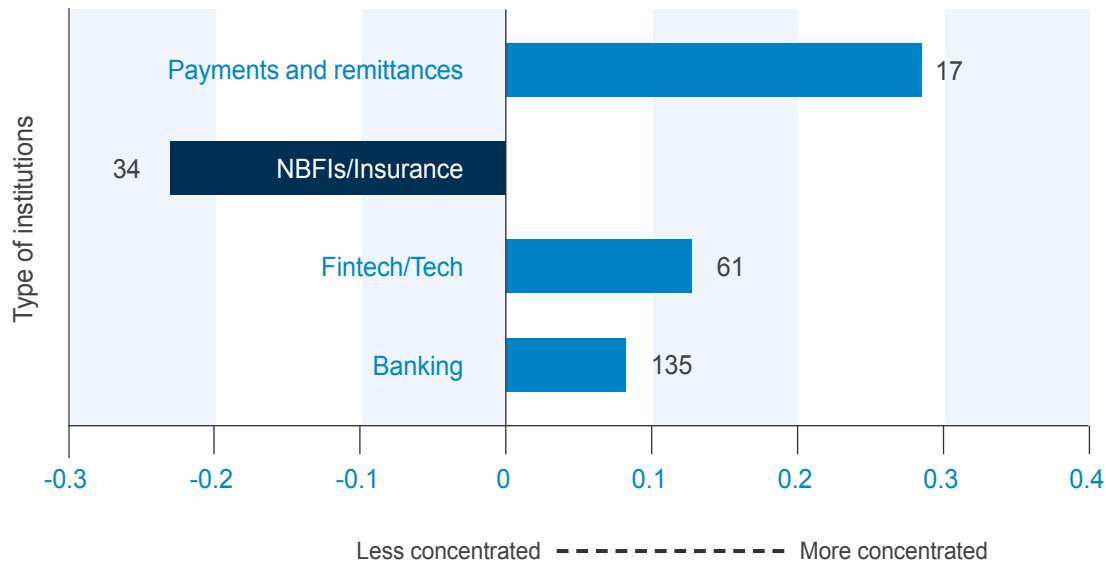
Financial services are thus becoming more competitive, but also potentially more concentrated. The entry of thousands of fintech startups, as well as new licensing regimes for challenger banks, digital banks, alternative lenders, and others speak to that competitive pressure. Most *Fintech Market Participants Survey* respondents believe that there will be increased competition and lower barriers to entry. Most also expect markets to become more concentrated (figure 10). This is consistent with a bifurcated market in which lower barriers to entry increases competition for smaller players or in specific segments, while economies of scale and network effects drive consolidation among large multi-product institutions such as big banks and larger fintech and big techs firm. The forces that might lead to that configuration are discussed below.

17. [EuroFinance: Consumer goods giants grow inventory, extend receivables amid Covid-19 shift](#)

18. [Number of Fintech startups worldwide from 2018 to February 2021, by region](#)

19. [CNBC: Fintechs help boost US personal loan surge to a record \\$138 billion](#)

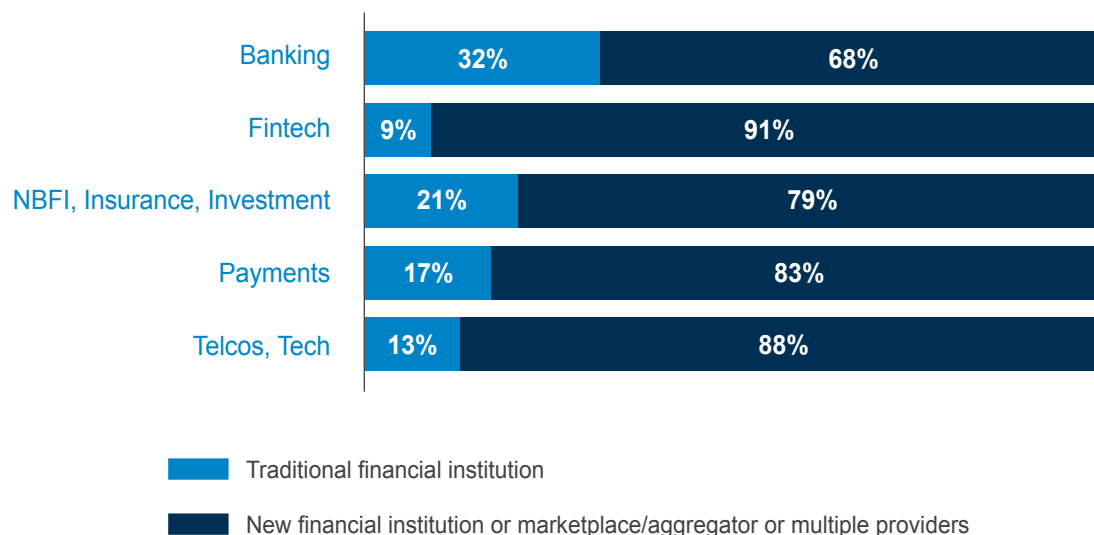
Figure 10. Expected Shifts in Market Concentration, by Subsector



Source: *Fintech Market Participants Survey*, World Bank Group.

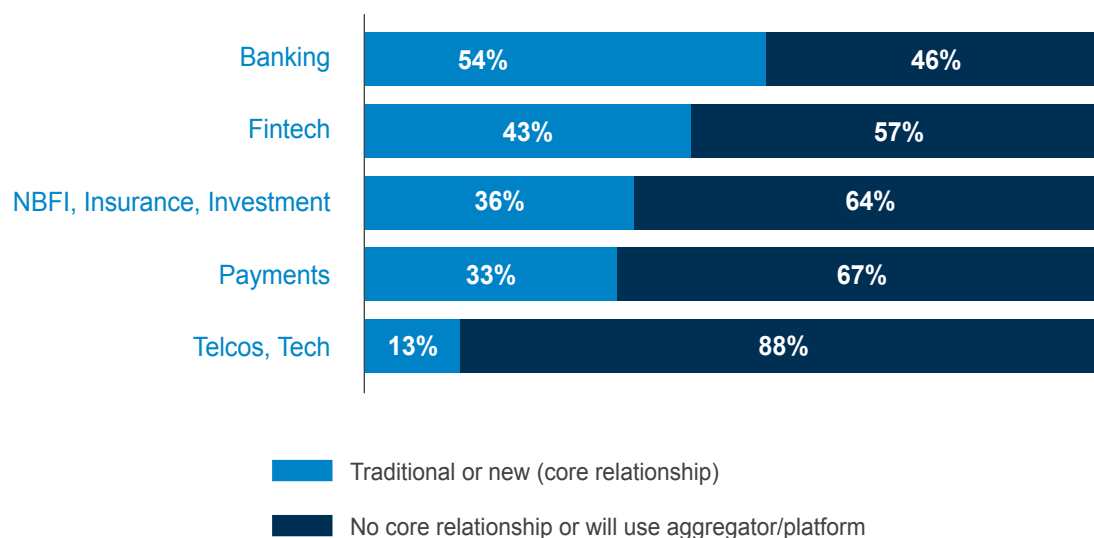
Who “owns” the consumer relationship is in flux. Marketplaces, mobile banking, super-apps, product specific apps and digital banks are offering customers a variety of ways to engage with one or many financial services providers. Customers are balancing the options to choose multiple providers and assemble their own packages of services (aggregation via a smartphone screen with different apps) or the convenience of a pre-packaged set of services from a traditional package (aggregation by the bank) or a new provider (aggregation via a marketplace or super-app). Among *Fintech Market Participants Survey* respondents, there are strong expectations that new types of providers—digital banks, fintech firms, or marketplace aggregators—will dominate customer relationships, and a plurality of respondents think customers will choose to have multiple relationships. Banks continue to expect customers to have a single core relationship, but a minority of banks expect that single relationship to be with a traditional bank. Views of market participants by sector have been illustrated in figures 11 and 12 below.

Figure 11. Expected Evolution of Customer Relationships: Traditional FIs versus New Types of Providers (Views by Sector/Type of Respondent)



Source: Fintech Market Participants Survey, World Bank Group.

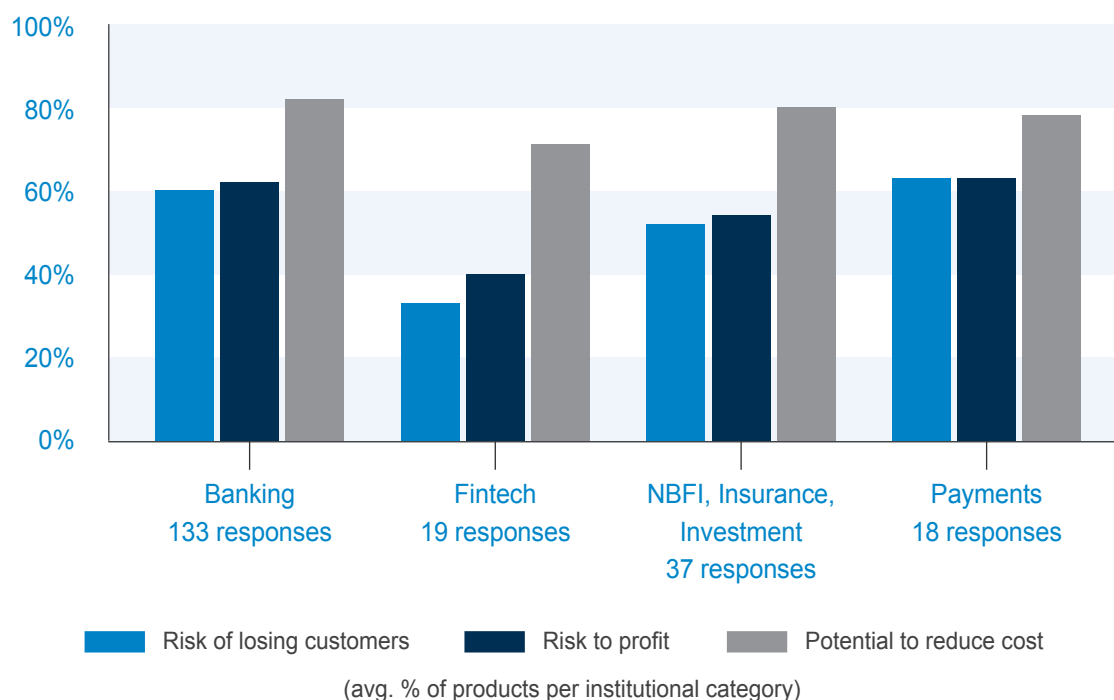
Figure 12. Expected Evolution of Customer Relationships: Single Core Relationship versus Multiple Providers (Views by Type of Respondent)



Source: Fintech Market Participants Survey, World Bank Group.

As a result, respondents to the *Fintech Market Participants Survey* see substantial risk of losing customers and reduced profitability in traditional market segments due to digital transformation. Fintech and tech companies see this as less of a risk. Across all segments, there is an expectation that digital transformation will reduce costs (figure 13). Taken together, this suggests that prices for consumers could fall, since if costs decline and profitability does not increase, in a competitive market the surplus would go to customers.

Figure 13. Business Risks and Opportunities from Fintech and Digital Transformation (Views by Responding Institution Type)



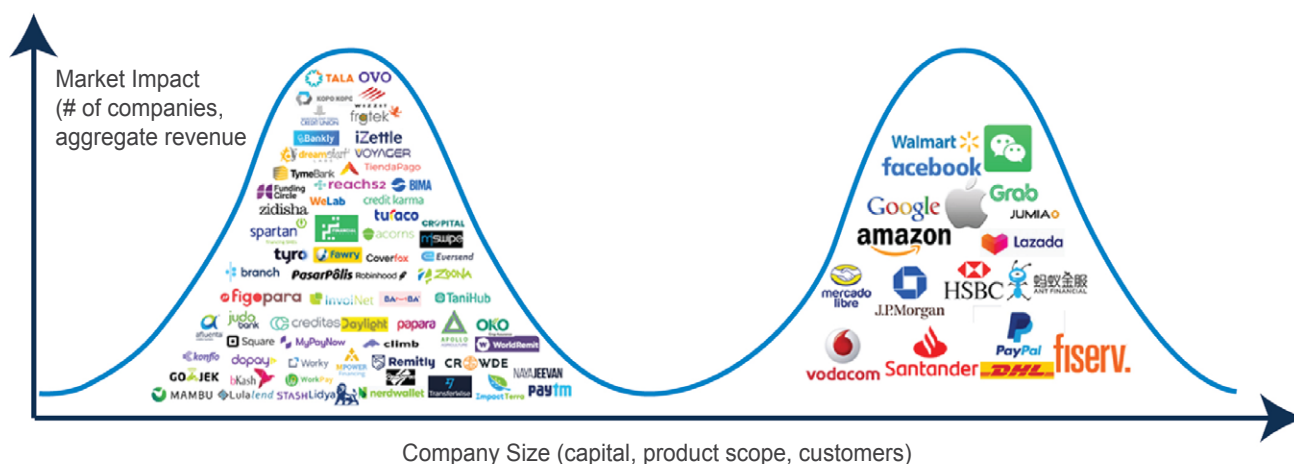
Source: *Fintech Market Participants Survey*, World Bank Group.

3.5 Implications for Market Structure

Market structure outcomes will depend on how three factors balance in a given market:

1. The degree of scale and scope economies in a particular product or market
2. Customer preferences for choice among many tailored products from different providers versus the convenience of pre-assembled product sets
3. Regulatory stances on entry, licensing, and competition.

These processes could drive a range of industry structure outcomes. On the one hand, digital technology enables niche providers to reach a target customer base and be economically viable. On the other, customer acquisition, funding, “assembly”, and switching costs tend to favor larger providers. Without regulatory interventions to prevent entry, restrict cross-over activities, or break up larger players, one likely outcome is a “barbell” configuration composed of relatively few large multi-product players on one end of the spectrum and many niche players on the other. The large, multi-product players could include traditional financial institutions, and fintech and big tech firms – thus both incumbents and new entrants. Small players may include fintech firms as well as geographically or sector-focused incumbents.

Figure 14. Potential Barbell Financial Services Market (Illustrative)²⁰

Source: Market Structure note, World Bank Group.

While a barbell is not the only potential outcome, it is a central case given the economic forces at work, and gives rise to important policy issues regarding competition, regulatory perimeters, and ensuring a level playing field. Both the analytical barbell model and the industry views captured in the *Fintech Market Participants Survey* suggest that concentration risks in financial services may increase, despite increasing entry of new players. Data-driven advantages of large players could increase switching costs and lock in customers; ex-ante remedies by the sector regulators may be superior to ex-post remedies. As a result, reinforcing competition will require taking both horizontal and vertical views of the financial services landscape, as well as cooperation of financial, sectoral, and competition authorities.

The interplay of technology, market forces, and policy will also influence the inclusiveness of market outcomes. While mobile connectivity is very high for low and middle-income countries,²¹ an estimated 600 million individuals in these countries lack internet access, and affordability of broadband is a barrier for many more.²² Digital business models can drive down costs so that even small markets offer sufficient scale for a provider to be viable, but such providers may have difficulty competing with cross-border entrants that can offer services remotely and leverage larger markets to achieve scale and scope economies. Limited access to cloud computing infrastructure may force policymakers to make tradeoffs between financial services efficiency, resilience, and data localization, particularly in smaller markets. The costs to authorities to effectively supervise a large number of small entities can also be significant and may be burdensome for EMDEs.

20. Graph 14 is purely illustrative and does not constitute endorsement of particular companies' potential roles in financial services or projections as to their future size or success.

21. [World Bank Data: Mobile cellular subscriptions \(per 100 people\)](#) shows connectivity of 105%, reflecting the fact that in many markets subscribers have more than one SIM card.

22. WDR 2021, Chapter 5.

3.6 Emerging Risks

Concerns about market concentration need to be addressed in a balanced way. Some issues, particularly with respect to data abuse by big tech firms, are already crystallizing. Concentration in and of itself, however, is not necessarily a problem. The emergence of a monopoly may not indicate exclusionary practices, but rather powerful network effects that create benefits to consumers from participating on the same platform (for example, on social media or messaging). A barbell configuration can manifest high concentration alongside product choice and price competition. Entry regulations that enable development of a reservoir of potential competitors can keep markets contestable and forestall some types of market abuses by dominant players.

In some markets, concentration can lead to more intense beneficial competition, with positive impact on price and quality. In many EMDEs the existing banking sector is already concentrated; additional competition, even from a dominant tech player, would increase consumer choice. Product tying and cross-subsidies can be beneficial to consumers in terms of convenience and cost. In the EMDE context, concentrated mobile money markets have delivered strong welfare benefits. However, market concentrations grant significant control over access to a marketplace or to large troves of personal data to unregulated entities, and abuses have occurred in some markets. Furthermore, big tech crossovers into finance mean that monopoly power that might have been beneficial in one market can now be wielded, potentially detrimentally, in another. The balance struck between competition policy enforcement and efficiency and inclusion goals will vary across countries and across sub-sectors within countries at different stages of market development.

Regulators have struggled to supervise new business models. As the *Regulation* note recounts, the sheer numbers of new financial services entrants have inevitably led to firm failures and frauds. Exit of some firms is part of a healthy innovation ecosystem, and is not cause for concern as long as customer funds have been appropriately segregated and there is an orderly wind-down—which has not always been the case. Fraud is another matter. P2P lending in China grew very quickly from its start in 2007 to its peak in 2016, when over 4,000 platforms were active. Numerous instances of fraud and ponzi schemes (by some accounts up to 40 percent of platforms were problematic) resulted in customer losses. Oversight was tightened, the industry shrank, and eventually P2P marketplaces were mandated to convert to regulated small loan providers. In Europe, two prominent failures illustrate the challenges regulators have had in adequately supervising complex fintech business models: Wirecard, a payments processor, and Greensill, a tech-enabled invoice financing operation. These fraudulent schemes have led to outright losses of capital, as well as to losses of access to funds, for example when accounts at other fintech firms that used Wirecard were frozen.

Adequate regulation and supervision to protect consumers and foster trust in fintech must address not only soundness, but integrity, safety, and appropriateness. As the *Regulation* note describes, if properly designed and regulated, remote onboarding and automated KYC checks can help prevent illicit actors to gain access to the financial system. Yet, the broader attack surface and the extension of access points to untrained users creates cybersecurity risks. Mundane examples are common, for example, the illiterate mobile-money user who gives his or her PIN to the agent and later finds an unexpected transfer was made. More sophisticated hacks such as the automated transfer of bank funds to 1500 fraudulently registered SIM cards in Uganda are also becoming increasingly common.

Fintech could pose significant consumer protection risks due to novelty and opaqueness of business models, unclear responsibilities of fintech entities, misaligned interests of fintech firms and consumers, lack of financial literacy, and challenges posed by digital finance for disclosures and transparency (see *Consumer Protection Note*). Consumers might misunderstand the product offering—for example, mistaking investing in crowdfunding platforms as providing guaranteed returns. The role of fintech entities with respect to exceptional circumstances could be unclear—for example, lack of liquidity at e-money agent locations, fees and charges levied by agents, or who is responsible for customer service or tracking a misdirected payment. In some contexts, fintech or big tech entities might have a conflict of interest—for

example, a platform might steer consumers to providers who offer better fees to the platform.²³ Inadequate safeguards with respect to data protection and cyber security could expose consumers to unauthorized disclosure of their data, data breaches, and fraud perpetrated using stolen data. Extensive use of analytics and algorithms could perpetuate latent biases or inadvertent exclusion due to lack of data or technology access. Lastly, failure of fintech entities could expose consumers to loss of their funds including those in transit, and complex partnership and outsourcing relationships may make it difficult for consumers to identify the responsible party and obtain resolution.

In situations where fintech is broadening inclusion by offering new products to customers with little experience of financial services, standards for responsible finance are critical. As noted in the *Regulation* note, while customers almost always receive a formal disclosure and some kind of consent is required, for example, when the app is downloaded, few consumers read this in full or are capable of fully appreciating the terms. Mobile and online lending is one area requiring careful supervision. The popularity of mobile money in Kenya, for example, has led to broader financial inclusion but also to the blacklisting of numerous borrowers for defaults on nano-loans under \$10, the terms and requirements of which they may not have fully understood. One of the responses of the Kenyan regulator was to block mobile lenders from recording defaults with the credit bureau. This could be ineffective and hurt digital and conventional lenders alike seeking to understand the full indebtedness of a potential borrower without addressing the product appropriateness issue. In Indonesia, regulators concerned about aggressive collection practices that used cellphone contacts data restricted lenders from using all but a narrow subset of phone data. This disrupted the innovative underwriting models that had been leveraging phone data. Challenges extend to developed markets as well, as the 583 percent (Annual Percentage Rate) and aggressive collection practices of Wonga demonstrated in the U.K. A carefully considered approach to strengthening consumer credit codes is needed to balance innovation and access with consumer protection.

23. Routing consumer securities transactions through market-makers that pay for order flow is an example. See for example, Bair, Sheila, "SEC needs to find a way to curb payment for order flow", *Financial Times* September 8, 2021.

4. Core Policy Objectives and Evolving Tradeoffs

4.1 Main Policy Challenges

Authorities are eager to foster the benefits of digital transformation but are also mindful of various challenges that emerge as digital transformation continues to permeate market activities. Fintech can promote poverty alleviation and economic growth by enhancing financial efficiency, inclusion, competition, and innovation, but these benefits need to be carefully weighed against challenges and risks such as those described in the previous section. The “Bali Fintech Agenda” outlined by the World Bank Group and IMF advocates embracing the promise of fintech while managing risks to consumers and to the stability and integrity of the financial system (box 3).

Box 3. The World Bank Group–IMF Bali Fintech Agenda

The Agenda distills high-level issues for policymakers and the international community into 12 elements aimed at helping policy makers to harness the benefits and opportunities of rapid advances in financial technology, while at the same time managing the risks. These elements broadly aim to promote four objectives:

- **Foster enabling environment to harness opportunities.** Develop open and accessible foundational infrastructures; reinforce fair competition and contestable markets to ensure a level playing field; and address challenges related to reach, customer information, and commercial viability to promote financial inclusion.
- **Strengthen the financial sector policy framework.** Monitor developments to formulate conducive policies and identify risks; adapt the regulatory framework and supervisory practices to promote safe entry of new products and entities, maintain stability, and respond to risks; and provide greater legal clarity and certainty while removing unnecessary legal obstacles.
- **Address potential risks and improve resilience.** Safeguard consumer and investor protection; ensure financial and monetary stability, financial integrity; develop resilient digital infrastructures to protect data integrity and privacy.
- **Promote international collaboration.** Encourage sharing of information and experiences and strengthen coordination for effective policy making.

Fundamentally, the nature of fintech-related risks is similar to those of traditional financial activities, but their shape and materiality can differ significantly. Mitigating risks to core policy objectives such as financial stability, integrity, and safety is a precondition for reaping the benefits of fintech adoption. All forms of financial services provision ultimately may give rise to, inter alia, liquidity, credit, market, and operational risks at the micro-prudential level and macroprudential risks that arise from system-level externalities at the macro level. Digital transformation causes these risks to present themselves in different ways and could also trigger risk migration outside the regulatory perimeter. As such, several interrelated and heightened challenges stand out, which will continue to evolve as the industry develops:

- **Financial stability.** Fintech developments can help diversify the financial sector and strengthen risk management, which may increase financial resilience and integrity. However, untested, and potentially risky business models and new entrants, new financial interlinkages and interdependencies across the sector, and new concentration risks may pose challenges to financial stability.
- **Financial integrity.** Fintech and digital ID approaches can improve transparency and reduce financial integrity risks. However, money laundering and financing of terrorism threats may increase when technology enables anonymity and instant, global reach.
- **Consumer protection and data protection.** A proliferation of new players and new business models can, in principle, enhance the consumer experience and make products safer since fintech enables tailoring to specific consumer needs and can better protect consumers and their data (for example, through encryption). However, so far this proliferation has occurred often in unregulated product areas, creating challenges to ensure whether products are appropriate for different consumers, and to ensure that fraudsters are not among the new entrants. Limited electronic disclosure of terms and conditions, and lack of transparency on costs and business models create risks to consumers, particularly those less financially literate. Unauthorized disclosure and use of personal data, including identity theft, is a key challenge.
- **Pass-through compliance.** In a partnership between fintech or big tech firms with incumbent financial institutions, the latter would be expected to ensure compliance with existing regulations but might not have the full visibility or ability to enforce this. When these incumbent institutions are smaller, they might be perceived to be lower risk under a risk-based supervision framework and risk build-ups could go unnoticed.
- **Operational and cyber security risks.** The distribution of technology and access points to end users and the restructuring of value chains leads to increased complexity, more points of vulnerability, and broader attack surfaces for cyber criminals. Cyber-attacks or failures necessitate strong operational resilience frameworks as they compromise business continuity, carry economic and reputational risks, and may threaten financial stability. Another source of elevated operational risk is the higher reliance on third-party service providers such as cloud storage and computing, data provision, and critical business services—for example, use of a third party for payment processing services.
- **Competition.** As described above, due to economies of scale, network effects, reputation, and capital, there is the potential for large providers such as big tech companies to achieve dominant positions quickly, thereby raising entry barriers and reducing overall competition and/or contestability. Market dominance by a limited number of providers could reduce consumer welfare. However, in markets with limited competition, the entry of large providers could have important welfare gains and enhance competition in the short to medium term. How the market develops from there will depend on the confluence of policy actions and market developments.
- **Regulatory arbitrage.** Financial services have been offered by new entrants that largely operate outside the regulatory perimeter, although their activities and risks are similar in nature to those offered by regulated entities. Similarly, decentralized systems, such as crypto-assets and peer-to-peer or DeFi platforms, may prove more difficult to regulate and supervise if a central governing body is absent. Given the supra-national nature of some fintech solutions, cross-border arbitrage opportunities complicate matters further and call for more international coordination.

How policy goals with respect to sound inclusive financial systems and competitive markets can be achieved depends on the entities that are providing financial services, the business models they use, and the market structure that ensues. The analysis here focuses on likely market structure outcomes based on underlying technology and economic drivers. It has raised new issues for financial supervision, competition regulation, and consumer protection as (a) financial services move from the first phase of disaggregation and competition to a new phase of reaggregation and concentration occurring alongside competitive entry and atomization; and (b) embedded finance has begun to demonstrate its power, particularly during the pandemic.

Salient issues include how to regulate and supervise a growing number of new entrants and how to manage increasing concentration at the other end of the spectrum. On the consumer side, growing competition, entry of new players from unregulated sectors, and broadened inclusion to new segments of customers all combine to create a dynamic where consumers' best interests may be lost in the rush for efficiency, market share, and revenues. The raft of new, smaller entrants challenges financial supervisors to review the regulatory perimeter and to become more adept at monitoring and supervising—leveraging digital tools in regtech and suptech where appropriate. The reaggregation and emerging concentration of market power introduces challenges in managing both the systemic risks and the market-conduct risks of an emerging set of large and potentially important global players whose activities cut across banking and non-financial businesses. For example, concentrated infrastructure providers serving the financial sector, such as cloud services and digital payments networks, present potential systemic concentrations of operational risk. A hardware failure at one payments network left millions unable to pay with their cards for about five hours across Europe in June 2018. The Financial Stability Board and other standard setting bodies are doing further work in this area.²⁴

The proliferation of cross-sector players highlights the challenge of interpreting monopoly guidelines in a new era. Concentration may not imply monopoly power in a highly contestable market, and the relevant market is increasingly difficult to define where traditional financial services providers compete with fintech and big tech companies in specific product areas. Product tying, which is part of many platform and embedded finance value propositions, is an example of the growing complexity of balancing consumer protection, financial, and competition regulation as business models and market structure evolve. While cross-selling services has been a common strategy in the financial sector, it has been subject to explicit anti-tying provisions in many markets. For example, a credit line was not supposed to be linked to requiring the borrower to move its transaction account to the lender. Unbundling would tend to reduce anti-competitive product tying. Re-aggregation and embedded finance, on the other hand, put tying at the center of financial product economics. In multi-sided tech platforms, linking, cross-selling and cross-subsidizing of products has generated consumer benefits (for example, 'free' e-mail accounts tied to advertising) as well as potentially questionable practices (for example, search engines charging businesses for advertising and for search ranking). Now cross-selling is extending across financial and non-financial services, potentially allowing for dominance in the non-financial services to extend to the financial sector as well.

These developments will test the boundaries of competition analysis and redefine how regulators consider the benefits and costs of concentration, product tying, and other aspects of market structure and conduct. As the *Market Structure* note explains, platform models that combine free services that have network effects with financial services could become highly concentrated and potentially result in abusive exercise of monopoly power. For example, a dominant social network that has a quasi-monopoly position over small local businesses' connections to their customers might embed payments in the social networking experience and make it difficult for a customer to pay businesses through anything other than the network's payment product. The increased resilience and access for borrowers potentially offered by embedded credit is largely the result of tying credit to other transactions. A distributor offering supply chain finance inevitably ties that working capital to the purchase of its products. What may seem to be low-cost or free tied services from a platform provider are rarely truly free, but in many EMDEs incurring costs in terms of data sharing, loss of privacy, or product lock-ins may be acceptable to gain access to finance that is not otherwise available. In some product areas, open data frameworks that eliminate data monopolies (for example, by conferring data ownership to the data subjects, who can then make their own data available to different finance providers) could help ensure that the benefits of innovative business models can be realized consistent with competitive markets and consumer protection. These require a level of consumer financial and data literacy; as an alternative, data intermediaries might enable safe data sharing and could also help individuals better understand and enforce their rights over their personal data.²⁵ More broadly, policy makers will have to address increasingly complex tradeoffs that depend on the level of development of the financial system and its customers, the pre-existing competitive environment, and other social preferences.

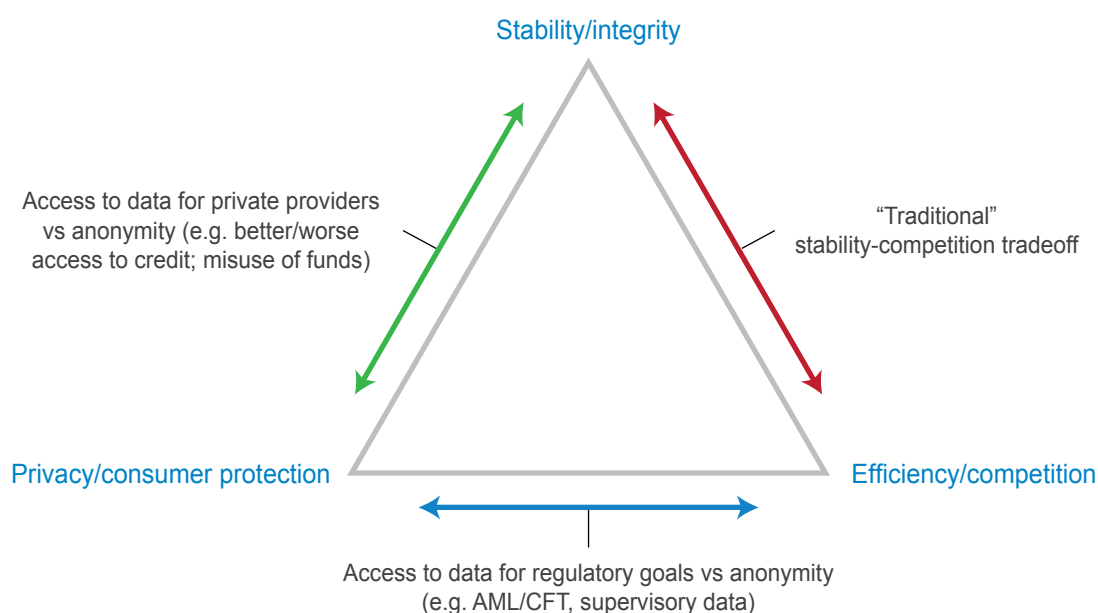
24. See for example [FSB's Third-party dependencies in cloud services: Considerations on financial stability implications](#) and [Financial Stability Institute's Insights on policy implementation No 13: Regulating and supervising the clouds: emerging prudential approaches for insurance companies](#).

25. World Bank World Development Report, 2021.

The **Market Structure** note describes the complex policy tradeoffs which may evolve in conjunction with the rapid developments in the financial sector. The fast-paced change of technologic innovation and its impact on the industry suggest that balancing tradeoffs may become more challenging, especially for EMDEs with capacity constraints and multiple competing mandates. These mandates include: (i) financial stability and market integrity; (ii) efficiency and competition; and (iii) data privacy and consumer protection. For example, financial inclusion, innovation, and efficiency objectives may run counter to preserving financial stability. Fintech companies may promote new lending based on weak business models, or be exposed to increased cyber risks. Big tech platforms may offer significant efficiency and inclusion gains but can also quickly dominate markets and become too big to fail. Similarly, reaping the full innovation and efficiency gains of fintech may require gathering, processing, and exchanging large amounts of consumer data, which may run afoul of consumer and data safeguards and could increase financial integrity risks. Different societies will attach different preferences to different market structure outcomes. Some societies may accept market structures that concentrate data and supercharge network effects if they reduce intermediation costs and broaden inclusion. In other markets, the resulting market power might be seen as more detrimental than these benefits. Concentration of infrastructure and data in state hands may be accepted in some societies, while others may be more concerned about potential extension of state surveillance. As in other industries, regulators will have to balance the efficiencies of natural monopolies against potential abuse of market power.

These tradeoffs also evolve as a country moves up the fintech development ladder. At lower levels of fintech development, the range of services, scale, and penetration is still limited. This requires policy makers' willingness to support innovation and provide basic legal and regulatory clarity. Addressing data gaps that prevent effective monitoring of risks and ensuring financial integrity objectives are met are key priorities as risks to financial stability, fair competition, and consumer and investor protection are still relatively low. However, as scale, complexity, and interconnectedness and possible concentration increases, more focus is necessary on safeguarding financial stability, data protection, and fair competition. This requires that legal, regulatory, and supervisory frameworks as well as technology and financial infrastructures be reviewed and strengthened accordingly to support a smooth transition towards a flourishing fintech eco-system that remains consistent with policy objectives. Figure 15 below illustrates the policy trade-offs due to fintech developments.

Figure 15. Policy Trade-Offs Due to Fintech Developments



Source: *Market Structure* note, World Bank Group and Bank for International Settlements.

5. Regulation and Supervision

5.1 Recent Developments

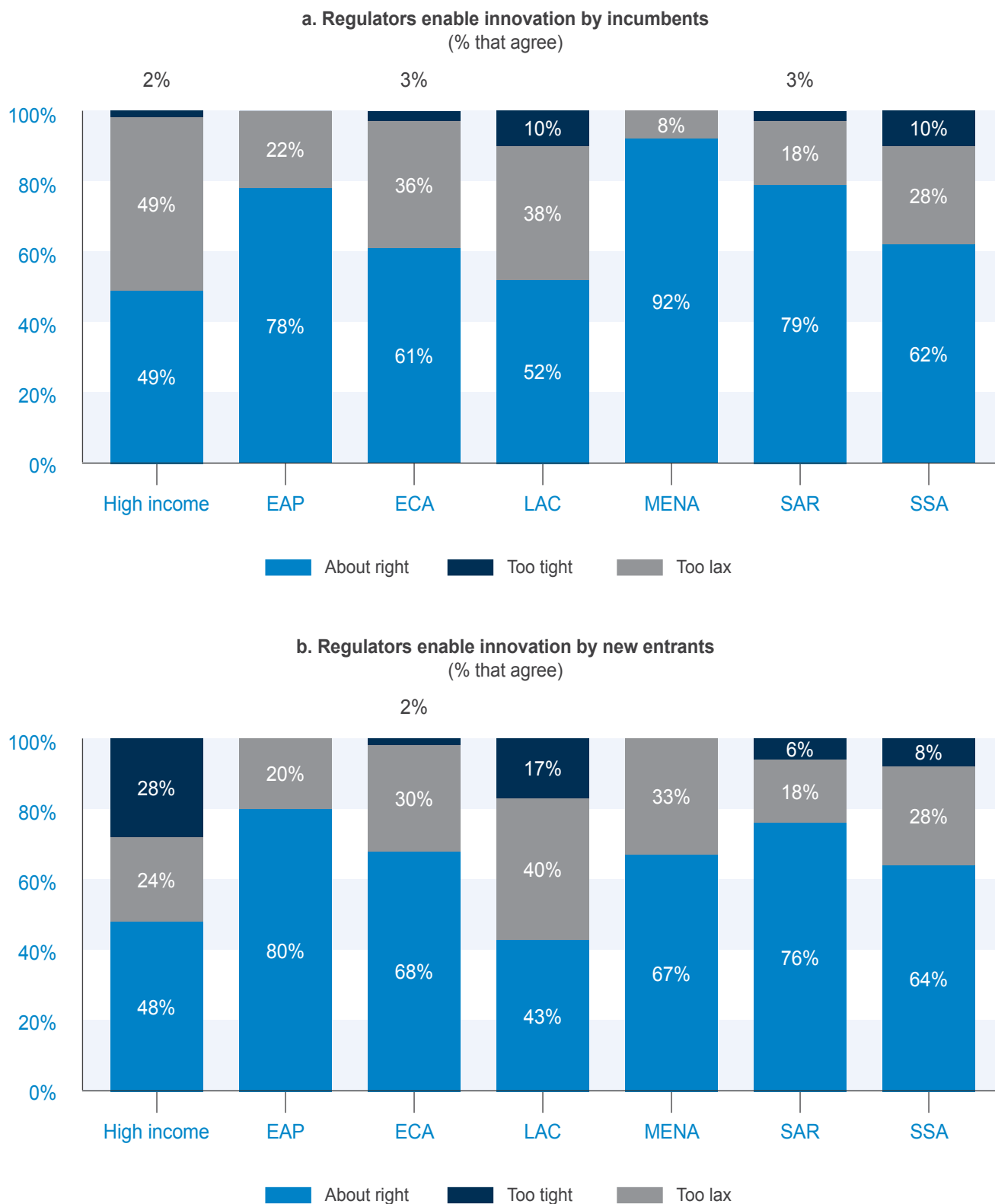
5.1.1 Regulatory Stance

The *Fintech Activity* note documents that a high-quality policy environment is a necessary, but not sufficient, condition for fintech development. The degree of fintech activity is consistently on the low end of the distribution in countries scoring poorly on policy indices that capture the existence of legal and regulatory frameworks relevant for digital financial services; whereas it varies widely across countries scoring high on these indices. Regarding the role of sector-specific legislation and regulations, our results show mixed patterns. While the existence of laws and regulations for e-money, digital IDs, and e-signatures—electronic know-your-customer (e-KYC) frameworks—tend to be positively associated with fintech activity, the coefficient on consumer protection tends to be negative.

The regulatory stance in different jurisdictions has sometimes facilitated or sometimes blocked these trends of technology-driven atomization and reconfiguration, and creation of open digital infrastructure. A notable example of facilitation was the Central Bank of Kenya's acquiescence to the creation of mPesa. In other markets mobile money was restricted to bank providers, and was slow to be implemented. The disaggregation of services and implementation of partnerships and outsourcing arrangements fundamental to the value chain restructuring described above depends on supervisory acceptance. Some regulators, for example, have provided detailed guidelines for banks with respect to outsourcing arrangements.

Entry of new businesses and introduction of new business models that have been enabled by the technology drivers depend on the approach regulators take. The *Regulation* note highlights three prominent approaches: regulate, wait and see, or test and learn. In the aftermath of the global financial crisis, when banks were seen as having failed society, some regulators became more welcoming of innovative financial services, from digital banks/neo-banks to new payment services, to alternative lenders. For some innovations, simply standing to the side is sufficient; marketplace lending emerged in the interstices between banking and capital markets regulation. Other innovations require enabling laws or regulations. Connectivity and computing enable invoice financing marketplaces and lending against physical assets like solar panels, but these are only viable business models when supported by the appropriate legal and regulatory frameworks for secured transactions and asset-based lending.

The *Fintech Market Participants Survey* shows that a significant proportion of respondents in EMDEs felt that there is scope to improve the regulatory and supervisory framework, although there is significant variation across regions and between incumbents and new entrants. In advanced economies, the perception of regulatory framework being too tight or about right is almost evenly split. In EMDEs except in the case of the LAC region, a significantly higher proportion of incumbents felt that regulatory framework was about right. In the case of new entrants, a similar trend is seen. Though for AEs, a considerable proportion felt that the regulatory framework was too tight (figure 16).

Figure 16. Do Regulators Enable Innovation by Incumbents and New Entrants? By Region

Source: Fintech Market Participants Survey, World Bank Group.

The *Fintech Market Participants Survey* and other surveys show that regulatory changes permitting eKYC and remote onboarding are seen as critical by both incumbents and new entrants. In addition, the incumbents also see policies enabling engagement of third-party agents as critical. Digital ID needs to be supported by appropriate regulatory changes. The *Fintech Market Participants Survey* found that a considerable proportion of incumbents and fintech companies alike feel that the regulatory frameworks for remote onboarding and account creation are inadequate in their jurisdictions.

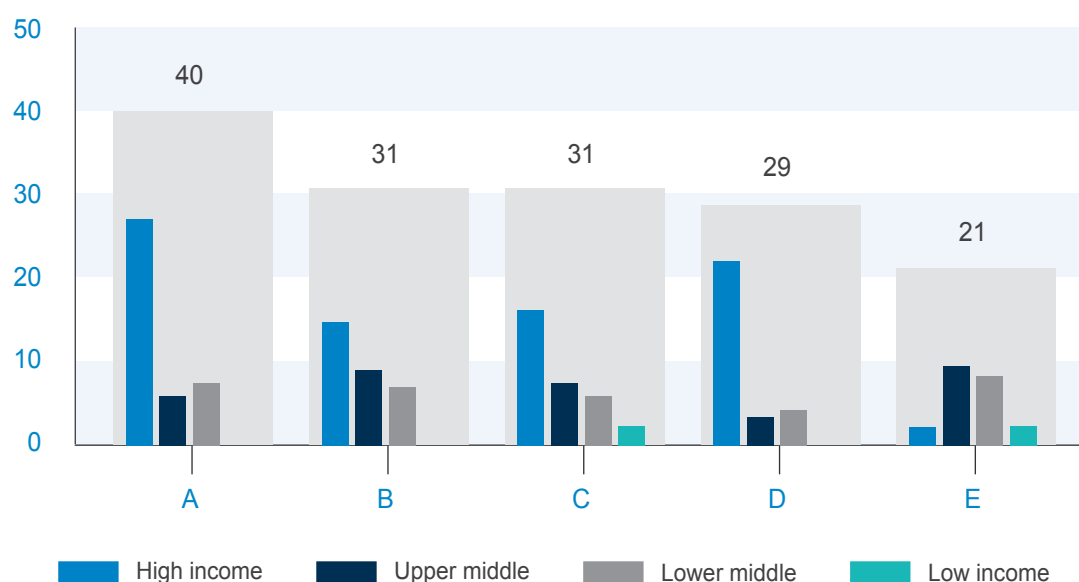
5.1.2 Typology of Regulatory Responses

The regulatory approaches observed across jurisdictions can be broadly grouped into:

- i. **Applying existing regulatory frameworks** to new business models by focusing on the underlying economic function—for example regulating digital currency exchanges as money services business or exchanges. Countries with legal and regulatory frameworks that are principles and outcomes-based have found it easier to extend the applicability of existing frameworks.
- ii. **Adjusting existing regulatory frameworks to accommodate re-engineering of existing processes and allow adoption of new technologies**—for example, minor tweaks to allow digital-only banks (digital banks or neo-banks), usage of digital forms of ID to open accounts and allowing adoption of cloud computing for banking services along the lines of existing rules for outsourcing.
- iii. **Creating new regulations to extend regulatory perimeters and introduce specific requirements for new class of players in the ecosystem**—for example, creating a new class of regulated entities for e-money and marketplace lending platforms; and requiring bank providers to offer application programming interfaces (APIs) to allow other institutions to directly access information and provide services to customers (open banking).
- iv. **Adopting new frameworks to promote innovation and experimentation in areas where the regulatory framework is either unclear or not present.** These frameworks include developments like regulatory sandboxes, innovation hubs, and accelerators. Regulatory sandboxes are structured to allow for experimentation with restrictions imposed on the scale, duration and scope, to mitigate risk while at the same time allow for demonstration of new technologies and approaches. The learning from regulatory sandboxes could then be used to structure the regulatory framework. Innovation hubs seek to further extend this by allowing innovators to directly interface with regulators and industry experts to help mainstream innovations. Accelerators seek to also direct financing to help demonstrate and bring to market new innovations. Regulatory sandboxes have captured the attention of several jurisdictions, spanning high-income economies (for example Australia, Hong Kong, Japan, U.K., and the U.S.) and World Bank client countries (for example, China, Colombia, India, Indonesia, Jordan, Mexico, and Morocco).

Some EMDEs have adopted innovation facilitators, notably regulatory sandboxes to provide a pathway for fintech approaches that are within the spirit of the regulatory framework but not fully compliant with the letter of the regulation. It is too early to determine the outcomes of the regulatory sandboxes in EMDEs. However, based on the review of the sandbox initiatives in a few jurisdictions—it appears that sandboxes are being used by both incumbents and new entrants. The focus of incumbents is on adopting new processes like remote onboarding.

Figure 17. Areas in Which Regulators Have Modified Their Regulatory and Supervisory Approach to Facilitate the Development of Fintech and/or Develop Supervisory Capacity. By Country Income Level



Have authorities modified their regulatory and supervisory approach to facilitate the development of fintech and/or develop supervisory capacity? (Please check all that apply)

- A. Set up special contact point for fintech questions
- B. Allowed sandboxes
- C. Other, [please provide brief description]
- D. Established innovation hubs
- E. None

Source: IMF/World Bank Global Fintech Survey (2019).

5.1.3 Specific Activities

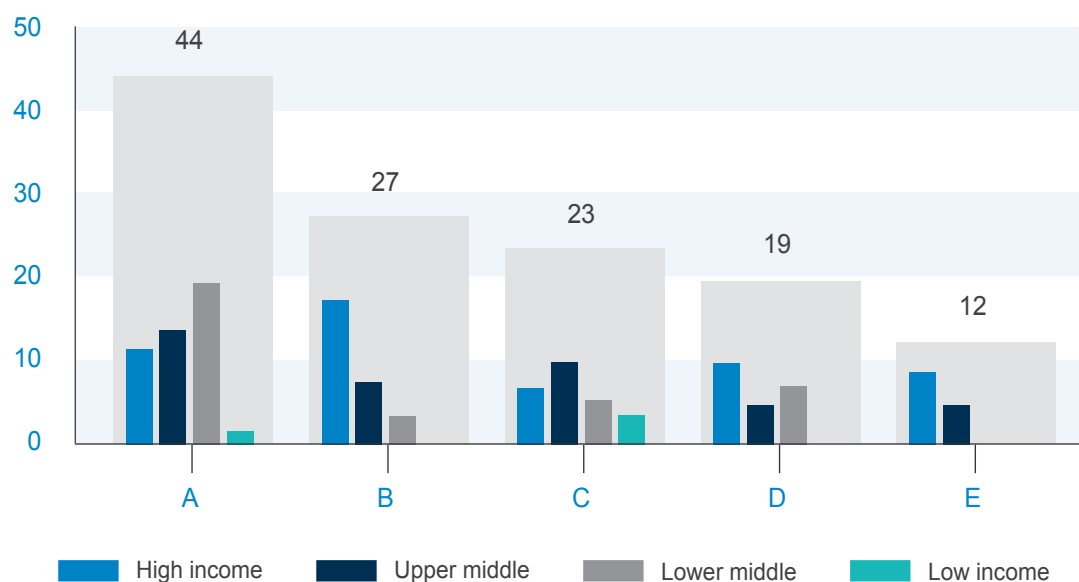
EMDEs have sought to bring specific fintech activities within the regulatory perimeter by developing bespoke regulations drawing on the general powers accorded to regulators or through provisions in public laws. These activities include (figure 18):

- **Digital payments and e-money services.** E-money issuance by non-bank entities, notably telecom operators, has been the dominant fintech activity in many EMDEs. Several EMDEs have accordingly modified their regulatory frameworks to enable development of e-money see figure 18.²⁶ In general, the approach has been to develop bespoke regulations covering both prudential and conduct aspects. There has also been convergence to a large degree on requiring companies outside of the financial sector offering e-money to set up a dedicated entity solely focused on e-money and associated payment services. The e-money entities are however allowed to originate sales of financial products for other regulated financial service providers. The other fintech activities being brought within the regulatory perimeter include lending platforms. In some cases, this has followed a period of “wait and see” when these services were not regulated or followed an iterative process of providing basic framework and finetuning them—“test and learn” (see Regulation Note for a more detailed discussion).

26. The findings from the IMF-World Bank Fintech Survey in 2019 which used a different categorization.

- **Digital banks.** These services involving deposit taking are often permitted by a (sometimes temporary) extension of the banking licensing framework. Some jurisdictions have opted for a phased licensing process through which new entrants start operations with limited activities and finally become fully licensed banks. Regulators mainly focus on facilitating the authorization process. Some jurisdictions are starting to issue specific licensing frameworks for digital-only banks with restrictions on physical presence and requiring a focus on financial inclusion.
- **Crowdfunding platforms (marketplace finance).** Lending platforms help connect investors with borrowers or corporates seeking to get funds by selling their equity or debt. Some countries have enacted a single framework to encompass both securities-based crowdfunding and lending crowdfunding. Other jurisdictions have opted for separate regimes, a model that seems more prevalent in countries with sector-based supervisory models.
- **Crypto-assets.** Most countries have taken a cautious stance towards crypto-assets. Some have taken a balanced approach by pro-actively regulating crypto-asset activity without outright banning, some have banned some or all crypto-assets activities, and others have taken a “wait and see” approach. In light of their cross-border and global nature, crypto-assets and stablecoins pose international regulatory arbitrage risks. Standard-setting bodies are applying general and transparent principles in their guidance and standards. The treatment of crypto-asset activity should focus on economic functions and objectives, using a proportionate “same risk, same activity, same treatment” approach while aiming for simplicity and to ensure a future-proof, technology-neutral stance, which helps bring about a level playing field.

Figure 18. Areas in Which Regulators Have Modified Their Regulatory Frameworks to Address Emerging Risks from Fintech Activities. By Country Income Level



In which areas have authorities modified their regulatory framework (e.g. expanding the perimeter or introducing a new regulation) to address emerging risks from fintech activities? (Please check all that apply)

- A. Mobile money/payment services
- B. Crypto-assets: issuance, exchange, and custody
- C. None
- D. Peer-to-peer lending
- E. Others, [please provide brief description]

5.2 Data Issues

Technological innovation has spurred the increase of granular, real-time data posing significant opportunities and challenges that call for a policy response (box 4). According to the *World Development Report 2021*: “These innovations in data generation create new opportunities for enhancing the economic performance of firms; for repurposing data to improve the design, execution, and evaluation of public policies; and for helping individuals and communities make better choices by accessing more information and knowledge.”

New ways of collecting, organizing, analyzing, and exchanging data are central to fintech, which requires regulators to address the risks while ensuring fair access. Big tech firms have largely relied on large troves of user data generated on their own platforms or acquired from third parties. Fintech firms, on the other hand, have primarily gathered user data through their apps. Both big tech and fintech companies, however, had to gather from customers of other financial institutions. As a result, fundamental data protection and privacy issues have prompted regulatory actions.

Many advanced economies and a few EMDEs have responded by formulating an overarching legal framework for general data protection and privacy and issuing open banking regulations. The overarching data protection and privacy frameworks²⁷ cover issues related to the collection, access, and portability of personal information and principles related to data quality and rectification, lawful processing, purpose specification, and consent. Open banking regulations seek to require banks and, in some countries, also other financial institutions (for example, Mexico and India) to provide a minimum set of data in an online and automated manner to third parties authorized by the account holder. These third parties are brought within the financial sector regulatory perimeter.

While most of the jurisdictions that have developed an open banking scheme already had in place a data protection framework, some have amended such framework (for example, Australia) and others developed it later. Except in the case of the U.S., all advanced economies had a data protection framework already in place. In countries where such frameworks do not exist (for example, the U.S.), the scheme recognizes the need for a data permissioned environment. In India, following judicial rulings, a data protection framework was adopted in 2019. This framework includes the construct of “consent manager” and “data fiduciary” and provides a pathway for development of open banking. Nigeria and Rwanda issued a payment regulation to allow for payment initiation service providers to access bank data in 2019. Appendix III presents a summary of the open banking framework adopted in select countries.

With respect to data processing, the application of artificial intelligence (AI) techniques has been shown to pose consumer protection risks and has prompted regulators and the industry alike to develop guidelines on responsible use of AI. The reliance of AI on past and/or unrepresentative data could perpetuate embedded biases that may result in discrimination and exclusion.²⁸ This has prompted calls for, inter alia, human oversight and better scrutiny of models and algorithms to better understand their inner workings and predictions. Regulators have thus far not intervened directly, although some have called for the adoption of a codes of conduct, while others have developed guidelines.²⁹

27. IMF-WB Bali Fintech Agenda: Experience thus Far, 2019.

28. See for example - <https://www.nytimes.com/2019/11/10/business/Apple-credit-card-investigation.html>

29. For example, the European Commission’s “Ethics Guidelines for Trustworthy AI” and the Monetary Authority of Singapore’s FEAT principles. See Appendix 4.

Box 4. World Development Report 2021: Data for Better Lives

Data can lead to better lives through multiple channels. Governments can use data to improve programs, policies, and the targeting of scarce resources to marginalized people and areas. The private sector can use data to fuel platform-based business models that stimulate economic activity and international trade in services. And individuals, empowered by data, can make better decisions and hold governments accountable.

Data can be subject to abuse through multiple channels. For example, a government could use data to undertake political surveillance or target certain social groups for discrimination. Private sector actors could exploit market power arising from data to take advantage of their customers. Or individuals could access data illegally for criminal purposes.

Governance arrangements to address such concerns remain in their infancy, particularly in lower-income countries. Legal and regulatory frameworks for data are incomplete, with gaps in critical safeguards (such as cybersecurity, data protection, and cross-border data flows) and a shortage of measures to enable data sharing (such as open licensing and interoperability). Even where nascent data governance frameworks exist, a dearth of institutions with the requisite administrative capacity, decision-making autonomy, and financial resources constrains their effective implementation and enforcement.

5.3 Competition Issues

Competition issues have surfaced in several EMDEs notably with respect to access to telecom services, exclusive distribution arrangements, and unequal access to platforms. Mobile-money issuance in EMDEs is largely led by telecom operators and is dependent on native telecom services like Unstructured Supplementary Service Data (USSD). EMDE banks also leverage these channels to offer mobile banking and mobile payment services. Non-bank mobile-money issuers are also reliant on the same channel. This has enabled telecom operators, who are also mobile-money issuers either on their own or through a subsidiary or partnership with another financial institution, to control over a channel that other non-telecom providers need access to, and its associated pricing power. This has required interventions by telecom regulators or dedicated competition related public authorities – for example, Competition Authority of Kenya intervened to require telecom operators to establish a fair and transparent access to USSD services. Competition issues have also arisen in exclusivity of third-party distribution networks like agents used by mobile-money providers. In China, where big tech activity has been significant, competition issues related to preferential treatment of offerings by companies related to the platform provider has raised competition issues. For example, some have questioned for services of group companies in platform models have come up – for e.g., the lack of diversity of money market funds made available to Alipay customers.

5.3.1 Big Tech

Regulators have sought to adjust the regulatory framework to create space for big tech companies to provide financial services—e-money issuance, digital bank license, and open banking. E-money licenses has been leveraged by telecom operators in EMDEs notably in sub-Saharan Africa, although also in other regions. Other big tech companies like Google, Facebook, Alipay, Tencent, and Grab and Go-JEK have obtained e-money licenses in various jurisdictions. Some jurisdictions, notably in Asia, have also allowed big tech companies to be shareholders in digital banks—for example, China, Korea, and Singapore. The other approach has been to leverage open banking regulations to allow big tech companies to manage the customer interface for initiating payments (for example, through UPI in India).

These approaches, while subjecting big tech firms to conduct regulations, do not fundamentally address competition issues, which has prompted regulators to impose additional requirements. In India, big tech firms were able to leverage the third-party payment initiation capability to rapidly expand their presence in the payments market, prompting the imposition of volume caps.³⁰ In China, the central bank required central clearing of payment transactions by e-money providers, in part to make it easier for smaller e-money providers to compete with big tech firms.

Big tech companies will retain several inherent advantages even if they are subject to traditional regulatory requirements. A big tech firm can leverage data from its non-financial operations,³¹ which often have unique insights into customer behaviors and cash flows to which an incumbent bank would not have visibility. The value of this information is confirmed by the phenomenon of some big tech companies developing a credit-score-like index and selling that information to third parties. The advantage over banks may be compounded where open banking forces incumbent financial institutions to share data with big techs firm, but there is no corresponding requirement on big tech firms to share their customer data.

Another source of advantage may come from product linkages and cross-subsidies. A big tech e-money issuer or digital bank could offer financial services at a steep discount because it expects to tap other revenue streams that would grow by offering financial services. For example, a big tech e-money issuer can generate revenue by offering advertising to a merchant and make the payment services free—a greater share of payment traffic will in turn help improve advertising offerings. An e-commerce marketplace can offer loans to merchants selling on its platform and make a margin on the increase in product sales as well as the loan. Finally, the increased visibility and leverage over the client's activities may improve loan performance and collections. When a sellers borrow from an e-commerce platform through which they sell to their customers, the loan repayments can be collected directly from their revenues, and they will be reluctant to default and risk being cut off from their customers. The differential in servicing costs and willingness to repay can manifest as lower costs of credit for the big tech firm relative to a bank.

5.3.2 Open Banking

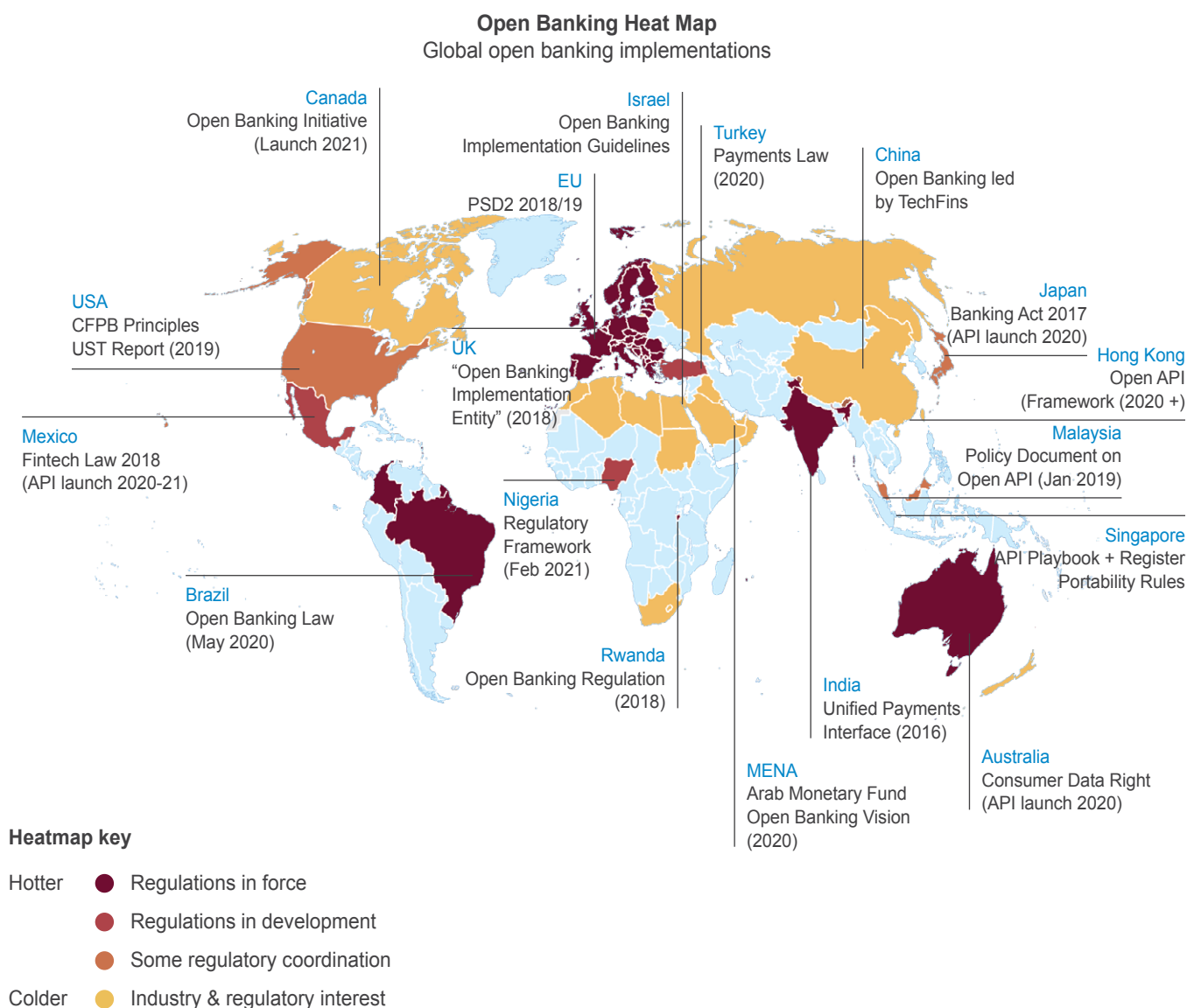
The U.K. and the EU in 2018 led the developments in open banking, only three years later several EMDE regulators have adopted or announced plans to launch similar initiatives. There is however significant diversity in the motivations, scale, and scope of these initiatives. In most countries the regulations mandate banks to provide open APIs, in some other it is voluntary. Brazil developed a hybrid approach combining a mandatory provision to enable access to larger banks and conglomerates while other financial institutions participate under a voluntary and customer-permissioned environment. The scope of the open banking regulations differs across jurisdictions—in Mexico, the range of institutions covered is wide, covering all financial institutions, but the scope of services is limited to information related to products and services and transaction enquiry; transaction initiation is not allowed (as yet). Open banking regulations in other markets cover a narrower range of institutions but enable a wider scope of activities. Appendix III provides a summary of open banking frameworks in selected markets.

Open banking was not necessarily designed with big tech firms in mind; however, they are likely to benefit significantly from this. The key motivation for open banking has been to foster competition and provide a pathway for fintech firms to offer services efficiently instead of having to rely on unreliable and risky processes like “screen scrapping”. In some countries, the motivations have included facilitating greater adoption of digital approaches by enabling data exchange in an efficient and reliable manner. It is becoming clear that big tech firms, given their strong customer base and apps that are integrated into daily lives of end-users, can derive significant benefits—for example Google Pay dominates the third-party payment initiation market in India. See figure 19 below for a heatmap of global open banking implementations.

30. [NPCI: Standard Operating Procedure \(SOP\)–Market Share Cap for Third Party Application Providers \(TPAP\)](#): No single third-party application can exceed a market share of 30% by payments volume.

31. This could be through an explicit consent of the customer, but a similar capability would not be available for a customer of a big tech company to share information with a traditional incumbent bank.

Figure 19. Open Banking Heat Map



Source: BBVA, Findexable 2021 via Finastra, June 2021.

5.4 Looking Ahead

Different societies attach different preferences to market structure and these preferences may evolve as countries climb the fintech adoption ladder. As such, authorities need to be continuously intentional with respect to outcomes. The barbell structure—or indeed other market structures that may emerge—may be more desirable or less desirable in a given market. The outcome will depend, inter alia, on consumer behaviors and skills that determine switching costs in a given market, and how participants use their market power. The impact of digital platforms that pursue growth over profits, and data over revenue, may not be well-captured by competition policy approaches that focus on traditional measures of consumer welfare such as costs and prices. Letting market forces determine the outcome may result in unexpected benefits, or unwelcome consequences. For example, longstanding precepts on the separation of banking

and commerce are already being upended. Prior approaches to the trade-offs between competition and stability, between inclusion and consumer protection, and between privacy and systemic integrity, all need to be re-examined. Fintech and embedded finance may require not only the expansion of the regulatory perimeter, but an expanded perimeter of regulators: financial, consumer protection, competition, data/privacy, telecoms/internet.

5.4.1 Regulatory Implications

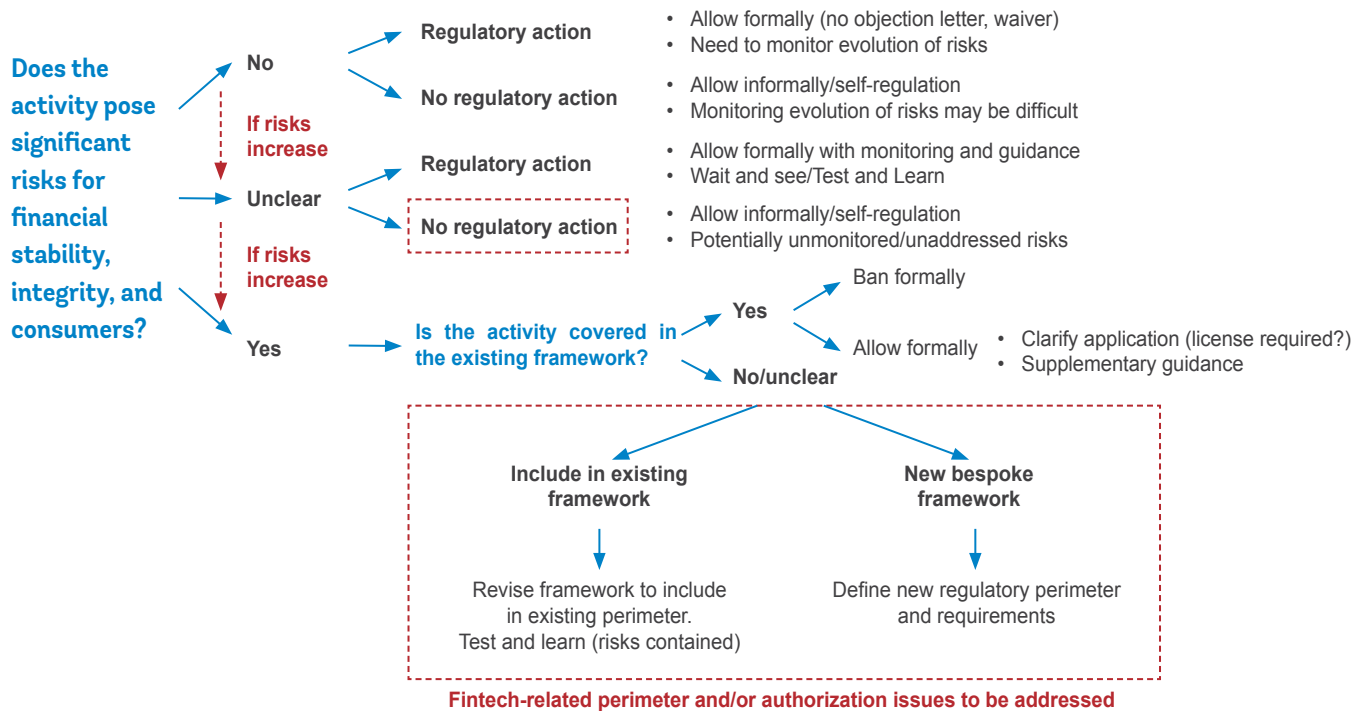
The implications of the cross-sectoral nature of fintech for regulation are profound. The boundaries between social networks, digital economy platforms, and financial services are blurring. Fintech and big tech-embedded finance cut across financial supervisors, market conduct and competition authorities, and consumer protection agencies. Regulatory approaches that separate commerce and banking may need to be revisited. Analyses of market concentration, use and abuse of monopoly power, and anti-competitive practices need to take into account the economics of multi-sided platform models, as well as the linkages of financial products to other activities where a single provider may have market power. New dynamics with respect to both market structure and non-financial participants in payments and lending will require new thinking about systemic stability and monetary policy transmission.

The growing diversity of financial services providers and business models may require an expansion of the regulatory perimeter. Payments, loans, and deposit-taking services may be provided by specialized payment service providers (fintech firms), e-commerce platforms (big tech firms), and other non-banks. Leaving activities outside the regulatory perimeter may entail risk. A lack of surveillance and oversight can hinder the regulators' ability to identify the relevant risks posed by a fintech activity early to avoid the accumulation of risks outside the regulated perimeter. It is therefore important that regulators develop approaches to ensure a level playing field and provide clear requirements for licensing.

This blending of commercial and financial activity is not permitted under some financial regulation, resulting in an un-level playing field. In Thailand, banks objected to e-commerce marketplaces being able to provide lending when banks were not allowed to provide non-financial products and the regulator created space for banks to offer e-commerce marketplaces. Indeed, the atomization and recombination of services enabled by connectivity and computing innovations blurs the borders of many economic sectors. One approach might be to regulate big tech firms as financial services providers. This might be feasible where there are payment services, insurance, or other specifically regulated activities. Credit is harder to regulate, since allowing a buyer to pay later is routine commercial practice. Some jurisdictions, such as Thailand, have looked instead to relax restrictions separating banking and commerce. New business models, and in particular the ability to leverage data to manage risk, have also changed the balance of risks that drove the commerce-banking separation in the first place. In recent periods financial services volatility has driven credit cycles more than real sector volatility, so linking credit emission with real sector activity might in fact be stabilizing.

As a result, regulators are confronted with three critical questions—what to regulate, when to regulate, and how to regulate. The “What” pertains to which entities to bring under the regulatory perimeter. Once that is determined then the question is whether to intervene right away or “wait-and-see” how the innovations shape up and whether they will pose risks. Some regulators have adopted an iterative approach—“test and learn” of starting with some basic regulatory frameworks and observing the interplay of these with the market forces before developing a more detailed regulatory framework. The recent developments of innovation facilitators provide a more structured way of implementing this approach. The last part of the puzzle on “how”—could range from making marginal changes to existing rules based on traditional institution types to implementing a new bespoke fintech framework. In some cases, the existing framework will be fit for purpose or need only a few amendments. In other cases, the regulatory framework will need to be complemented by supplementary guidance. It may also be that the existing regulations are not directly applicable to the fintech activity but provide a solid basis from which to undertake the necessary changes to effectively regulate and supervise or allow a fintech activity. The *Regulation* note describes a decision framework to navigate these three critical issues (figure 20).

Figure 20. The Fintech Regulatory Decision Tree



Source: Regulation note, World Bank Group.

The policy response chosen by each country will depend on the type of activity and country-specific factors such as the stage of development of the financial sector, the size of the market, and the scale and type of fintech activity. Fintech activities that pose significant risks to the financial system will likely require authorization and a supervisory license to operate. The rest might only need to be registered with or notified to the relevant regulator. The type of risks posed by the activity and its penetration will be the most relevant driver, but not the only one. Country-specific factors include the state of the market, capacity constraints, existing financial regulatory frameworks, or the country-legal tradition. When the risks perceived are not high, EMDEs tend to allow fintech activity with no formal regulation. This may be related to the overall capacity and resource constraints that several of these countries face, the specific challenges posed by big tech firms (which offer a broader scope of services in EMDEs than in advanced economies), the often-underdeveloped state of fintech in the country, and lower competition levels in the financial service markets.

Where the legal and regulatory changes to bring fintech entities and activities inside the regulatory perimeter may take time and not be feasible, some fintech entities and activities may remain outside the regulatory perimeter. In these circumstances, another mechanism to monitor risks is needed, such as a partnership with a regulated entity or a Memorandum of Understanding between the entity and the regulator. In some cases, fintech activities can be adequately monitored indirectly through their linkages with regulated entities within the regulatory perimeter. Such fintech activities usually fall under typical outsourcing constructs. However, even in such cases, authorities will need a way to monitor the collective impact on the financial system which might be missed when monitoring indirectly.

In the absence of a competition mandate, financial sector regulators have several levers they can use to mitigate competition barriers and risks. Financial sector regulators should understand the synergies and relationship between financial regulation and competition within their mandates. When establishing licensing frameworks, regulators may incorporate fair market entry aspects. Regulators may also consider promoting a level playing field regarding distribution (agency banking and mobile-money agents), data (open banking regimes), and customer due diligence (eKYC and tiered customer due diligence). Regulators could also ensure that financial infrastructures have fair and transparent access

criteria that is the least restrictive and any restrictions are justifiable on risk-management grounds. Finally, financial regulators can collaborate with other authorities (for example, for telecoms and other utilities that may offer financial services) as well as competition and data protection authorities.

Addressing consumer protection risks would require bringing fintech under existing consumer protection frameworks and addressing any gaps with respect to specific risks that fintech can pose. Where there is no overarching consumer protection framework, bespoke conduct regulations could be an interim measure. Regulatory approaches to address such risks include vetting of fintech entities during the authorization stage; risk-management and governance obligations for platform operators; imposing clear responsibility and liability on providers for the conduct of persons acting on their behalf; placing targeted obligations on platform operators to safeguard consumers' interests regardless of business model (such as requiring P2PL platform operators to undertake creditworthiness assessments, even if they are not themselves the lender); warnings and provision of other key disclosures to consumers regarding the risks associated with fintech products; and segregation of client funds.

The continued rise of new forms of digital money such as CBDCs and crypto-assets poses important issues:

- **CBDCs.** Many jurisdictions are contemplating the issuance of a central bank digital currency (CBDC). While CBDCs could improve financial inclusion, efficiency, and cross-border payments, they are no panacea. Further, CBDCs, may pose challenges related to, inter alia, data privacy and competition and consume significant resources to set up.
- **Crypto-assets and stablecoins.** Crypto-assets are increasingly regarded and regulated as an emerging asset class. In light of sharp recent growth, some stablecoins could reach global scale quickly. Crypto-assets and stablecoins pose several public policy issues (box 5) and the potential for international regulatory arbitrage risks requiring close international collaboration and guidance by standard setting bodies within their respective mandates.

Box 5. The Public Policy Implications of Crypto-Assets and Stablecoins

While the impacts of crypto-assets and stablecoins currently remain limited, adoption and usage may evolve rapidly, calling for monitoring and continued progress on key policy considerations:

- **Monetary and fiscal issues.** Given the current challenges to reach scale and high price volatility, crypto-assets pose limited risks to monetary sovereignty. However, stablecoins could pose issues to monetary policy transmission, lead to currency substitution, and impact capital flows in EMDEs. Crypto-asset transactions that don't occur through regulated intermediaries, may make identifying tax evasion and enforcing capital flow controls more difficult. Taxation on crypto-asset activity and capital gains could become a source of revenue.
- **Financial inclusion, cross-border payments, and remittances.** Crypto-asset payment service providers have emerged that aim to enable near-instant, mobile-to-mobile-based small-value transactions, at lower cost than existing solutions, using new, promising open-source technologies (for example, Lightning Network). However, these technologies remain untested at scale and pose various risks that are not yet well-understood. Moreover, lack of access to smartphones, ID documents, and need for physical access points could make exchanges between physical fiat and crypto-assets difficult for the currently excluded customer segments.
- **Financial stability.** As crypto-assets grow in size and interconnectedness with the financial system, they could have stability implications, but these are currently limited, according to the FSB. Stablecoins could pose issues related to financial stability and the smooth functioning of the payment system. In EMDEs, a lack of supporting domestic infrastructures, regulatory frameworks, and institutional capacity may complicate issues.

- **Illicit finance and market integrity.** Due to their decentralized and global nature, crypto-assets pose such risks. According to the FATF's 12-month review (May 2021): "The value of virtual assets involved in most ML/TF cases detected to date remains relatively small compared to cases using more traditional financial services and products." Industry estimates suggest that in 2021, illicit activity represented 0.15 percent of crypto-assets transaction volume, down from 3.4 percent in 2019. However, crypto-assets have facilitated the rise in ransomware attacks. Many crypto-intermediaries are not registered or licensed, particularly in EMDEs, giving rise to regulatory arbitrage, data gaps, and issues regarding the safekeeping of users' assets, transparency of operations, price discovery mechanisms, and cyber resiliency and security.
- **Investor and consumer protection.** Most authorities have advised the public regarding the risks related to crypto-assets such as their volatile nature. Unsophisticated users can easily have their funds lost or stolen with currently few, if any, redress options. Several projects also appear to be outright scams and frauds. Stablecoins aim to maintain a stable value relative to a reference asset, but nevertheless are subject to, inter alia, legal, exchange rate, and/or redemption risks and may raise anti-trust issues if operated at large scale. These risks are exacerbated if intermediaries are not properly licensed and supervised, which makes enforcement of consumer and investor protection regulations difficult.
- **Energy consumption.** Securing the value stored in crypto-assets networks and maintaining decentralization of the network requires energy. For example, Cambridge University estimates that Bitcoin, the largest crypto-asset, represents around 0.25% on average of global energy consumption.³² According to Cambridge, 39 percent is estimated to come from renewable sources³³ and that share continues to grow. The industry is also adopting more efficient hardware and exploiting "stranded" or non-rival sources of energy. Many crypto-assets have emerged, which do not use energy-intensive consensus mechanisms (for example, Proof-of-Stake instead of Proof-of-Work).

Policy makers have taken a cautious stance regarding crypto-assets. Jurisdictions aim to provide an environment for safe innovation and adoption and are clarifying existing or creating new legal, regulatory, and supervisory approaches, although some jurisdictions have limited or banned some or all crypto-assets activities. In light of their supra-national and decentralized nature, crypto-assets pose international regulatory arbitrage risks. Various standard-setting bodies are applying general and transparent principles to provide guidance, set minimum requirements, and promote cross-border collaboration. In doing so, there is a need to focus on economic functions and objectives, using a "same risk, same activity, same treatment" approach while aiming for simplicity, to ensure a future-proof, technology-neutral stance. However, this remains a work in progress and many national authorities still lag behind in upgrading their policy frameworks and addressing regulatory fragmentation.

Some types of crypto-assets, notably global stablecoins, have the potential to attract broad public usage as a means of payments including in the De-Fi ecosystems. In this context, public authorities are actively exploring issuing central bank digital currencies (CBDCs). Widespread adoption of crypto-assets could challenge the primacy of public money with implications for, among others, monetary policy and financial stability. Some authorities have also noted the concentration and data protection and privacy risks that large-scale payment service providers can pose, particularly the ones employing a data monetization-led business strategy. It is perceived that a CBDC being a digital version of fiat currency could imbue public money with the necessary digital features and enable it to provide a safer and efficient alternative to society, while promoting competition and innovation. The perceived potential of CBDCs to advance financial inclusion is also of interest to some public authorities, notably the EMDEs. CBDCs however are not a panacea for financial

32. [University of Cambridge: Bitcoin network power demand.](#)

33. [University of Cambridge: 3rd Global Cryptoasset Benchmarking Study.](#)

inclusion since key behavioral, technological, and infrastructural barriers that are also faced by other digital payment solutions may remain in place. Further, alternative avenues to address the gaps sought to be addressed by crypto-assets and CBDCs deserve equal attention.

5.4.2 Supervisory Implications

Countries will need to regularly evaluate the appropriateness of their supervisory frameworks to account for the digital transformation of the financial sector. Supervisory and regulatory frameworks are closely linked and influence each other. The supervisory framework should be well-designed to respond to the risks inherent in fintech activities and flexible enough to adapt to rapid market developments. The framework should also embed proportionality, to ensure that prompt supervisory actions are commensurate with the level of risk posed. A single institutional model to supervise fintech activities is not necessarily feasible and to date no country has created one. Rather, supervisory responsibilities related to fintech tend to follow preexisting frameworks and mandates for financial sector supervision, although in some countries there is a debate on whether the existing framework and approach remains appropriate or whether adaptation and change is needed. New responsibilities are being allocated to existing authorities. Since some services previously only provided by established financial institutions are now also provided by non-financial corporates and start-ups, questions arise as to which authority has to supervise. The contours of the regulatory perimeter have implications for supervision—implications of activities that are outside the regulatory perimeter on regulated entities will also need to be assessed as part of the supervisory processes.

Various fintech-specific supervisory challenges stand out.

- **Cyber risk and resilience.** Cyber threats are bound to increase in an increasingly fintech-dominated financial sector, calling for prompt and timely supervisory action. International bodies and standard setters have issued guidance and stock takes including the G7, BCBS, CPMI/IOSCO, and the FSB that outline supervisory requirements to mitigate cyber risks, which typically consist of: (i) a documented cybersecurity program or policy; (ii) identification of critical information assets; (iii) testing; (iv) cyber-event reporting; (v) cyberthreat intelligence sharing; (vi) documented security capabilities of third-party service providers; and sometimes (vii) security certification of information security professionals.
- **Reliance on third parties.** As outsourcing by regulated financial institutions is becoming more prevalent (and potentially systemic), supervisors are developing structured and proportional approaches that considers the materiality, complexity, and impact on business continuity. The outsourcing of critical services or functions would need prior authorization and comply with requirements regarding, inter alia, data security, data protection and privacy, auditability, due diligence of providers, contingency plans, and reporting obligations. Cloud-based infrastructures raises unique concerns relating to outsourcing practices.
- **Data protection.** Massive breaches of consumer data in recent years have left consumers vulnerable to identity theft and violation of their privacy. Data protection requirements are increasingly used in licensing frameworks. As such, supervisors will need to pay continuous attention to the disclosure of the types of data used by financial institutions and on measures to help consumers understand how their data is being used and to be able to grant or withdraw consent. Constraints on sending data across national borders are also increasingly applied.

Supervisors will need to catch up, particularly in EMDEs. Supervisory agencies should regularly evaluate staff skills and gaps. Skill gaps typically include areas such as: cyber security, legal (for example, to assess outsourcing contracts), data science and statistics (for example, to manage and extract insight from big regulatory datasets or to review models of financial institutions), and crypto-assets. In many EMDEs, supervisors are just starting to understand how fintech is impacting the financial sector and will need to strengthen institutional capacity, including by training or hiring new staff.

Authorities are embedding fintech skills into their organizations in different ways. Some authorities have established dedicated fintech teams, which assist fintech firms with licensing issues and provide guidance throughout the process,

including in innovation facilitators. Other authorities have embedded fintech expertise in traditional supervision units to promote cross-fertilization with financial sector and risk-management disciplines. An intermediate option is to set up inter-departmental working groups that analyze the risks involved, the level of detail required by examinations, whether dedicated teams would be appropriate, and what specific expertise and techniques are required. Regtech and supotech approaches can facilitate supervisory and compliance processes for both the authorities and the industry and may help overcome resource constraints, but they are no panacea.

Effective supervision of fintech calls for coordination and information-sharing arrangements between domestic authorities. Fintech activities may fall in the regulatory perimeter of multiple agencies but only a few jurisdictions have a formal body in charge of coordinating fintech policies. Collaboration mechanisms may be formalized through memoranda of understanding (MoU) to cover cross-cutting issues, such as AML/CFT or consumer protection, with other financial sector regulators, including, but not limited to, the national treasury, prudential authorities, the central bank, the financial sector conduct authority, telecom authorities, financial intelligence units, national credit regulators, and stock exchange authorities. The national or federal government might get involved in these MoU when the impact transcends the financial sector, for example in relation to digital ID, data privacy, or cyber security.

Involving the industry in fintech coordination efforts in cyber security, payments and securities is also becoming more frequent. Strengthening the engagement with the industry such as by including regulatory sandboxes, accelerators, innovation hubs, and fintech coordination groups provides excellent learning opportunities for supervisors to develop a deeper understanding of fintech and identify appropriate regulatory and supervisory responses.

International cooperation on fintech matters will further gain in importance, both bilaterally and in a multilateral context. In light of the cross-border and often global nature of fintech developments (for example, remittances, CBDCs, crypto-assets, cross-border payments, cloud-service providers), authorities will need to strengthen coordination and information sharing to facilitate knowledge transfer and effectively monitor financial service provision that transcends jurisdictional boundaries. Initiatives to foster cooperation to agree on standards to develop supotech solutions that are compatible across countries are particularly necessary and valuable. The Global Financial Innovation Network (GFIN) is a new model of international cooperation on fintech innovation and supervision that aims to increase collaboration between regulatory agencies in fintech and regtech.

5.4.3 Winding Down

The approach to dealing with fintech failures may need strengthening. Many jurisdictions have specific crisis management arrangements for regulated financial institutions, aimed at preserving financial stability, the integrity of the financial sector, and savings of depositors, investors, corporates, and households. For the most part, these regimes are not readily applicable to fintech firms. However, for fintech firms that work solely as intermediaries of transactions the financial risks are limited and no special wind down arrangements may be needed. This is the case, for example for certain types of robo-advisors, which work like investment advisors. However, those that also handle client funds and execute the investment advice have characteristics of a brokers. Similarly, market-place lending platforms might need to ex-ante institute procedures to support orderly termination, transfer, or continued servicing of loans/investments facilitated by the platform in the event of the platform exiting the business. Moreover, authorities often impose requirements to ensure client access to relevant documentation and transaction data if these firms fail.

The basics of what to include in wind-down procedures are clear, however there are challenges with respect to legal basis and supervisory and operational capabilities. The procedures need to include an ex-ante articulation of how customer positions and contracts can either continue to be operational or be transferred to another operator. However, there could be specific legal issues—starting from whether the regulators have the powers to require and administer these procedures to whether the underlying contracts/services are legally amenable to such procedures. Moreover, for these procedures to be credible there need to be appropriate supervisory processes to ascertain effectiveness of the underlying arrangements and develop capabilities to operationalize these procedures.

E-money providers and other fintech firms that handle customer funds should adequately ringfence their clients' funds and keep them segregated from the institution's own assets and in a safe place. This will ensure that funds are readily available and easily transferable in case of failure, especially if they are kept in government securities or deposited with the central bank. In some cases, consideration could be given to extending the coverage of the deposit guarantee scheme to the balances of e-money accounts to protect customer funds against fraud or misappropriation of the reserves. Even so, without mechanisms to smoothly transfer balances to an alternative operator or servicer, customers may lose access for days or weeks, as was the case when Wirecard failed.³⁴

Special wind-down procedures may be indicated where the fintech provider has systemic relevance. This could be the case, for example in some markets where mobile money has been broadly adopted. Financial authorities must evaluate the potential impact of the failure of a systemically important fintech firm and address all major concerns appropriately. However, the lack of international standards or recommendations is a challenge, especially for EMDE countries with capacity constraints.

5.4.4 Implications for Financial Infrastructure

Financial infrastructures that are available on terms typically associated with public goods—open, fair, and transparent access—are critical for market contestability. The Central Bank of Mexico, for example, is allowing non-banks to access the payments infrastructure and the Peoples Bank of China is allowing non-bank credit providers to access its credit registry. In other cases, regulators are requiring operators of financial infrastructures to open access to non-banks—Reserve Bank of India, required non-banks e-money issuers access to payments infrastructure. In some cases, new open infrastructures are being created, which would be open for all DFS players—for example, in Pakistan and Sierra Leone.

With new payment media emerging, including CBDC and stablecoins, achieving interoperability and standardization of clearing and settlement rules and infrastructures will become critical. The *Payments* note articulates that these features would allow users of different technologies or systems to interact with one another, improving their effectiveness and efficiency. This interoperability must be possible not only in terms of technology but also in terms of costs, to avoid high charges derived from the interaction and transactions between systems. Regulators can help to ensure a more seamless payments infrastructure and support interoperability, for example, by requiring market participants to develop end-user payment services based on open data-entry solutions to avoid the creation of closed payment solutions and fragmentation of the market. Governance of payment systems increasingly requires governments and regulators to be much more proactive in understanding and, where needed, set standards for new technologies and business models and operating procedures and rules.

The increasing role of fintech firms, adoption of fast payments, embedded finance, and cross-border financial flows will put pressure on central banks to modernize their settlement services. Options range from enhancements to existing systems to re-designing the provision of central bank money. Maintaining the status quo of restricting access to central bank settlement asset and services to only incumbents could amplify risks, hamper competition, impact efficiency and affect safety and reliability of payment services. There are two non-exclusive sets of solutions. For the first, a more traditional response could be round-the-clock availability of settlement services, including expanding the range of entities that can access and embrace open APIs. In the second, re-designing the provision of central bank money for a digital world, taking into account technological developments, could lead in the direction of central bank digital currencies (CBDCs). The implications of the former are better understood than of the latter.

The coverage, quality, and ease of accessing credit information reporting systems can enable new lenders and also preserve the soundness of incumbents. Whether credit information is assembled by an industry-led bureau or a central-bank registry, the core goal of preventing over-indebtedness is thwarted if new lenders do not report credit

34. [Forbes: Customers Left With No Money As Wirecard Fallout Continues](#)

exposures or do not have access on an equal footing to existing credit exposure information. At the same time, it should be recognized that inclusion-minded fintech firms may be lending to segments not currently covered by the bureau or registry. For example, in markets where there is no differential in pricing between an inquiry that returns information and a no-hit inquiry, to mandate that lenders must make bureau inquiries for all borrowers would impose excess cost on inclusive lenders trying to serve previously underserved market segments. Recognizing that fintech business models often leverage alternative data such as utility data or transactional data, the scope of credit information sharing might be expanded beyond lenders. Ideally, commercially beneficial arrangements can induce participation in credit information sharing, but may need adjustments to the frameworks for information sharing to institutionalize the data subjects' control of their data and protect against unauthorized uses of personal data, algorithmic discrimination, and other abuses.³⁵

The coverage, quality, and ease of accessing of government data can be a key enabler for fintech models. Fintech providers are required to conduct verification of their customers, conduct ongoing customer due diligence, and validate information on their customer and their assets. These processes benefit greatly from access to information held with public authorities, government agencies, and potentially other private sector players; for example, on ID, land records, demographic information, income tax records, education records, and employment history. How fintech providers can access the data on customers held by the government—or by other providers—has an impact on their ability to serve their customers. Availability of these data in an efficient manner using automated interfaces enable DFS providers to reduce their costs and improve customer convenience. Automated access to government data platforms has enabled banks in India to approve MSME and personal loans online in under an hour from over 20 to 25 days.

The definition of infrastructure is broadening, technology brings in more players and what constitutes infrastructure is becoming more fluid. As such the challenges of what to regulate and how becomes more challenging. On the one hand, new types of services like digital ID, alternative data, and orchestration of customer consent are becoming centralized and taking on characteristics of financial infrastructures. On the other, some financial service providers have become so dominant and have inserted themselves into the value chains of a range of financial services such that they are taking on some characteristics of financial infrastructure or quasi-infrastructure. How this new class of providers should be regulated to ensure protection of safety, reliability, competitiveness, and efficiency of the financial sector needs attention. Financial infrastructures could be provided by entities in various corporate structures—for example, publicly-owned, privately-owned, for-profit, not-for-profit—and deployed in different technological approaches—centralized versus de-centralized. Where private sector solutions do not emerge, public authorities may need to play a catalytic role, including potentially in building and operating necessary infrastructure. Irrespective of the form they take and technology framework, certain key themes remain critical—prioritizing the needs of the overall ecosystem, safety, reliability, efficiency, sound risk management, and robust governance.

35. Salamina, Chhabra, Sankaranarayan, and Masunda: *"Disruptive Technologies in the Credit Information Sharing Industry: Developments and Implications."* World Bank. 2019.

6. Conclusion

The ongoing transformation of finance represents a paradigm shift. It calls for new approaches to regulation and supervision, and heightened collaboration and co-operation with other public authorities across data protection, privacy, and competition. Financial sector and other public authorities will need to step up to this challenge to play a critical role in fostering sound fintech adoption and the development of responsible, open, and inclusive markets for digital finance. In this regard, several policy implications emerge:

- **Foster beneficial innovation and competition, while managing the risks.** In light of the fast-evolving landscape and rapid spread of innovations from market to market, adopting an enabling approach to support responsible fintech innovation and adoption is critical. The approach of authorities needs to be proactive, pragmatic, clear, and collaborative with public and private stakeholders to promote trust, innovation, and investment, particularly since fintech issues cut across financial prudential supervisors, market conduct and competition authorities, and consumer protection agencies.
- **Be mindful of evolving policy tradeoffs as fintech adoption deepens.** One size will not fit all; for example, the prudential and monetary policy implications of digital money and alternative credit at low levels of penetration are different from those at higher levels. Policy tradeoffs will evolve as fintech continues to permeate the financial sector. This calls for proper safeguards to, among others, maintain fair competition, financial stability, ensure data and consumer protection, and prevent the abuse of market power. Data collection principles and proactive monitoring of market conduct, frameworks for open banking and data ownership, fostering development of financial infrastructure and fair and transparent access to them, and revisiting any restrictions on product tying and linkages between banking and commerce can help regulators balance the tradeoffs among stability, competition, concentration, efficiency, and inclusion as fintech adoption reaches scale.
- **Broaden monitoring horizons and re-assess regulatory perimeters as embedding of financial services blurs the boundaries of the financial sector.** Financial services are increasingly provided by a wide variety of entities, making services more decentralized, are being embedded into other products and services, and delivered as part of underlying commercial transactions or social interactions that are part of customers' workflows and daily activities. The underlying developments powering these include atomization of financial services value chains, product unbundling and separation of customer interfaces from underlying accounts, crypto-assets, and DeFi. These trends are leading to a more complex constellation of traditional regulated institutions, technology, and product providers, fintech and big tech firms and other providers. These can deliver efficiency, greater inclusion, and improved development outcomes where they are responsibly adopted. The variety of providers raises questions on the scope and intensity of regulation and supervision—that is, which of these institutions and services to monitor or to regulate, and how to calibrate supervisory intensity. Developing the ability to monitor the entire financial sector value chain and to reshape the regulatory perimeter is essential.
- **Review regulatory, supervisory and oversight frameworks to ensure they remain fit for purpose and enable the authorities to foster a safe, efficient, and inclusive financial system.** The range of new products and providers, use of new technologies and a wider range of data, and inclusion of new customer segments in increasingly complex markets is making existing regulatory and supervisory mandates and approaches insufficient, risking fragmentation of the institutional landscape. The decentralization of financial services as embodied in crypto-assets also poses domestic

and international regulatory arbitrage challenges and countries should adopt new binding global standards as quickly as possible. Broad principles that help underpin the policy stance include: ensure an approach that is proportional to risks; maintain a level playing field by treating the same activities and same risks similarly, looking through technology; and ensure the primacy of core policy objectives, which may call for bespoke approaches.

- **Anticipate market structure tendencies and proactively shape them to foster competition and contestability in the financial sector.** While the initial focus has been on facilitating entry, and the momentum of innovation has been from small startups and new entrants, the market is already rapidly boomeranging towards concentration of players and platforms, especially due to economies of scale and network effects in data. That trajectory may deliver inclusion and efficiency, particularly in developing economies, which lack a robust, competitive, and inclusive banking sector. Regulators will need to proactively monitor market conduct, and ensure that markets remain at least contestable, while continuing to dynamically balance tradeoffs between competition, concentration, efficiency, data protection, and inclusion.
- **Modernize and open up financial infrastructures to enable competition and contestability.** Financial infrastructure should be interoperable and open to both new and traditional players (for example, through open APIs) to promote network effects, innovation, and competition. The increasing role of fintech companies, embedded finance by big tech companies, digital money, and cross-border financial flows will put pressure on regulators to ensure that the access policies of financial infrastructures are fair and transparent and are not used as a way to lock out competition. This is particularly critical when the financial infrastructures are owned by incumbents. The governance arrangements of financial infrastructures will become an important element for regulators to monitor and shape. Moreover, with the entry of new market-level services that take on characteristics of financial infrastructures, regulators will need to assess whether and how to bring them within the regulatory perimeter.
- **Ensure public money remains fit for the digital world amidst rapid advances in private money solutions.** Crowding out of public money will hamper the ability of public authorities to shape and safeguard financial sector and economic development. The ongoing developments in the digitalization of the economy and payments, the world of crypto-assets, and the influence of big tech firms in payments and user data, could over time challenge the role of public money, competition, and privacy. In addition to strengthening policy frameworks regarding crypto-assets and big tech firms; and modernizing and opening up payments and related market infrastructures, public authorities might need to consider structural alternatives like CBDCs. Countries that consider launching a CBDC should carefully evaluate the wide-ranging implications and design options in consultation with public and private stakeholders.
- **Pursue strong cross-border coordination and sharing of information and best practices, given the supra-national nature of fintech.** Fintech developments enable providers to reach a wide set of customers across borders and provide services without necessarily being subject to regulation in the customers jurisdiction. Regulators and public authorities would need to collaborate and co-ordinate with their peers to safeguard their respective financial systems and customers. In this regard, global standard-setting bodies and international bodies like the IMF and World Bank have a critical role.

Appendix 1: COVID-19 Acceleration of Fintech Use

Globally, the pandemic has intensified fintech use. Social distancing and other containment measures adopted on a global scale to mitigate the spread of COVID-19 have increased the benefits of DFS. Traditional financial services are predominantly built on cash transactions and face-to-face interactions with financial service providers, which were interrupted by social distancing. Digital financial services could proceed, since they are largely predicated on remote, contactless, and cashless payments and transactions.

In a number of EMDEs, mobile-money activity declined as the pandemic struck, alongside the overall decline in economic activity. As lockdowns were lifted, mobile-money transactions recovered and grew to levels well above the pre-pandemic baseline, even allowing for trend growth. Registered accounts grew by 13 percent with active accounts growing by 17 percent, indicating that many users who had registered but not used their accounts were now active. Transaction volume rose 15 percent and value of transactions by 22 percent.³⁶ In the U.S., one study found fintech usage rose during the pandemic from 36 to 42 percent among consumers surveyed.³⁷

The pandemic accelerated providers' plans for digital transformation. More than 80 percent of all *Fintech Market Participants Survey* respondents felt that COVID-19 had increased the need for fintech and digital transformation. Digitization in customer channels, product adaptation, and internal processes were strategic priorities.

The *Fintech Activity* note looked at novel app download data. This dataset, reflecting the stream of new users of financial apps, provided insights into DFS adoption worldwide during the COVID-19 pandemic.

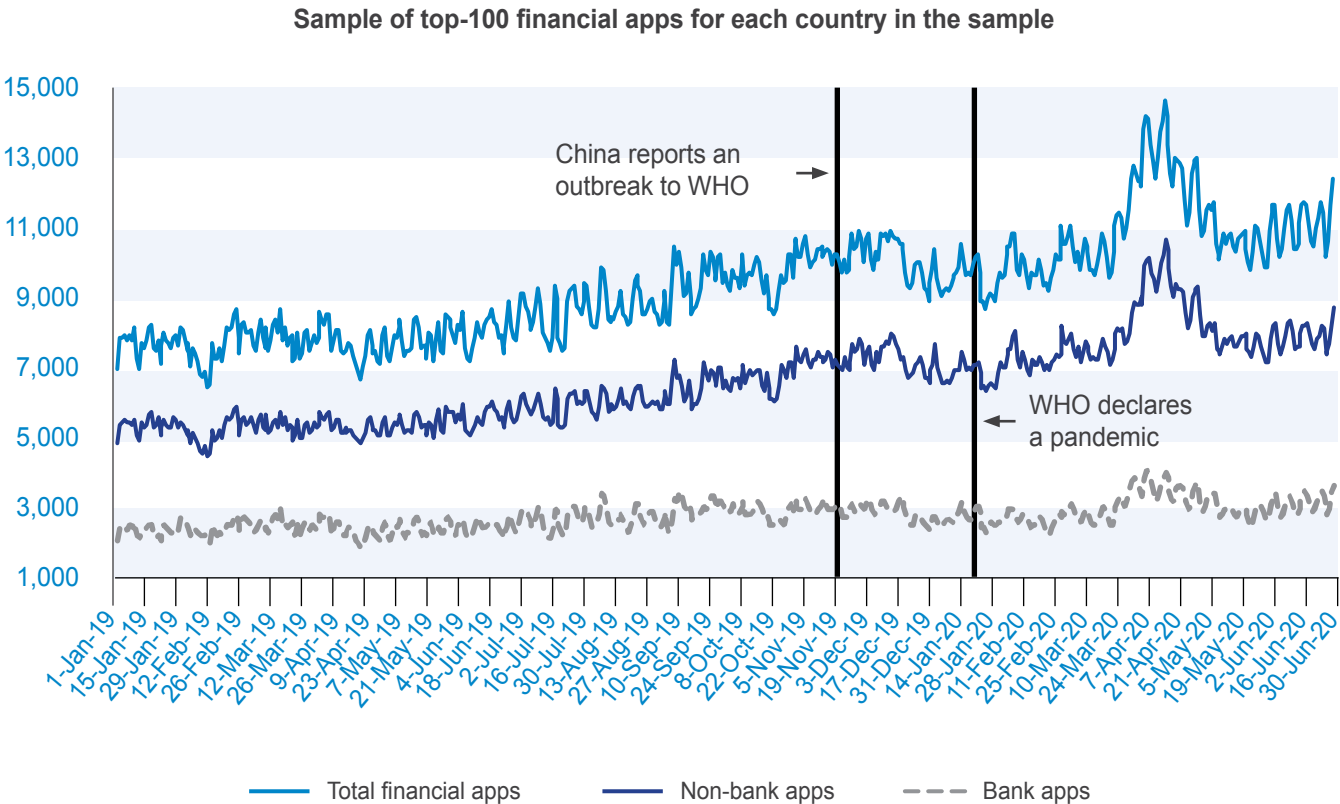
The analysis in *Fintech Activity* note showed a marked spike in worldwide financial app downloads, especially of non-bank financial apps, during the first peak months of the COVID-19 pandemic. The increase is particularly marked for non-bank financial apps. Global downloads of non-bank financial apps increased 45 percent, from an average of about 7 million downloads per day during the last quarter of 2019 (2019Q4) to over 10 million at its peak on April 15, 2020 and around the peak of policy measures taken to constrain community mobility.

The analysis also shows a robust positive correlation at the country level between the growth in downloads of top 100 financial apps since the outbreak of the pandemic and the severity of the impact of COVID-19, even after controlling for GDP per capita and demographic characteristics (figure 21). Moreover, the estimations indicate that the increase in financial app downloads was related to the stringency of community mobility policies or practices rather than the contagion of the disease itself in a given country.

36. GSMA *State of the Industry Report on Mobile Money 2021*

37. A. Krivkovich, O. White, Z. Townsend, and J. Euart. ["How US customers' attitudes to fintech are shifting during the pandemic."](#) McKinsey. December 2020.

Figure 21. Worldwide Downloads of Financial Apps during the Pandemic



Source: *Fintech Activity* note, World Bank Group.

Appendix 2: Overview of Recent Market Developments

Fintech Activity Index

The *Fintech Activity* note develops a novel country-level index of fintech activity for 125 countries covering the period 2014 to 2018. The index covers three dimensions of fintech activity: fintech firm creation and growth through the availability of early-stage equity financing; usage of fintech credit and digital payments, currently the most commonly used digital financial services, especially in developing countries; and the usage of mobile distribution channels for financial services.

Fintech activity is closely associated with ICT infrastructures and financial sector development.

- **ICT infrastructure.** Fintech activity is positively associated with ICT and financial infrastructures, though the relevance of specific type of infrastructure varies across types of fintech services. Specifically, the evidence indicates that payments infrastructure plays a more important role in the usage of digital payment services, whereas the development of credit information systems is more relevant for the usage of digital lending services.
- **Banking.** There is a robust negative association between fintech activity and bank development, consistent with the view that digital financial services may have more opportunities to develop in countries where the under and unserved share of the market is relatively large. Countries with more stringent overall banking regulations exhibit subdued fintech activity, suggesting that this is linked to a less permissive environment for innovation and fintech entrants. At the same time, there is a higher prevalence of bank app downloads in countries with more stringent banking regulations, suggesting in these cases that the digital transformation is driven by incumbents.
- **Capital markets.** Third, fintech activity is positively correlated with capital market development. The positive association with capital market development suggests that a supportive funding environment for fintech firms, especially start-up equity financing, can play an important role.

Many of the first round of consumer fintech firms were unbundling plays, offering a single product or a few tightly integrated solutions. Examples include mobile wallets, product search and comparison apps, peer-to-peer (P2P) lending, remittance/international transfer, and stock trading apps, as well as B2B solutions offering processing efficiencies, data analytics, or other services to established players. Some of these were regulated, such as payments and remittances, or worked with regulated institutions, for example, to book loans via a bank partner if required in their jurisdictions. Others were in unregulated spaces, or were outright regulatory arbitrages, such as P2P lending; the category definer, Zopa, was designed specifically to avoid being categorized as a deposit taker.

Despite the advantages of not requiring physical infrastructure and scalable technology, fintech strategies have boomeranged toward re-bundling and even licensed banking. Increasingly, one-time single-product firms that avoided the regulated space are seeking licenses, in some cases because regulators have closed loopholes and limited

arbitrage opportunities. Customer acquisition, regulatory requirements, and building trust (including investments in brand recognition) introduce costs that can only be justified with a higher lifetime customer value—which can only be achieved with a broader range of products. This is particularly true for fintech lenders that obtained banking licenses in order to access low-cost deposit funding. Once the overhead of a bank license has been incurred, a single product strategy no longer makes sense. There is an observable trend of fintech firms seeking banking licenses, and new fintech firms entering the market as licensed neo-banks.

Payments

Payments are probably the financial activity most affected by innovation and have undergone radical changes from various perspectives. This transformation has been prompted by the adoption of new technologies and business models, the emergence of new market players, and changes in the structure of the market, and it is having a profound impact beyond the realm of payments by also affecting the real economy. Significant changes include:

- From a supporting function offered typically only by banks as part of a bundle of services and with comfortable profit margins, payments have become a standalone product. In other words, they have become a separate, identifiable service offered by a growing number of providers, including non-banks, exercising a downward pressure on fees and margins as well as an upward demand for quality.
- The consumer experience has been transformed to overcome long-standing barriers or frictions that had been deterrents to the use of digital payments, and also to meet new demands from payers and payees for increased speed and convenience and lower prices.
- In some cases, like in ride-hailing or meal-ordering apps, or in “one-click” online ordering, the purchase experience has been totally transformed by making the actual payment process “invisible” from the perspective of the customer.
- Payments are increasingly becoming a source and provider of data that is critical for differentiation against competitors and for the provision of other products and services, including, but not limited to, those offered by financial sector entities.
- Innovation in payments has also enabled and shaped up major developments in the real economy, like the surge of e-commerce—including transactional online services offered by governments—and in turn, new platform models, which have put additional demands on payment services.

While innovation in the area of retail payments has been prolific, it has not fully transmitted to specific payment streams like international remittances and other forms of cross-border payments, some types of government payments, and business-to-business (B2B) payments.³⁸ For example, the Committee on Payments and Market Infrastructures (CPMI) reports that cross-border payments lag domestic payments in terms of cost, speed, access, and transparency.³⁹ In the area of government payments, many EMDEs still have a long way to go in digitizing their payments and collections effectively, largely due to coordination challenges and other elements that slowdown the generalized use of payment innovations. In this area, however, the COVID crisis has favored an acceleration of these digitalization efforts, for example to facilitate the transfer of relief funds, while at the same time trying to ensure social distancing. Regarding B2B payments, this market segment has certain unique requirements like the linkage to invoicing processes and taxation, and payments tend to be for larger amounts. To date, these unique requirements have not been fully met.

38. There have been also some relevant developments in large-value payments, which have been less visible for non-payments specialists and the general population. These include the adoption of ISO 20022 message standards, cloud-based hosting of the solution and expanding access to large-value payment systems to participants other than banks.

39. CPMI (2020).

Credit

The available data suggest digital credit has grown significantly, driven by big tech firms most recently.⁴⁰

According to BIS credit statistics, in 2019, total credit to the non-financial sector from banks and other intermediaries was around \$185 trillion globally and \$60 trillion in emerging market and developing economies. Cornelli et al. (2021) document that, in 2019, credit provided by fintech firms had grown to an estimated \$296 billion globally. However, China, one of the leaders in fintech credit growth, imposed regulatory restrictions, resulting in a global decline in fintech credit to \$167 billion in 2019. Fintech lending continued to grow outside of China in 2018-2019, but the overall volume was lower due to the decline in China. In 2020, the biggest portion of the global decline was again in China, where fintech lending all but ceased with the closure of P2P platforms. Fintech credit volumes also fell in some other key jurisdictions, including the UK, Netherlands, Korea and India during the Covid-19 pandemic. Volumes rose however, in the US, where fintech platforms were able to participate in the Paycheck Protection Program.⁴¹ Meanwhile, credit provided by big tech firms reached in \$700 billion in 2020 and is growing fast in Asia and some countries in Africa and Latin America (see also the section below on *Platform models and embedded finance*).

Digital credit is driven by several supply and demand factors. Cornelli et al. (2020) find that both fintech and big tech credit tends to be higher in countries with higher levels of GDP per capita, with banking systems that are less competitive, have fewer regulatory restrictions in place, where the ease of doing business is greater, and investor protection disclosure and the efficiency of the judicial system are more advanced. Fintech credit is inversely related to bank branch concentration. They conclude that fintech and big tech credit are complementary to traditional forms of credit provision, rather than substitutes.

There are still sizable data gaps on digital credit provision. Many fintech credit providers, such as peer-to-peer and marketplace lending platforms, are not (yet) regulated and therefore not subject to regular reporting requirements. In addition, standard reporting requirements for more established, regulated financial institutions are not well-suited to separately capture their provision of digital financial services. For instance, it is hard to identify digitally originated loans extended by banks or the extent to which their loan underwriting and processing has migrated toward newer technologies.

Digital credit can help expand coverage to those with limited access to traditional sources of bank credit. For example, MYbank, an online bank serving micro and small enterprises in China uses e-commerce and digital payments data from Alibaba and Alipay and adaptable scoring and risk management to lend to small companies, many of which have limited access to bank finance. Research on lending to two million firms that borrowed from MYbank and from traditional banks between 2017 to 2019 found that MYbank's underwriting was less dependent on the financial cycle. MYbank expanded its customer base, and also partnered with 118 other banks to leverage MYbank's transaction data, automated processing, and risk management to lend to SMEs as they resumed operations.⁴²

Recent analytical work around credit during the COVID-19 pandemic recovery has pointed to the importance of fintech firms and other digitally-enabled lenders for economic resilience.⁴³ While traditional credit data became less useful during the pandemic, as credit histories did not reflect the pandemic impact on a borrower's finances, alternative data such as real-time transactions data from payments, inventory orders, and sales provide more visibility to current activity and cash flows. Fintech lenders and embedded finance providers with access to more timely data were well-positioned to lend into the uncertainties of the pandemic and the recovery phase. For example, Konfio, a Mexican fintech

40. 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 887.

41. The 2nd Global Alternative Finance Market Benchmarking Report - CCAF publications - Cambridge Judge Business School (fintech lending is referred to in that report as "debt-based alternative finance").

42. Finextra: [MYbank aims to bring inclusive financial services to 2,000 rural counties by 2025](#).

43. World Bank World Development Report 2022.

lender, adapted its credit algorithm to integrate data on the sectoral impacts of COVID-19 containment measures. The company was able to limit portfolio delinquencies and recalibrate underwriting to resume lending to both existing and first-time clients, growing new loan bookings from August 2020 onward and fully recovering pre-pandemic monthly disbursement levels by early 2021.

Remittances

The *Fintech Activity* note shows that technology can help reduce the costs associated with remittances on which many households in EMDEs rely. Remittances are small-value, cross-border, person-to-person transfers.⁴⁴ They are an essential source of income for millions of families across EMDEs. When regulators and policymakers create the right enabling environment, remittance service providers can leverage new technologies for the benefit of migrants and their families back home, for example, in the form of cost and time savings.⁴⁵ At the same time, the use of technology can help reduce the time it takes to transfer funds. This includes time spent for travel and wait times.

Mobile money for international remittance transfers can lower fees for sending remittances. GSMA (2016, 2018) notes the use of mobile technology reduces the cost of remittances by half. Based on the *Remittance Prices Worldwide* (RPW) database, the World Bank reports that as of Q4, 2020, the global average cost for digital remittances was recorded at 5.11 percent of the total amount sent, while the global average for non-digital remittances was 6.99 percent.⁴⁶

The speed of an international remittance transaction is another challenge for which innovative models can provide solutions. International remittances take longer to process, compared to domestic transfers, from end to end due to a variety of factors, including differences in daily cut-off times and closing times in different jurisdictions, time required for reconciliations, dispute resolutions, and AML/CFT checks to name a few. New technologies can offer innovative ways to overcome lengthy procedures for these purposes. The analysis shows that a larger share of services offered by digital MTOs is associated with lower average costs.

Crypto-Assets and Decentralized Finance

Technology is gradually blurring one of the last functional boundaries, the distinction between an individual and a financial intermediary. In a future of increased connectivity and decentralized finance, individuals may play hybrid roles, or even directly provide financial services. For example, if search and contracting costs are sufficiently reduced, an individual with savings to deploy need not place the deposit at a bank, but find one or more borrowers to lend directly. Distributed ledger technologies have already demonstrated the potential to transfer value without intermediaries. P2P marketplaces have demonstrated the feasibility, and the risks, of direct lending. Various platforms are developing blockchain-native assets that will enable investments without brokers or exchanges. The pieces are falling into place to enable intermediary-free finance to develop as another stream of financial services.

44. CPMI and the World Bank. 2007.

45. According to the RPW database, speed of an international remittance transaction varies by the type of the remittance service provider (RSP): While on average the speed of a transaction is 25 hours, it is close to five days (69 hours) for banks and less than one day (17 hours) for non-banks.

46. World Bank. 2020a. These costs are reported as the average costs of sending \$200. A digital remittance must be sent via a payment instrument in an online or self-assisted manner, and received into a transaction account, that is, a bank account, transaction account maintained at a non-bank deposit-taking institution (say a post office), or mobile money or e-money account.

Crypto-assets operate on open, decentralized networks which enable users to store, transfer, and receive funds with global reach without the need for financial intermediaries. In this context, crypto-assets have put a welcome spotlight on some deficiencies in the financial and monetary system. Some of these deficiencies are related to financial inclusion, financial literacy, citizen's trust in traditional financial intermediaries, cross-border payments and remittances, and macroeconomic policies. Crypto-assets adoption in EMDEs appears higher in countries with weaker macroeconomic and financial conditions and infrastructures, suggesting that crypto-assets could fulfill an important role if conventional alternatives are lacking or perceived as riskier, and where trust in public institutions and the financial sector is lacking. Crypto-assets face various technical challenges to reach scale, although the industry is attempting to overcome them through new technologies.

Crypto-assets are increasingly regarded and regulated as an emerging asset class. The *Digital Money* note argues that most crypto-assets⁴⁷ are currently very volatile and often considered an investment asset rather than a medium of exchange or store of value. The market value of crypto-assets exhibited various boom-bust cycles reaching an all-time high of \$2.8 trillion in November 2021. Some industry estimates suggest that 100-200 million people around the world own or use crypto-assets. A Statista household survey found that there are at least 20 countries where over 10 percent of the respondents owned or used crypto-assets in 2020, many in EMDEs. Several large banks, payment card companies, and payment processors have started to offer crypto-asset services.

Some crypto-asset platforms also allow for a complex, interoperable ecosystem of financial services to emerge, called decentralized finance (DeFi). These platforms can run decentralized applications, which offer a range of interoperable financial services such as exchange, trading, collateralized lending, borrowing, escrow, derivatives, and the creation of new crypto-assets with user-designed properties, all without the need for intermediaries.⁴⁸ These services can be used as building blocks and used by developers to create new services. Un-intermediated finance would render any individual with surplus funds a financial services provider. While the emergence of individuals as direct providers of financial services is nascent at present, it cannot be discounted as a potential influence on market structure in the future. Distributed ledger technology that underpins crypto-assets may have applications beyond finance including for digital ID, data exchange, and providing users with control over their own data.

In response to the high volatility of crypto-assets, so-called “stablecoins” have emerged as a new type of crypto-asset—no global stablecoin is currently operational. Stablecoins attempt to maintain a stable value relative to a fiat currency or a basket of fiat currencies. Some stablecoins such as Facebook's Diem (formerly Libra) may tap into large existing user bases of social media and e-commerce platforms, thus reaching global scale quickly. The G7 determined that: *“A global stablecoin for retail purposes could provide for faster and cheaper remittances, spur competition in payment services and thus lower costs, and support greater financial inclusion.”*

These developments have prompted central banks and public authorities to evaluate the issuance of digital variants of fiat currency—central bank digital currencies (CBDCs). This is because a large-scale shift to crypto-assets or stablecoins would have implications for, inter alia, financial stability and monetary sovereignty. CBDCs, unlike crypto-assets and stablecoins, would be a liability of the central bank and be a digital variant of fiat currency, freely convertible to notes and coins and commercial bank money at par and are legal tender. Central Banks and international bodies are actively deliberating on different design options for CBDCs and the discussions thus far categorize CBDCs by,⁴⁹ who has access (wholesale versus retail); whether there is an underlying account (account-based versus token versus DLT account); in the case of retail CBDCs, who manages the customer relationship (tier-1, as in central bank managing the

47. Crypto-assets are broadly defined as digital representations of value that can be used for payment or investment purposes or to access a good or service and rely on open-source distributed ledger (DLT) or similar technology through the internet. A distributed ledger is often referred to as a “blockchain”. See Glossary.

48. See for example Harvey, C. R., Ramachandran, A., and Santoro, J. 2021. “DeFi and the Future of Finance.” John Wiley & Sons and Schar, F. 2021. “Decentralized Finance: On Blockchain- and Smart Contract-Based Financial Markets.” FRB of St. Louis Review. (pp. 153-174).

49. CBDC—A Payments Perspective, World Bank. 2021.

relationship, versus tier-2, where licensed financial institutions manage the customer relationships); and scope of usage (domestic versus cross-border). To date The Bahamas, Eastern Caribbean Central Bank, and Nigeria have launched retail CBDCs which are account-based using a 2-tiered design and restricted to domestic use. China is conducting live testing on a retail CBDC and has made the same design choices. Several other countries are in advanced stages of issuing retail CBDC – for example, Jamaica and Ghana. While CBDC need not necessarily be built on decentralized architectures, they could nevertheless have a role in supporting the functioning of the DeFi services and provide an alternative to stablecoins and crypto-assets.

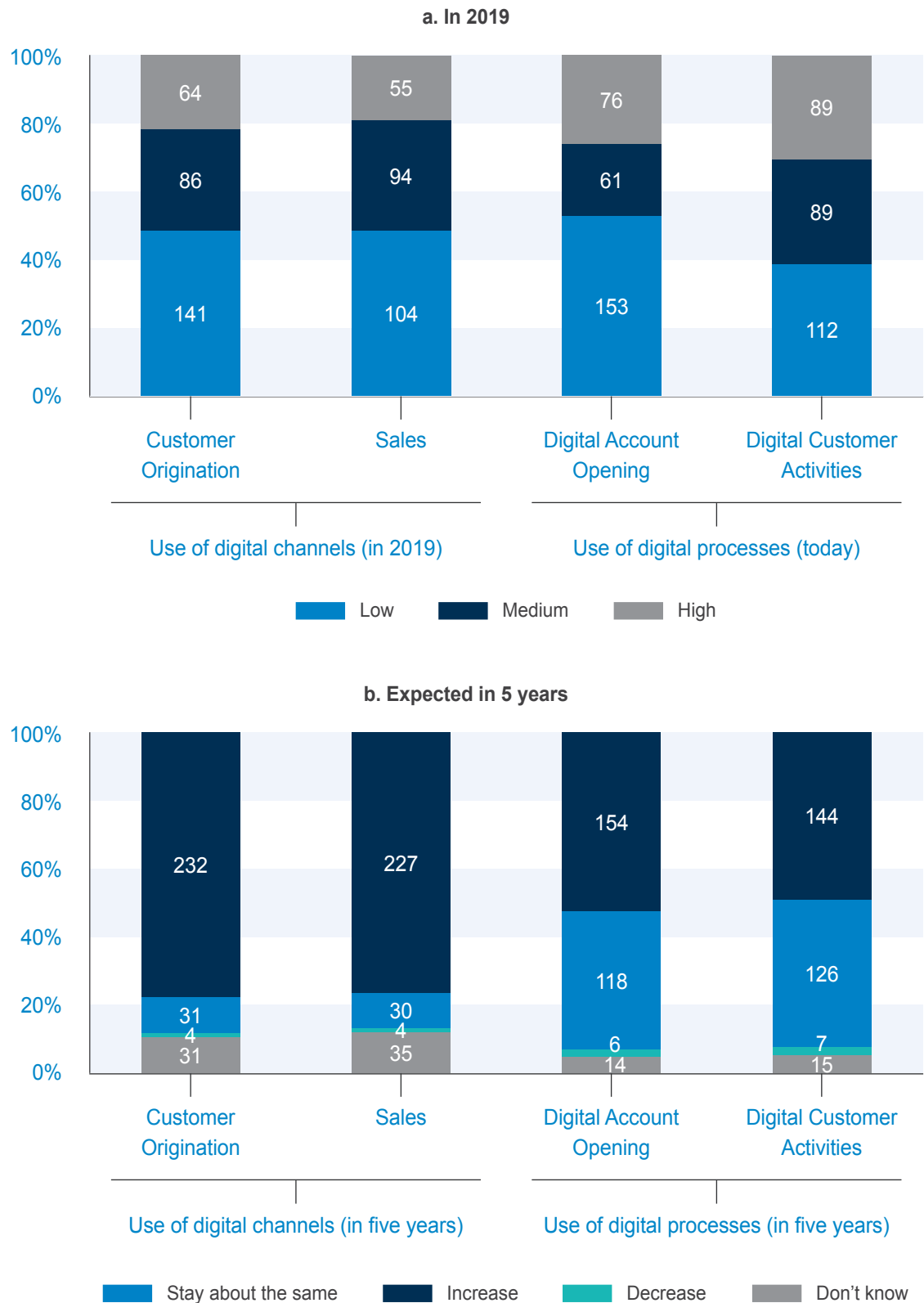
Cross-border payments service providers have emerged that use open-source technologies built on top of Bitcoin (that is, the Lightning Network). These providers aim to enable near-instant, mobile-to-mobile-based small-value transactions, perhaps at lower cost than existing solutions, using new, promising technologies. However, these technologies remain largely untested in a real-world environment at scale. Moreover, these services may raise various issues including liquidity, operational issues, consumer protection, and money laundering and terrorist financing risks.

Transformation of Incumbents and B2B Services

Incumbent financial institutions have also adopted new technologies and reconfigured their production of financial services to improve efficiency and compete with new entrants. The *Fintech Market Participants Survey* found that digital transformation is a strategic priority for the overwhelming majority of incumbents, to shed overhead costs and employees, improve products, and compete for consumer relationships. The pandemic increased the urgency of these efforts. Large banks tended to be ahead of smaller banks, and to feel that digital transformation was affecting their businesses in a positive way. This might be expected, given the resources required to take full advantage of digitization across channels, products, and processes. The divergence of banks by size also map to divergences across countries. Banks in EMDEs tend to face significant resource constraints. In particular, the skills required for digital transformation are in short supply in many emerging markets. Indeed, the *Fintech Market Participants Survey* responses confirmed that EMDE banks were less positive about how fintech and digital transformation were affecting their businesses. This is also consistent with the Global Patterns of Fintech Activity observation that there is a negative association of fintech activity and bank development, meaning banks in EMDEs may be facing more competition from fintech firms.

Digitization of channels and process is underway. *Fintech Market Participants Survey* respondents expect digital sales and customer origination to shift from 0-25 percent today to 50-100 percent within five years (figure 22). Similarly, internal processes are expected to be significantly digitized. However, half of banks and remittance operators, and 60 percent of MFIs and NBFIs, as well as payments operators, expect business to continue to be conducted largely through physical locations. Nevertheless, banks expect to continue serving customers through their own delivery channels while other providers look to more diverse channels and partners.

Figure 22. Use of Digital Channels for Sales and Customer Origination



Source:

In pursuing their own digital transformations, incumbents have become important consumers of B2B fintech and big tech services. These include cloud-based services provided by big tech firms to banks, as well as fintech service components (for example, loan servicing) that banks incorporate into their product offerings. There is a growing trend of banks and fintech firms cooperating to white-label or co-deliver fintech products; these partnerships enable the bank to short-cut its internal innovation cycles to deliver services to its customers, and the fintech to leverage an existing customer base at reduced acquisition costs.

Incumbents also continue to have a comparative advantage in managing complex balance sheets and regulatory compliance; as a result, many fintech and big tech firms work with banks to offer financial services. This is often necessary for consumer-facing (B2C) fintech and big tech firms to access the regulated financial system, for example to execute real-time payments. Depending on a fintech firm's business model and the local regulatory environment, customers may need to have a financial institution account to hold funds or the tech company may have to hold all customer funds in a bank trust account. The unbundling of payments, use of APIs, and open banking enables regulated banks to turn this into a business model, offering banking-as-a-service to enable non-bank providers to 'rent' licensed capabilities such as holding deposits, or providing balance-sheet capacity, linkage to payments infrastructure, and compliance services. The fintech firm can then focus on customer experience and service, and avoid having to obtain a license.

Financial Infrastructure Operators

In addition to banks, incumbent financial infrastructure operators are also deeply impacted by the ongoing changes. This is especially the case for international and domestic payment card networks and ACH service providers. *The Payments Note* observes that the business strategy of payment card networks and ACHs is evolving and they attempt to reinvent themselves and their business model along several key paths. Firstly, they try to become themselves operators of fast payment services. Second, they evolve into gateways and hubs for open banking and API-based services. Third, they position themselves as payment systems underpinning CBDCs, stablecoins and crypto-assets. Fourth, they introduce services for B2B payments, like Direct Corporate Access in ACHs and by adding additional services on top of existing card rails to carry the additional B2B information. Lastly, the international card networks in particular, are becoming white-label service providers for some cross-border payment services like remittances. Similarly, credit reporting infrastructures are foraying into provision of value-added services integrating alternative data, providing digital identity services, and becoming hubs for open banking.

Credit information systems are also transforming. Bureaus and registries are upgrading their infrastructure to handle new participants and larger volumes. They are increasingly adding alternative data to expand their coverage, for example, by collecting utilities payment histories which may include more individuals than have had prior access to a bank loan. At the same time, the proliferation of credit-relevant data other than traditional credit histories has fostered the entry of new credit information and credit-scoring providers. Some of these, for example, analyze telecom data and social media footprints to create a credit score. Others use transaction data from financial services, utilities, and other sources. According to one tally, there are 222 alternative data credit-scoring providers globally.⁵⁰

50. Tracxn. "[Top Alternative Credit Score Providers Startups](#)." April, 2021.

Platform Models and Embedded Finance

Scale and scope economies, along with network effects, play to the fundamental strengths of big tech companies. They have established customer bases, extensive customer data, and unique positioning to provide contextual finance. Platforms and other tech players can reduce customer acquisition costs, and leverage data for marketing and risk management, especially where they are mediating the underlying business transaction for which a financial service is required. More importantly, they can leverage their position as a business facilitator to enforce good behavior, and can potentially cross-subsidize the financial service from other income.

Early platform forays into financial services were in payments, and filled a gap in the online market. Ebay bought PayPal because there was no card acquiring business serving the individuals and small merchants trading on its platform; offering payments was necessary to grow the marketplace business. The same was true for Alibaba's introduction of Alipay, and the development of wallets by ride hailing firms such as Grab and GoJek in Southeast Asia. Having met a need within the platform, these payments businesses did not always charge for their services, since the platform derived income from the core business transaction that was being facilitated. Eventually they found traction and created synergies across a broader set of use cases. Payment services are increasingly seen as a service distinct from provision of an underlying transaction or credit account. This has enabled different trajectories for embedded payments, as exemplified by Amazon Pay, which executes payments for other e-commerce sites for Amazon customers. Amazon itself is the merchant of record working with a merchant acquirer to accept card payments, and most users in its core markets have credit/debit cards. Executing payments for Amazon sellers became another part of the overall marketplace offering. Providing Amazon Pay to other websites and online sellers⁵¹ is a reflection of Amazon's market dominance—"your customer is probably already an Amazon user so we have his/her payments information"—and consumer preferences for convenience and privacy.

Platforms and big tech firms are increasingly offering credit to their users, directly or via partners. A common use case is working capital for merchants selling through e-commerce platforms. Since the platform has extensive information about the merchant's prior sales, fulfillment record, customer satisfaction, and other data, it is in a position to predict cash flows and ability to repay. Since, it also is handling the merchant's revenues, it can take repayment for a loan out of future sales through the platform. In some cases, this embedded lending is done by the platform itself, and in other cases through partnerships with fintech lenders or banks. Another instance of embedded finance is buy-now-pay-later funding for consumers, which leverages the selling website's customer acquisition and data.

SME Finance

One important market segment that is benefiting from the digital transformation of finance (and of commerce more broadly) is the small and medium enterprise (SME) sector. Fintech can help address key barriers SMEs face in access to finance, particularly in EMDEs: high cost to serve, lack of credit history or collateral, and bankability, both in terms of registration, verification, and record keeping and in terms of financial literacy and capacity. As an example of the potential with respect to cost to serve, 90 percent of banks responding to the *Fintech Market Participants Survey* expect digital transformation to reduce costs of SME lending.

New entrants (fintech and big tech firms) are driving tailored customer-centric products and processes, and new business models that can compete with traditional players on price, convenience, and inclusivity. Banks and NBFIs are adopting new technology to compete, sometimes in partnership with fintech firms. A bank that successfully

51. Amazon Pay: [Let Amazon customers pay their preferred way without ever leaving your site.](#)

deploys technology to serve its customers better and more profitably will have lower unit costs and lower cost of capital, as well as more data to fine tune its algorithms, further reducing its credit costs. From the perspective of SMEs, new entrants offering tailored, focused products and large players improving their efficiency and pricing by leveraging technology all help improve access to finance.

To realize this potential, economies need adequate digital infrastructure, regulatory frameworks supportive of digital onboarding, new providers, and innovative products, and capacity building for SMEs. Promoting broad-based digitization of SME activities would not only improve entrepreneurs' efficiency and access to markets, but also reinforce improvements in SME registration and identity verification and create a foundation of business data that can be used for financing.

Appendix 3: Open Banking Framework in Select Countries

Country	Authority driving OB	Regulatory approach
Australia	Australia Competition and Consumer Authority	Mandatory
Brazil	Central Bank of Brazil	Hybrid (mandatory for larger banks and conglomerates and voluntary for the rest)
Canada		
Colombia	URF but Banco Central will implement	Voluntary
EU		Mandatory
Georgia	Central Bank of Georgia	
India	RBI/NPCI	Mandatory
Indonesia	Central Bank of Indonesia (BI) and OKJ	Voluntary (API standardization)
Malaysia	Bank Negara Malaysia	Voluntary
Mexico	CNBV and Banxico	Mandatory
New Zealand	Industry led supported by the Gov	Voluntary
Nigeria	Central Bank of Nigeria	Voluntary
Rwanda	Central Bank of Rwanda	
Singapore	Monetary Authority of Singapore (MAS)	Voluntary
The Philippines	Central Bank of the Philippines	To be determined

Table continued

Country	Authority driving OB	Regulatory approach
Turkey	Banking Regulatory and Supervisory Authority (BRSA)	Mandatory
U.K.	Competition and Markets Authority	Mandatory
U.S.	CFPB	Voluntary

Appendix 4: Principles for Ethical Use of AI and Data Analytics

Various principles are being developed to ensure the ethical use of AI and data analytics. Examples include:

- **European Commission.** The EC's guidelines on the ethical use of AI, which were issued in 2019 (since then updated in 2021), aim to maintain ethics in the use of technology, as government authorities and private companies explore opportunities and risks of this new technology. The seven key principles listed by the EU for ethical development of AI include ensuring human agency and oversight, privacy and data governance, non-discriminatory and non-biased algorithms, accountability in the systems, and robustness and traceability of AI systems. Privacy and data governance are listed by the EU among the key principles for the ethical development of AI. The principles state that besides ensuring full respect for privacy and data protection, adequate data governance mechanisms must also be ensured, considering the quality and integrity of the data, and ensuring legitimized access to data. It must be ensured that data collected about individuals will not be used to unlawfully or unfairly discriminate against them. It also requires that AI systems be protected against vulnerabilities that may lead to data poisoning and influence the data or the system's behavior. The document also states that considering the principle of proportionality between means and ends, AI developers should always prefer public sector data to personal data.
- **Monetary Authority of Singapore.** The Monetary Authority of Singapore's fairness, ethics, accountability and transparency (FEAT) principles to promote responsible use of AI and data analytics is another useful framework to govern the use of data. Some of the key principles include fairness, accountability (both internal and external) and transparency—specifically, data-driven models be regularly evaluated and validated to minimize data-driven biases, people be informed of the data being used to make decisions and how the data affect them, and taking into account verified relevant supplementary data provided by data subjects.

Appendix 5: Individual Executive Summaries from Supporting Papers

Data trends and market perceptions

1. Global Patterns of Fintech Activity and Enabling Factors (Fintech Activity note) by Tatiana Didier, Erik Feyen, Ruth Llovet Montanes, and Oya Ardic
2. Global Market Survey: Digital Technology and the Future of Finance Survey (Fintech Market Participants Survey) by Erik Feyen (World Bank), Harish Natarajan (World Bank), Guillermo Rabadan (World Bank), Robert Paul Heffernan (IFC), Matthew Saal (IFC) and Arpita Sarkar (World Bank)

Policy issues

3. Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy (Market Structure note) by Erik Feyen, Jon Frost, Leonardo Gambacorta, Harish Natarajan, and Matthew Saal
4. Regulation and Supervision of Fintech: Considerations for EMDE Policymakers (Regulation note) by Tatiana Alonso Gisbert, Pierre-Laurent Chatain, Karl Driessen, Danilo Palermo and Ariadne Plaitakis with contributions from Ana M. Carjaval and Matei Dohotaru
5. Financial Consumer Protection and Fintech: An Overview of New Manifestations of Consumer Risks and Emerging Regulatory Approaches (Consumer Protection note) by Gian Boeddu and Jennifer Chien

Specific fintech products

6. Innovation in Payments: Opportunities and Challenges for EMDEs (Payments note) by Dorothee Delort and Jose Antonio Garcia Garcia Luna
7. Fintech and SME Finance: Expanding Responsible Access (SME note) by Ghada Teima, Ivor Istuk, Luis Maldonado, Miguel Soriano, and John Wilson
8. What Does Digital Money Mean for Emerging Market and Developing Economies? (Digital Money note) by Erik Feyen, Jon Frost, Harish Natarajan, and Tara Rice

Global Patterns of Fintech Activity and Enabling Factors (Fintech Activity Note)

by Tatiana Didier, Erik Feyen, Ruth Llovet Montanes, and Oya Ardic

The objectives of this paper are to take stock of the available fintech-related data, to document patterns of fintech activity across the world, and to help identify enabling factors. Fintech has seen remarkable growth over the past few years and will likely continue to shape the financial sector in terms of products, business models, and industrial organization. Yet, measurement of fintech activity is challenging, complicated by both the lack of a widely accepted definition, as well as important data limitations.

This paper tackles this measurement challenge by leveraging a wide range of data sources and developing a novel, country-level index of fintech activity for 125 countries, covering the period 2014-2018. The index covers three dimensions of fintech activity: fintech firm creation and growth through the availability of early-stage equity financing; usage of fintech credit and digital payments—now the most commonly used digital financial services, especially in developing countries; and the usage of mobile distribution channels for financial services.⁵²

The fintech activity index is positively correlated with countries' overall level of economic development. For instance, high-income countries generally rank higher than middle- and low-income countries not only in terms of the aggregate fintech index, but also along its four constituent dimensions. However, significant variation across both regions and income groups persists, suggesting that other enabling factors matter.

This paper then uses the index to systematically analyze the association between fintech activity and a wide range of economic and technological factors in a multi-variate regression setting. Specifically, the paper explores the role of three broad set of enabling factors: basic foundations, including information and communications technology (ICT) and financial infrastructures; financial sector development, distinguishing between the development of the banking system and capital markets; and the enabling policy environment, capturing the legal and regulatory frameworks for digital financial services.

There are three key findings in this paper. First, the estimations show that fintech activity is positively associated with ICT and financial infrastructures, though the relevance of the latter varies across types of fintech services. Specifically, the evidence indicates that ICT payments infrastructure plays a more important role in the usage of digital payment services, whereas the development of credit information systems, a financial infrastructure, is more relevant for the usage of digital lending services.

Second, the analyses also show a robust negative association between fintech activity and bank development, consistent with the view that digital financial services may have more opportunities to develop in countries where the under- and un-served share of the market is relatively large. Countries with more stringent overall banking regulations exhibit subdued fintech activity, suggesting that this is linked to a less permissive environment for innovation and fintech entrants. At the same time, there is a higher prevalence of bank app downloads in countries with more stringent banking regulations, suggesting in these cases that the digital transformation is driven by incumbents. Importantly, the estimations also show that fintech activity is positively correlated with capital market development. These correlations stem from the development of digital financial services by institutions other than banks, such as fintech companies. The positive association with capital market development suggests that a supportive funding environment for fintech firms, especially start-up equity financing, can play an important role. For example, the mobile app data show that downloads of non-banking apps are significantly positively related to the development of capital markets but negatively associated with

52. Nascent, but rapidly evolving digital financial products and services such as central bank digital currencies, crypto-assets, stablecoins, and decentralized finance (DeFi) are beyond the scope of the current version of our index.

banking system development. The opposite patterns are observed for bank app downloads. The analysis thus supports the idea that the distinction between incumbent banks and fintech companies is particularly important when exploring the potential drivers of fintech activity.

Third, the empirical results are consistent with a high-quality policy environment as a necessary, but insufficient condition for fintech development. Other factors need to be in place as well for fintech activity to flourish. The degree of fintech activity is consistently on the low end of the distribution in countries scoring poorly on policy indices that capture the existence of legal and regulatory frameworks relevant for digital financial services. Whereas, it varies widely across countries scoring high on these indices. In fact, there are several countries that despite having a supportive enabling policy environment exhibit relatively low levels of fintech activity. Finally, regulation could have positive and stabilizing impact on fintech activity in the longer term. These benefits are not likely to be reflected in the analysis, given the relatively short time horizon.

Regarding the role of sector-specific legislation and regulations, our results show mixed patterns. While the existence of laws and regulations for e-money, digital IDs, and e-signatures—electronic know-your-customer (e-KYC) frameworks—tend to be positively associated with fintech activity, the coefficient on consumer protection tends to be negative. The results, however, are not as forceful as those related to the other set of enabling factors and may reflect the complexities of policy interactions, pre-conditions, and tradeoffs at different levels of fintech development as well as measurement challenges. Moreover, it is important to recognize that alternative policy combinations can promote innovation and foster fintech activity, with similar outcomes. Overall, the demands on the enabling environment will likely evolve as fintech activity develops. Finding the right balance between trade-offs at every stage of fintech development remains essential to promote activity and innovation while keeping excessive risks in check.

Finally, separate in-depth analyses documented in the appendices explore two additional topics: the impact of the pandemic on finance app downloads and the link between the digitization of remittances services and remittance costs. On the former, the paper's analysis of mobile app download trends indicates that the pandemic may have accelerated fintech adoption. Moreover, the evidence indicates that the strict social distancing practices, including government implemented containment measures such as lockdowns, quarantines, and travel restrictions required to mitigate the spread of the coronavirus, has amplified the use of digital financial services. On the latter, the results indicate that digital service providers may help lower the costs of cross-border remittances, a key financial service for households in many EMDEs. Specifically, the analysis shows that remittances costs are lower in corridors with a higher prevalence of digital service providers.

Global Market Survey: Digital Technology and the Future of Finance Survey (Fintech Market Participants Survey) by Erik Feyen, Harish Natarajan, Guillermo Rabadan, Robert Paul Heffernan, Matthew Saal, and Arpita Sarkar

Digital technologies have made an indelible impact on the provision of financial services by new entrants and incumbents alike. The World Bank Group conducted a global survey on fintech and digital transformation of a range of financial market participants. The survey sought to capture market perceptions of the impact of fintech and digital technology on:

- Market developments, including the impact, risks, and benefits of fintech and digital transformation.
- Evolution of consumer behavior, including consumer relationships with traditional and new financial service providers, and use of physical locations.
- Competition and market structure, including the perceived risk of losing customers, risks to profitability, potential to reduce costs, market concentration, competition, and outsourcing.
- Corporate strategy, including priorities at the board level, strategic fintech activities, challenges to digital transformation, and impact of COVID-19 on strategic priorities.
- Regulatory environment, including enabling environment for innovation for incumbents and new entrants, and whether regulatory framework and guidance are fit for purpose in key product areas.

During the period of May 2020 to February 2021, 330 market participants from 109 countries responded from May 2020 to January 2021. These included traditional banks, payments/remittance service providers, fintech firms, insurance companies,⁵³ non-banking companies, tech companies, telecom companies, industry associations, and other financial market players from countries in all six World Bank Group regions. The survey was updated to include questions on the impacts of the COVID-19 pandemic.

Consistent with other surveys conducted by the World Bank Group, IMF, and the Cambridge Center for Alternative Finance (CCAF), fintech and digital transformation, accelerated by the pandemic, was expected to increase in importance. This trend was largely welcomed by respondents⁵⁴ and seen as positive for financial services businesses. Key strategic priorities for firms included digitization of customer acquisition and account opening, creating new digital products, and transforming internal processes. More than 80 percent of respondents felt that the COVID-19 pandemic increased the need for fintech and digital transformation and made digitization in customer channels, product adaptation, and internal processes a strategic priority. There were differing expectations, often by type of respondent, on channels and customer preferences. Reduced entry barriers were expected to increase competition, yet except for NBFIs, most respondents expected markets to become more concentrated. Respondents were concerned about operational and cyber risks increasing as a result of fintech and digital transformation. The regulatory framework and guidance for fintech and digital transformation innovation could be improved, particularly with respect to remote onboarding and account opening, use of agents or third-party channels, and automation of new products.

This paper is organized as follows: Section 1 provides background on the survey's objective. Section 2 summarizes the demographics of survey respondents. Section 3 presents survey findings, organized according to the key topics covered by the questionnaire, from digitization trends to evolving customer needs to provider views on risk and regulation. Section 4 synthesizes this analysis and highlights six key themes that emerge:

53. This has been used as a generic term for insurers of all types

54. Unless specified otherwise, the term 'respondent' refers to the institutions that chose to respond to the specific question or questions being discussed.

1. **Digital transformation of financial services was pervasive, strategically imperative, and was accelerated by the COVID-19 pandemic.** 82 percent of all respondents across all types of institutions expected an increase in the digital proportion of key activities. Fintech and digital transformation were a strategic priority at the boardroom level for 82 percent of respondents. More than 70 percent of respondents indicated that the pandemic increased the need for digital transformation across customer channels, internal processes, and product adaption. Respondents expected digitization to deliver significant benefits to customers and the firms themselves.
2. **The future combines physical and digital aspects—“phygital.”** Digitization does not spell the end of physical infrastructure for financial services. Half of banks and remittance operators, and 60 percent of MFIs and NBFIs, as well as payments operators, expected business to be conducted largely through physical locations in the next five years. Banks expected to continue serving customers through branches and proprietary digital channels, while other providers looked to more diverse channels and partners.
3. **Customer relationships are changing, and incumbents and new entrants perceived customer relationship preferences very differently.** Who will “own” the consumer relationship is in flux, as is how the customer will be served. There were strong expectations that new types of providers—neo-banks, fintech firms, big techs, platforms, and aggregators—will dominate customer relationships. Even as banks continued to expect customers to have a single core relationship for their financial services, only 34 percent expected that to be with traditional banks.
4. **Banks and fintech firms did not see each other as competitors.** Respondents tended to see the greatest competitive threat coming from institutions that are similar to them. Banks mostly saw other banks and neo-banks as a bigger competitive threat than other fintech players. Fintech firms expected to compete with other new types of players such as big techs, platforms, or aggregators. While there may be distinct customer segments, given the broader ambitions of neo-banks, fintech firms, and incumbents, they cannot all be correct about what the majority of customers prefer.
5. **Most financial services will be more competitive, but also more concentrated.** 48 percent of respondents believed that competition will increase and barriers to entry will lower to a great degree while another 40 percent believed that this will happen to a moderate degree. Except for NBFIs, most respondents expected markets to also become more concentrated. This is consistent with a bifurcated market in which lower barriers to entry increases competition for smaller players or in specific segments such as those where NBFIs mainly operate, while economies of scale and network effects drive consolidation among large multi-product institutions such as big banks, larger fintech firms, and big techs.
6. **Regulatory and supervisory barriers to innovation need attention.** While the regulatory stance with respect to enabling innovation was seen as “about right” by a majority of respondents, in 9 out of 12 specific areas the regulatory framework and guidance was seen as lacking (that is, less than 60 percent of respondents agreed that it is fit for purpose).

Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy (Market Structure Note)

by Erik Feyen, Jon Frost, Leonardo Gambacorta, Harish Natarajan, and Matthew Saal

Financial intermediaries, such as banks and insurance companies, act as the middleman, linking together participants in financial transactions. Economic frictions in the form of information asymmetries and economic forces, such as economies of scale and scope, give rise to financial intermediaries and shape financial markets. While technological advances are not new to finance, digital innovation has brought major improvements in connectivity of systems, in computing power and cost, and in newly created and usable data. This digital innovation is shaking up financial intermediaries and the markets in which they operate.

Digital improvements have alleviated transaction costs and given rise to new business models and new entrants. As technology has increased information exchange and reduced transaction costs, the production of financial services could be disaggregated. Specialized players have unbundled financial services, allowing consumers to find and assemble their preferred suites of products.

Digital technologies are reshaping payments, lending, insurance, and wealth management—a process that the COVID 19 pandemic has accelerated. While this is making financial services in many economies more diverse, competitive, efficient, and inclusive, it may also increase concentration in markets. Economies of scale and scope, and network effects are present in many aspects of financial services production, including customer acquisition, funding, compliance activities, data and capital (including trust capital). Despite advances in technology, the costs of consumer search and assembly remain significant. These forces encourage re-bundling, and confer advantages to large multi-product providers, including technology (big tech) firms expanding into financial services from adjacent markets.

Moreover, new risks may arise to a range of key public policy goals. This paper draws on the underlying economics of financial services and their industrial organization to examine—with recent empirical evidence—the implications of digital innovation for market structure and attendant policies, including financial and competition regulation.

The organizing framework for the discussion is built around how economic frictions and economic forces, mentioned above, are driving market changes. For example, mobile phone use has surged globally; social and economic activity has shifted online—often to platform-based businesses—and new technologies like cloud computing have been widely adopted.

These improvements have alleviated frictions, blurred firm and industry boundaries, and given rise to new business models. New and often smaller and more specialized financial technology (fintech) players have unbundled services (see definitions). Economies of scale and network effects are strong in digital platforms and cloud computing. These scale effects, alongside economies of scope, encourage re-bundling, and allow large technology (big tech) firms and other new players to deepen inroads into core financial product markets. Available evidence shows that big-tech firms are rapidly expanding their footprint in finance and can use Big Data in ways that reduce the need for collateral. Meanwhile, incumbent financial institutions have adapted by adopting new technologies and by disaggregating their production of financial services to improve efficiency.

Digital innovation could drive a range of industrial organization outcomes. On the one hand, digital technology enables niche providers to reach a target customer base and be economically viable. On the other, customer acquisition, funding, “assembly,” and switching costs tend to favour larger providers. One possibility is a “barbell” shaped market, composed of a few large players and many niche players. The large, multi-product players could include traditional financial institutions, fintech and big tech firms—both incumbents and new entrants. Small players may include product, geographic or sector-focused fintech firms and incumbents.

While a “barbell” is not the only potential outcome, it is a central case, given the economic forces at work. It is a potential steady-state market structure as some participants leverage scale economies and network effects to grow larger, while innovation continues to result in new entrants. Market forces will push players to either hyper-focus or to aim for the large, multi-product type of service offering. However, atomization—the reduction of services to their most basic parts—may continue and re-aggregation could stall, leading to a market of more small players. Then again, limits on entry could result in a completely different market configuration. It’s difficult to predict.

This analysis gives rise to important policy issues regarding competition, regulatory perimeters, and ensuring a level playing field. Concentration risks may increase in the provision of financial services to end-users, and in the provision of infrastructure to financial institutions. Market structures that concentrate data and supercharge network effects could reduce intermediation costs and broaden inclusion. In many markets, however, the resulting market power might be detrimental. Competition regulators will have to strike a balance appropriate to the needs of their markets, since different societies will attach different preferences to market structure outcomes.

At the same time, financial regulatory authorities are working to manage policy trade-offs between stability and integrity, competition and efficiency, and consumer protection and privacy. The barbell outcome, for example, could present challenges in terms of stability with respect to both large and small payers. Widespread access to data raises privacy concerns. Regulators need to balance the innovation and efficiency brought by new entrants with the potential challenges for oversight, enforcement, and consumer protection. Emerging policy approaches—such as new anti-trust rules for the digital era, data mobility requirements, and data protection laws—may help mitigate the policy trade-offs. Yet the responsibility for these changes generally lies with different public authorities, and with legislatures.

Financial services are undergoing a profound transformation. To navigate this new territory effectively, and to balance the necessary policy goals, authorities will need to collaborate. This will need to occur both domestically—with cooperation between central banks, financial sector regulators, other industry regulators, and competition and data protection authorities—and across borders. Such collaboration can help to ensure regulatory consistency and peer learning within and between countries, and ultimately better development outcomes for the country.

Regulation and Supervision of Fintech: Considerations for EMDE Policymakers (Regulation Note) by Tatiana Alonso Gispert, Pierre-Laurent Chatain, Karl Driessen, Danilo Palermo and Ariadne Plaitakis with contributions from Ana M. Carjaval and Matei Dohotaru

Fintech is transforming the global financial landscape. It is creating new opportunities to advance financial inclusion and development in Emerging Markets and Developing Economies (EMDEs), but also presents risks that require updated supervision policy frameworks. Fintech encompasses new financial digital products and services enabled by new technologies and policies.⁵⁵ Although technology has long played a key role in finance, recent fintech developments are generating disruptive innovation in data collection, processing, and analytics. They are helping to introduce new relationship models and distribution channels that challenge traditional ways of financem while creating additional risks. While most of these risks are not new, their effects and the way they materialize and spread across the system are not yet fully understood, posing new challenges to regulators and supervisors. For example, operational risk, especially cyber risk, is amplified as increasing numbers of customers access the financial network on a 24/7 basis. Likewise, increased reliance by financial firms on third parties for provision of digital services, such as cloud computing, may lead to new forms of systemic risks and concentration on new dominant unregulated players such as big techs.⁵⁶

This note aims to provide EMDE regulators and supervisors with high-level guidance on how to approach the regulating and supervising of fintech, and more specific advice on a few topics. Preserving the stability, safety, and integrity of the financial system requires increased attention to competition and ensuring a level playing field and to emerging data privacy risks. As a general principle, policy response should be proportionate to risks posed by the fintech activity and its provider. While striking the right balance can be challenging in the absence of global standards, the IMF-World Bank Bali Fintech Agenda (BFA), along with guidance by Standard Setting Bodies, provides a good framework for reference.

A sound policy design must start with assessment of the fintech landscape, its risks and regulatory gaps. Simplicity and pragmatism—for example combining simple regulations with supervisory judgment—increases the odds of successful policy. In practice, this will mean different things, depending on local context. In many cases, a clarification or review of existing frameworks will be sufficient and is easily done through enhanced supervisory guidance. In others, a full regulatory overhaul might be required. In some systems, an activities-based, technology-neutral approach, based on the function of the financial service can help balance stability and innovation goals. In others, a combined approach, taking into account the activity and the entity, might be necessary to ensure financial stability. In any case, there needs to be clear definition of which activities are under the regulatory perimeter and which requirements apply, including the need for licenses. Some fintech activities will require licences with integrity (AML/CFT) and conduct requirements. The introduction of data protection provisions in licensing frameworks is common. Activities that could potentially pose risks to stability should face prudential requirements.

Competition and inclusion objectives will become more relevant from a financial policy view, given the growing interdependencies and trade-offs with core priority mandates of preserving stability, integrity, and safety of the financial sector. The multiplicity of new entrants and the potential for dominant players (for example, incumbents, big techs, platforms) and first movers (for example, M-Pesa) to create barriers and generate distortions has led to an increased recognition of the strong links between inclusion, competition, and financial stability. Indeed, a targeted participation by

55. According to the Bali Fintech Agenda and the Financial Stability Board.

56. According to the FSB, big tech firms are large companies with established technology platforms, such as Alibaba, Amazon, Apple, Baidu, eBay, Facebook, Google, and Microsoft. Big techs that offer financial services are a subset of fintech firms—a broader class of technology firms (many of which are smaller than big tech firms) that offer financial services.

financial service authorities in competition policy matters is increasingly being observed in EMDEs. The potential role of prudential and conduct regulation in mitigating barriers to market access and reining in abusive dominant practices should not be understated.

Cooperation, both interagency and cross-border, can help in the design and implementation of a sound supervisory response to fintech, which can be particularly challenging for EMDE countries suffering from supervisory capacity constraints or juggling competing policy priorities. An effective supervisory function for fintech activities is as essential as an appropriate regulatory regime. Supervisory processes and methods may need significant changes. Supervisors' knowledge, skills, and tools should keep pace with the speed of innovation and related risks, including cyber threats. Building proper expertise is crucial and suptech and regtech solutions could be excellent catalysts for this. Fintech is cross-sectoral and cross-country, making cooperation among agencies at the national and international levels essential for sound supervision. While many supervisors in G20 EMDEs participate in international fora, smaller jurisdictions may need to rely on International Financial Institutions (IFIs) and other available channels—for example, Global Financial Innovation Network (GFIN)—to raise issues, keep abreast of global developments, and exchange best practices. Involving the industry in fintech policy coordination efforts in a responsible and transparent way also appears increasingly relevant in areas such as cybersecurity, data, payments and securities, and for the design and implementation of regtech and suptech solutions (Appaya et al., 2020).

Further, authorities need to ensure that client funds are well preserved and that proper wind-down mechanisms are in place for systemically relevant firms operating in fintech. For crisis-management, fintech providers should be treated the same as their peers in traditional finance. For E-Money Institutions (EMIs) and payment institutions, regardless of their size, mechanisms should be established to require adequate ring-fencing of client funds and proper segregation, preferably by keeping them in government securities or deposited with the central banks. Where this is not feasible, segregation could be done by requiring that the funds are deposited with commercial banks, although this bears the risk of the commercial banks' failure, in which case the reserves could be lost. To mitigate this risk, some countries extend deposit-insurer protection to EMI customers, although challenges remain for the implementation of such protection, including that it would not cover the risk of misappropriation or fraud by the EMI as the EMI would not be a direct member of the deposit insurer. Other jurisdictions require that the EMI becomes a direct member of the deposit insurer—thus covering losses due to fraud or misappropriation. But this might clash with the purpose of a deposit insurance and impose costs that are not compatible with EMI business models or pose operational challenges that may render them ineffective.

Reaping the benefits from fintech in a sustainable and durable way will require adapting and strengthening financial-policy frameworks. Policymakers need to put in place a timely and proportionate regulatory and supervisory approach to managing financial risks arising from fintech. Ensuring financial stability, safety, and integrity will remain the core mandates, and these can, in turn, contribute to sustainable development amid healthy innovation and increased competition. Assessing the fintech landscape and related risks is a prerequisite to identifying regulatory gaps at an early stage. Then, authorities can set clear policy goals with a priority on surveillance and oversight mandates. As operational risks are amplified, defining a clear strategy for promoting operational resilience is important. Fintech-related changes may also require financial supervisors to scale up capacity and resources to meet the specific challenges posed by fintech, including through use of regtech and suptech solutions. Domestic and international cooperation is essential to successfully manage cross-sectoral risks, while achieving the benefits of fintech. And if an e-money institution fails, authorities should be well prepared by establishing safe mechanisms to protect customers' funds and to wind down systemic fintechs.

Financial Consumer Protection and Fintech: An Overview of New Manifestations of Consumer Risks and Emerging Regulatory Approaches (Consumer Protection note)

by Gian Boeddu and Jennifer Chien

Fintech⁵⁷ is increasingly recognized as a key enabler worldwide for more efficient and competitive financial markets, and for expanding access to finance for traditionally underserved consumers. As noted in the Bali Fintech Agenda,⁵⁸ launched in October 2018 by the World Bank Group (WBG) and the International Monetary Fund (IMF), fintech can support economic growth and poverty reduction by strengthening financial development, inclusion, and efficiency. The critical challenge for policy makers is to harness the benefits and opportunities of fintech while managing its inherent risks.

Some of these risks are new. But many represent new manifestations of existing risks due to the technology that supports and enables fintech offerings, from new or changed business models, product features, and provider types, and from greater consumer accessibility to sometimes unfamiliar or more complex financial products.⁵⁹

For example, a rapid expansion of the peer-to-peer lending (P2PL) market in China in the first half of the 2010s was followed by significant platform collapses, incidents of fraud, and platform operator misconduct, which caused significant losses to consumers.⁶⁰ While digital microcredit has expanded access to credit in some developing economies, countries such as Tanzania and Kenya have seen large numbers of borrowers unable to repay loans due to irresponsible lending practices.⁶¹ Similarly, while there was significant uptake of electronic money (e-money) in many developing markets, this has been accompanied by a rise in a variety of risks for consumers, including potential loss of funds due to fraud and unscrupulous fee-charging. Such negative experiences, in addition to causing direct harm to consumers, may also lead to greater mistrust of fintech and the financial sector, overall.

The COVID-19 pandemic has further accelerated the widespread transition of consumers to digital financial services and fintech, highlighting their significant benefits while also demonstrating how risks to consumers can increase in times of crisis and economic stress. For example, reports from Indonesia indicate that individual lenders/investors have been adversely affected by risky loans made through P2PL platforms, as have been borrowers who obtained such loans, and are now struggling to get lenders/investors to restructure them.⁶² Significant numbers of low-income consumers have faced difficulty repaying existing debts due to the pandemic.⁶³ Small enterprises have been severely affected by widespread closures and safety measures to slow the spread of COVID-19, thus decreasing enterprises' profitability and impeding repayment obligations.⁶⁴ This in turn exposes their investors to increased risk of loss from their investments. In addition, significant increases in fraudulent app-based digital microcredit lenders have been observed during COVID-19 lockdowns.⁶⁵

Authorities responsible for financial consumer protection (FCP) regulations are increasingly faced with the challenge of developing or adapting regulations that may be necessary to address risks to consumers generated by fintech. The task of regulators in developing countries is even more difficult if they tackle this new challenge while

57. For the purposes of this note, *fintech* refers to advances in technology that have the potential to transform the provision of financial services, spurring the development of new business models, applications, processes, and products. See World Bank Group and International Monetary Fund, *Bali Fintech Agenda*, 12.

58. World Bank Group and International Monetary Fund, *Bali Fintech Agenda*.

59. For an overview of risks and benefits in a digital financial services context, see G20/OECD Task Force on Financial Consumer Protection, *"Financial Consumer Protection Policy Approaches."* 12–14.

60. See, for example, Duoguang, "Growing with Pain," 42; Owens, "Responsible Digital Credit," 8–9; Huang, "Online P2P Lending," 77; Hornby and Zhang, "China's Middle Class."

61. For example, a 2017 MicroSave study found that 2.7 million Kenyans were blacklisted in credit reference bureaus in the past three years; 400,000 of these for amounts of less than \$2. See MicroSave, "Where Credit Is Due."

62. See, for example, Faridi, "P2P Fintech Lending Sector in Indonesia."

63. For example, 76 percent, 80 percent, and 89 percent of low-income survey respondents in Ghana, India, and Kenya, respectively, indicated they were late in making loan repayments since the pandemic began. See BFA Global, "Dipstick Surveys."

64. See, for example, Gibbens, "Helping Small Businesses."

65. <https://www.centerforfinancialinclusion.org/combating-the-rise-in-fraudulent-fintech-apps>.

having to implement a baseline FCP regulatory framework.⁶⁶ In a recent survey, regulators identified their limited internal technical expertise as the foremost impediment to regulating and supervising “alternative finance” (such as P2PL and equity crowdfunding) effectively.⁶⁷

This note provides (1) an overview of new manifestations of consumer risks that are significant and cross-cutting across four key fintech products: digital microcredit, P2PL, investment-based crowdfunding, and e-money;⁶⁸ and (2) examples of emerging regulatory approaches to target such risks. This note is based on a more detailed recently-published WBG Policy Research Paper titled *Consumer Risks in Fintech—New Manifestations of Consumer Risks and Emerging Regulatory Approaches*. The research paper delves more deeply into each of the four key fintech products and their associated risks. The appendix provides an overview of product-specific risks for which more information can be found in the research paper.

The primary focus and objective of this note, and the paper on which it is based, is to inform authorities’ development of regulatory policy. The examples included here are intended to assist regulators considering potential FCP regulatory approaches to fintech. However, it is hoped that the discussion of manifestations of consumer risks in a fintech context can also assist authorities with related key areas, such as market conduct supervision.

The key consumer risks and corresponding regulatory approaches discussed in this note include the following:

- **Factors, such as the novelty and opaqueness of fintech business models, responsibilities of fintech entities’ in the context of those business models, and a lack of consumer understanding of the new offerings can lead to heightened risks of fraud or misconduct by fintech entities or third parties.** Platform finance (P2PL and investment-based crowdfunding) poses risks to consumers; both lenders/investors and borrowers. Lenders/investors may face losses due to the conduct of platform operators or related parties, such as fraudulent lending or investment opportunities, misappropriation of funds, or facilitation of imprudent lending or investment to generate fee revenue for the operator to the detriment of consumers who will ultimately bear resulting losses. Consumers borrowing from such platforms may similarly suffer harm from the resulting imprudent lending. Holders of e-money face risks related to agent misconduct, including charging of unauthorized fees, splitting transactions to earn more commissions, and “skimming” into agent accounts. Regulatory approaches to addressing such risks include: vetting of fintech entities during the authorization stage; risk management and governance obligations for platform operators; imposing clear responsibility and liability on providers for the conduct of persons acting on their behalf; placing targeted obligations on platform operators to safeguard consumers’ interests regardless of business model (such as requiring P2PL platform operators to undertake creditworthiness assessments even if they are not themselves the lender); warnings and provision of other key disclosures to consumers regarding the risks associated with fintech products; and segregation of client funds.
- **Certain characteristics of fintech business models can lead to conflicts of interests between consumers and fintech entities.** For example, business models heavily dependent on fees generated by new lending business can give rise to perverse incentives for fintech entities to act in a manner inconsistent with the interests of their consumers, such as P2PL platforms or digital microcredit providers focusing on loan quantity over quality to maximize fee-related returns. Such risks can be exacerbated in markets where fintech entities are attempting to grow their revenues and size quickly. Potentially harmful conflicts can also arise where fintech entities are empowered to take decisions affecting the risk of loss on loans, but where that risk is borne by consumers—such as a P2PL or crowdfunding platform operator assisting with loan or investment selections without performing adequate due diligence. Corresponding regulatory

66. For an overview of key elements of an FCP regulatory framework (being an element of a broader legal and supervisory framework for FCP), see, for example, World Bank Group, *Good Practices*, 14, 68, 102, and 140.

67. World Bank Group and CCAF, *Regulating Alternative Finance*, 63.

68. Selected as examples of fintech offerings that may address some of the most basic needs of first-time, and thus inexperienced, financial consumers—namely, making payments, borrowing, or saving or investing money—as well as representing different stages in the development of fintech product offerings and corresponding regulatory and policy frameworks that surround them. See section 2.2 for definitions of these terms as used in the paper.

approaches include placing positive obligations on fintech entities to manage and mitigate conflicts of interest, to act in accordance with the best interests of their consumers, to undertake adequate assessments regardless of business model, and to prohibit business arrangements that encourage conflicted behavior.

- **Consumers may face a heightened risk of adverse impacts due to platform or technology unreliability or vulnerability.** Consumers may be more vulnerable to cyber fraud when acquiring fintech products than when accessing financial products through more traditional channels as interaction with providers is largely or exclusively via digital and remote means. Platform or other technology malfunctions can have adverse impacts on consumers ranging from inconvenience and poor service to monetary loss and loss of data integrity, the risk of which may increase due to heavier reliance on automated transaction processing. Regulatory approaches to addressing such risks include specific obligations on fintech entities to address technology and systems-related risks and risks associated with outsourcing.
- **Some fintech entities may be at greater risk of business failure or insolvency than established financial service providers (FSPs), due to inexperience, untested businesses, and market factors affecting long-term viability.** This can mean that consumers, whose funds are held or administered by a fintech entity, face correspondingly greater risk of loss if the provider becomes insolvent or the business ceases to operate. Consumers may risk losing their committed loan principals and investment funds or repayments and earned investment returns that are being held or administered by a P2PL or crowdfunding platform that fails. Insolvency of e-money issuers or banks holding e-money floats similarly puts client funds at risk, especially where there is no deposit insurance. Regulatory approaches to address such risks include requirements for client funds to be segregated from other funds held by a fintech entity and requiring that fintech entities have in place business-continuity and resolution arrangements.
- **The digital environment poses inherent challenges for disclosure and transparency, amplified by the novelty of fintech product offerings and consumers' lack of experience with such products.** Information provided via digital channels may not be appropriately formatted to assist in understanding or retention by consumers. Poor design of user interfaces may hamper consumer comprehension or exploit behavioral biases by concealing or underplaying "negative" aspects such as risks and costs. Fintech can also give consumers access to products, such as P2PL or crowdfunding investment opportunities, to which they may previously have had limited or no exposure, thus making clear and understandable information even more essential for good decision-making. Approaches to address such issues include requirements to disclose key information in a consistent and clear format, on a timely basis, and in a manner that can be retained by consumers. Behavioral insights can also be utilized to disclose information via digital channels in a manner that aims to increase the likelihood of consumer comprehension.
- **Consumers face potentially heightened risks when acquiring fintech products due to their lack of sophistication or inexperience.** With the development of fintech, consumers increasingly have access to novel and complex financial products, but they may lack the knowledge or experience to assess or use these products properly. For example, platform finance enables more individuals to act as investors and lenders. This has positive implications for financial inclusion but can present enhanced risks for ordinary consumers new to assessing more complex opportunities. Potential regulatory approaches include setting limits on individual investments, such as overall caps on how much an individual may borrow through a P2PL platform or how much money a company can raise on a crowdfunding platform, or limitations on specific types of investors or exposures; targeted warnings to potential investors; requiring consumers to confirm that they understand the risks they are undertaking; and cooling-off periods. Risks may also arise with respect to digital microcredit products being offered to consumers that are unsuitable and unaffordable. Regulatory approaches include requiring effective creditworthiness assessments and applying product design and governance principles, particularly where automated credit scoring is utilized.
- **Use of algorithms for consumer-related decisions is becoming particularly prevalent in highly-automated fintech business models.** Consumers may face a range of risks as a result, such as discriminatory or biased outcomes. Emerging approaches in this context include applying fair treatment and anti-discrimination obligations

to algorithmic processes; putting in place governance frameworks that require procedures, controls, and safeguards on the development, testing, and deployment of algorithms to ensure fairness; auditing requirements; and providing consumers with rights regarding how they or their information may be subjected to algorithmic decision-making.

It is not the intent of this note to suggest that all risk mitigants it discusses should be implemented. For any regulator contemplating implementing the kinds of regulatory measures discussed in this note, it will be important to prioritize and take a risk-based approach, to tailor regulatory approaches to country context, and to balance the need for consumer protection with the resulting impact on industry and market development and innovation. It would not necessarily be advisable for a country to implement all of the regulatory measures discussed in this note immediately or to transplant approaches from other jurisdictions without adjustment. This note also summarizes a range of key implementation matters for regulators to consider.

Innovation in Payments: Opportunities and Challenges for EMDEs (Payments Note)

by Dorothee Delort and Jose Antonio Garcia Garcia Luna

The global economy is undergoing a rapid digital transformation that is changing many conventional notions about our behavior and preferences. This includes the way in which we—as consumers, as businesses, or in interactions with government—seek out goods and services and pay for them or how we receive money from others or transfer it to family or friends. As the payments industry undergoes radical changes due to digital transformation, users, providers of payment services, and regulators are adapting to the new dynamics at varying paces.

This note discusses the most significant innovations in payments and their key impacts and implications on users, banks and other payment service providers, regulators, and the overall structure of the payments market. The note places special emphasis on how Emerging Markets and Developing Economies (EMDEs) can reap the benefits of payment innovations in terms of costs, convenience, accessibility, and inclusion for individuals and firms, and allow them to leapfrog development of their payments markets and effectively support economic activity.

Payments are probably the financial activity most affected by innovation, undergoing radical changes from various perspectives. This transformation has been prompted by the adoption of new technologies and business models, by the emergence of new market players, and by changes in the structure of the market. This is having a profound impact beyond the realm of payments and is also affecting the real economy. Changes are significant.

- Payments have become a standalone product, no longer just a supporting function typically offered only by banks as part of a bundle of services and with comfortable profit margins. In other words, payments have become a separate, identifiable service offered by a growing number of providers, including non-banks, exercising downward pressure on fees and margins and upward demand for quality.
- The consumer experience has been transformed as long-standing barriers or deterrents to the use of digital payments are gradually being overcome, helping meet new demands from payers and payees for increased speed and convenience and lower prices.
- In some cases, as with ride-hailing or meal-ordering apps or “one-click” online ordering, the purchase experience has been totally transformed by making the actual payment process “invisible” from the customer’s perspective.
- Payments are increasingly becoming a source and provider of data that is critical for differentiation against competitors and for the provision of other products and services, including—but not limited to—those offered by financial sector entities.
- Innovation in payments has enabled and shaped major developments in the real economy, like the surge of e-commerce—including transactional online services offered by governments—and, in turn, new platform models that have placed additional demands on payment services.

Competition in payments has increased and is only intensifying, but may paradoxically lead to renewed concentration and an oligopolistic equilibrium. In essence, payments may evolve once again into a concentrated market served by a relatively limited number of providers. Unlike in the past, these providers could be technology giants and/or large telecommunication firms, rather than banking institutions. The consequences and challenges of this potential outcome are not fully understood.

While innovation in the area of retail payments has been prolific, it has not fully transmitted to specific payment streams like international remittances and other forms of cross-border payments, some types of government payments, and business-to-business (B2B) payments.⁶⁹ For example, the Committee on Payments and Market Infrastructures (CPMI) reports that cross-border payments lag behind domestic payments in terms of cost, speed, access, and transparency.⁷⁰ In the area of government payments, many EMDEs have a long way to go in digitizing their payments and collections effectively, largely due to coordination challenges and other elements that slow down the general use of payment innovations. Here, however, the COVID crisis has accelerated digitalization efforts, for example to facilitate transfer of relief funds while trying to ensure social distancing. Regarding B2B payments, this market segment has certain unique requirements like linkage to invoicing processes and taxation, and payments tend to be for larger amounts. To date, these unique requirements have not been fully met.

Innovations in payments and their consequences on service providers and the overall payments market are also proving to be a unique challenge for central banks in their various statutory roles in payments.⁷¹ The regulatory and oversight roles of central banks are already being challenged by the changes in the structure of the payments market resulting from innovations. Furthermore, innovations may even disrupt the traditional divide between central bank money and commercial bank money, and therefore impact all aspects of the central bank's mission, beyond its mandate on payments, including monetary policy and financial stability. Central banks have no choice but to introduce changes in their own work processes and procedures, build new capacities and, more generally, rethink their approach to money. Their role is not diminished by innovation in payments; it is, on the contrary, made even more critical.

EMDEs can greatly benefit from many of these innovations but will need to carefully consider their multiple facets and implications and develop policies and institutional capacities accordingly. EMDEs should continue to create an enabling environment for innovation in their financial sector, fostering new products and providers while managing risks and protecting consumers. At the same time, they should not write off proven strategies and methods to accomplish important objectives like financial inclusion and stability. In any case, central banks and other regulators should be duly equipped and prepared to support their country's public and private sector actors so that they can maximize gains from the new reality.

***Innovation in payments can be characterized on three levels, how it materializes, its structural impact, and how the central bank, as payments authority, needs to adapt.** The main pillars of innovation in payments include: i) changes to the way payment services are linked to an account; ii) changes to the systems that process payment transactions; and, iii) changes in the way consumers interact with payments and the business model of payment service providers. Thanks to innovations like mobile wallets or super apps—combined with fast payments, APIs, and other technologies—customers now find it more convenient and less costly to make and receive digital payments, while enjoying a smoother user experience. At the same time, innovations are also redefining business models for payments, which in turn is having far-reaching consequences for the very structure of the payments market.*

***The most conspicuous effects of innovation on the structure of the market have been its impact on competition by opening up the payments market to non-banks, by putting downward pressure on payment service fees, and by making real-time payments the new normal.** While new entrants challenge incumbents,*

69. There have been also some relevant developments in large-value payments, which have been less visible for non-payments specialists and the general population. These include the adoption of ISO 20022 message standards, cloud-based hosting of the solutions and expanding access to large-value payment systems to participants other than banks.

70. CPMI (2020).

71. These include being operators of payment systems, supervisors of payment services providers, catalysts for change, and overseers of the National Payments System (NPS), which encompasses payment systems, payment services, and payment instruments.

innovation could end up having a paradoxical, centralizing effect and a tendency to increase concentration, with the major transformation being the shift of dominant market positions from incumbents to big techs. In addition to banks, other payments ecosystem players are deeply impacted by the ongoing changes, and it is especially the case for international and domestic payment card networks and ACH service providers. Government agencies are also significantly affected by the wave of innovation in payments: for interactions with citizens through the provision of government services and programs that involve making payments.

Innovation in payments challenges central banks in their typical roles vis-à-vis payments; that is, as operators, overseers, regulators, and catalysts for change. They also need to move beyond their typical mandates on payments as innovations continue to redefine money. The combination of traditional and new risks and causes for potential market failures calls for central banks to reassess and renew, not just policies, but also their internal organization, activities and tools, and heighten their level of collaboration and cooperation with authorities and stakeholders.

-
69. There have been also some relevant developments in large-value payments, which have been less visible for non-payments specialists and the general population. These include the adoption of ISO 20022 message standards, cloud-based hosting of the solutions and expanding access to large-value payment systems to participants other than banks.
70. CPMI (2020).
71. These include being operators of payment systems, supervisors of payment services providers, catalysts for change, and overseers of the National Payments System (NPS), which encompasses payment systems, payment services, and payment instruments.

Fintech and SME Finance: Expanding Responsible Access (SME Note)

by Ghada Teima, Ivor Istuk, Luis Maldonado, Miguel Soriano, and John Wilson

Small and medium enterprises (SMEs) represent the economic backbone of most developed and emerging countries. Globally, SMEs account for more than 90 percent of all businesses and more than 50 percent of employment. SMEs are also significant contributors of economic activity, representing on average 60 - 70 percent of the GDP of most countries worldwide.

SMEs play a major role in the economy, however their lack of access to finance in many cases is a critical barrier for them. There are many reasons preventing SMEs from obtaining adequate access to finance. These include, higher cost to reach and serve SMEs relative to the financial service revenue potential, information asymmetries that affect the availability of financial and credit data needed to assess their creditworthiness, the lack of collateral, the lack of financial literacy and difficulties in registration and verification.

Digital financial services (DFS) can help close the financing gap for SMEs, by providing access to alternative sources of funding and improving access to traditional players by enabling new digital products and process automation. Digitization and automation make the financing process more efficient, thereby lowering costs. The use of alternative data sources and Big Data analytics provides additional information sources to the credit risk-assessment process, allowing SMEs that were once unable to obtain finances to gain access. New business models, such as the sharing economy, e-commerce, digitization of SME-business processes, and open banking and APIs, provide rich data on SME activities and cashflows. This enables DFS and helps SMEs obtain access to financial products.

Globally, millions of small businesses are at risk of closing permanently and/or have suffered massive losses due to the COVID-19 pandemic. In a crisis, SMEs are more vulnerable in terms of access to finance when compared to large corporations. Speed of execution is critical for the provision of government relief funds to SMEs; digital financial products are essential to support SMEs during the COVID-19 pandemic.

However, there are obstacles and challenges which make it difficult for SMEs to fully adopt digital financial products. These are the main areas where challenges have been identified: digital financial literacy and awareness of DFS, digital infrastructure, financial supervision and regulation, identity, and data privacy and data protection. Some of the issues are more prevalent in emerging markets, which have less developed digital infrastructure, systems and processes.

Policy and regulatory approaches can facilitate access to finance for SMEs through DFS. Foundational elements where policy can have a positive impact include:

- Digital financial education programs for SMEs highlighting DFS awareness;
- Affordable digital infrastructure that fosters widespread internet access and usage, along with robust cybersecurity frameworks;
- Financial regulatory frameworks that encourage financial innovation while minimizing the risks created by digital financial products;
- Robust, secure and universally accepted company identification/registration frameworks for SMEs, and
- Adequate data protection and data privacy regulations.

In addition, policy and regulatory recommendations that are specific to digital financial products for SME financing can be classified around the following themes:

- a. Promote the digitalization of SMEs' operations, improve the availability of SME information, expand credit information sharing and support efficient and widely accessible digital payment systems;

- b. Develop modern credit infrastructure frameworks to support the introduction of Fintech asset-based lending products for SMEs;
- c. Support the growth and development of debt and equity capital platforms to improve SME access to finance through the establishment of regulatory frameworks that balance innovation with investor/consumer protection.

What Does Digital Money Mean for Emerging Market and Developing Economies? (Digital Money Note) by Erik Feyen, Jon Frost, Harish Natarajan, and Tara Rice

Physical cash and commercial bank money are dominant vehicles for retail payments around the world, including in emerging market and developing economies (EMDEs). Yet payments in EMDEs are marked by several key deficiencies—such as lack of universal access to transaction accounts, widespread informality, limited competition, and high costs, particularly for cross-border payments. Digital money seeks to address these deficiencies.

This note categorizes new digital money proposals. These include crypto-assets, stablecoins, and central bank digital currencies (CBDCs). It assesses the supply and demand factors that may determine in which countries these innovations are more likely to be adopted. It lays out particular policy challenges for authorities in EMDEs. Finally, it compares these with digital innovations such as mobile money, retail fast-payment systems, new products by incumbent financial institutions, and new entrants such as specialized cross-border money-transfer operators.

Proposals for global stablecoins have put a much-needed spotlight on deficiencies in financial inclusion, and in cross-border payments and remittances in EMDEs. Yet stablecoin initiatives are no panacea. While they may achieve adoption in certain EMDEs, they may also pose particular development, macroeconomic, and cross-border challenges for these countries and have not been tested at scale. Several EMDE authorities are weighing the potential costs and benefits of CBDCs. We argue that the distinction between token-based and account-based money matters less than the distinction between central bank and non-central bank money. Fast-moving fintech innovations that are built on, or improve existing financial plumbing, may address many of the issues in EMDEs that both private stablecoins and CBDCs aim to tackle.

Bibliography

Allied Market Research. “FinTech Lending Market to Reach \$4,957.16 Billion, Globally, By 2030 at 27.4% CAGR.

Alonso Gispert, Tatiana, Pierre-Laurent Chatain, Karl Driessen, Danilo Palermo, and Ariadne Plaitakis with contributions from Ana M. Carvajal and Matei Dohotaru. 2022. “Regulation and Supervision of Fintech: Considerations for EMDE Policymakers (*Regulation note*)”. Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Bair, Sheila. 2021. “SEC needs to find a way to curb payment for order flow.” Financial Times.

Boeddu, Gian and Jennifer Chien, “Consumer Protection Implications of Fintech (*Consumer Protection note*).” Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Cap Gemini Research Institute. 2021. “World-Payments-Report.”

Cisco Systems. 2020. “Annual Internet Report (2018–2023).”

CNBC, 2019. “Fintechs help boost US personal loan surge to a record \$138 billion.”

Cornelli, Giulio Jon Frost, Leonardo Gambacorta, Raghavendra Rau, Robert Wardrop and Tania Ziegler. 2020. “Fintech and big tech credit: A new database.” BIS Working Paper 887. Bank for International Settlements.

Cornelli, Giulio, Jon Frost, Sebastian Doerr, Lavinia Franco. 2021. “Funding for fintechs: patterns and drivers”. BIS Quarterly Review. Bank for International Settlements.

Crisanto, Juan Carlos, Conor Donaldson, Denise Garcia Ocampo and Jermy Prenio. 2019. “Insights on policy implementation No 13: Regulating and supervising the clouds: emerging prudential approaches for insurance companies.” Financial Stability Institute.

Delort, Dorothee and Jose Antonio Garcia Luna. 2022. “Innovation in Payments: Opportunities and Challenges for EMDEs (*Payments note*).” Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Didier, Tatiana, Erik Feyen, Ruth Llovet Montanes, and Oya Ardic. 2022. “Global Patterns of Fintech Activity and Enabling Factors (*Fintech Activity note*).” Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

EuroFinance. 2020. “Consumer goods giants grow inventory, extend receivables amid Covid-19 shift.”

Feyen, Erik, Harish Natarajan, Guillermo Rabadan, Robert Paul Heffernan, Matthew Saal, and Arpita Sarkar. 2022. “Fintech Market Participants Survey (*Fintech Market Participants Survey*).” Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Feyen, Erik, Jon Frost, Harish Natarajan, and Tara Rice. 2022. “What Does Digital Money Mean for EMDEs? (*Digital Money note*).” BIS Working Paper and World Bank Group Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Feyen, Erik, Jon Frost, Leonardo Gambacorta, Harish Natarajan, and Matthew Saal. 2022. "Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy. (*Market Structure note*)."

BIS Working Paper and World Bank Group Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Financial Stability Board. 2019. "FSB's Third-party dependencies in cloud services: Considerations on financial stability implications."

GSMA. 2019. "State of the Industry Report on Mobile Money."

IFC. 2021. "The Early Impact Of Covid-19 on Financial Institutions: Insights from a survey of IFC financial institution clients."

IMF-World Bank. 2019. "Bali Fintech Agenda: Experience thus Far." IMF and World Bank, Washington D.C.

Krivkovich, A., O. White, Z. Townsend, and J. Euart. 2020. "How US customers' attitudes to fintech are shifting during the pandemic." McKinsey.

Pazarbasioglu, Ceyla, Alfonso Garcia Mora, Mahesh Uttamchandani, Harish Natarajan, Erik Feyen, and Mathew Saal. 2020. "Digital Financial Services". IMF and World Bank, Washington D.C.

Salamina, Luz Maria, Pratibha Chhabra, Shalini Sankaranarayan, and Collen Masunda: 2019. "Disruptive Technologies in the Credit Information Sharing Industry: Developments and Implications." World Bank, Washington D.C.

Statista. 2021. "Total value of investments into fintech companies worldwide from 2010 to 2021."

Teima, Ghada, Ivor Istuk, Luis Maldonado, Miguel Soriano, and John Wilson. 2022. "Fintech and SME Finance: Expanding Responsible Access (*SME note*)."

Fintech and the Future of Finance Technical Note. World Bank Group, Washington D.C.

Tracxn. 2021. "Top Alternative Credit Score Providers Startups."

University of Cambridge.2020. 3rd Global Cryptoasset Benchmarking Study

World Bank, World Development Report. 2022. "Finance for an Equitable Recovery." Washington D.C.

World Bank. 2021. "CBDC—A Payments Perspective. Washington D.C.

World Bank. 2022. "World Development Report." Washington D.C.

