



Conclusion: Fintech—A Perfect Day or Walk on the Wild Side?

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11.1 INTRODUCTION

The *Global Fintech Index 2020* envisages 60% of global GDP will be digitised by 2022. Across sectors, digitally enhanced offerings, operations, and relationships will drive growth (Findexable, 2019). At the fulcrum of this Fourth Industrial Revolution is a digitally enhanced financial services sector shaped by enabling technologies.¹ Leading the charge are financial technology (fintech) and big technology (bigtech) firms. To supporters, fintech is a game changer that will disrupt or decentralise existing market structures by unbundling traditional financial services, blur industry boundaries, revolutionise how firms create value, and deliver services in ways that will democratise financial services to yield welfare

¹ See <https://www.weforum.org/focus/fourth-industrial-revolution>.

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gains across global society (Frame et al., 2019; FSB, 2017; Philippon, 2020).² Notwithstanding, the World Economic Forum cautions against unblinkered optimism noting the “huge promise” but “potential peril” of market developments.

We offer a high-level review of fintech through the lens of the supra-national agencies and multilateral institutions (*the Institutions*) charged with monitoring the impact of developments in market structure on the financial system and finessing the regulatory architecture.³ Interest in fintech from a financial stability perspective is recent, becoming a priority of the Financial Stability Board (FSB) in 2016. Stability rests alongside other policy objectives pursued by various national authorities, such as, consumer and investor protection, market integrity, financial inclusion, and promoting innovation and/or competition.

In a series of ongoing reports, *the Institutions* assess matters pertaining to fintech. *The Institutions* like many academics use the FSB definition of fintech as “technology-enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services” (FSB, 2017, p. 7). While the FSB expects fintech will facilitate significant changes in financial services, it does not envisage the core functions of intermediation fundamentally changing.⁴ The benefits of technological change often take time and ambiguity exists over whether benefits will materialise fully.

The Basle Committee on Banking Supervision (BCBS, 2018) considers competition policy. New fintech entrants can increase market contestability facilitating improvements in firm-level and market-level efficiencies and realisation of welfare gains. New technologies enable fintech firms to lower transactions costs by ameliorating information asymmetries; in turn, customers receive tailored financial services at more affordable rates

² National governments like the UK government are devising and implementing industrial strategies that place innovation at the centre and are reshaping regulation in ways that support innovation. <https://www.gov.uk/government/publications/regulation-for-the-fourth-industrial-revolution/regulation-for-the-fourth-industrial-revolution>.

³ See Ehrentraud et al. (2020) for an insightful cross-border overview of policy responses to fintech.

⁴ The core functions of financial intermediation can reduce financial frictions, for instance, information asymmetries, incomplete markets, and negative externalities. Frictions could be related to misaligned incentives, network effects or behavioural distortions (FSB, 2017).

and faster speeds. Automation could reduce regulatory costs facilitating improvements in compliance. Policy initiatives to encourage competition in financial markets could benefit financial stability if markets fragment in ways that reduce the systemic risk potential of large incumbents. Fintech could increase consumer welfare through financial inclusion via wider access to financial services and financial deepening.⁵

Fintech is challenging the regulatory architecture to deal with complementarities and trade-offs between financial stability, competition, consumer and investor protection, and financial inclusion. Small compared to banking, fintech is fast growing (BCBS, 2018). Existing regulatory structures cover some micro-financial and macro-financial risks, but other risks are not yet covered.⁶ Unresolved is whether to regulate firms or their activities (Andresen, 2016). If tech firms reside outside the regulatory perimeter yet perform core banking activities or should a tightening of regulations force activities into unregulated space, unmonitored vulnerabilities could build up. Evading regulations, intentionally or not, creates moral hazard and increases tail risks establishing a channel for financial instability (Aizenman, 2020). Consistent regulatory and legal frameworks can mitigate regulatory arbitrage and contagion, ensure resilience of economies, and capture welfare gains.

Emergent technologies have challenged banking before (Alt et al., 2018; Beck, 2020). One should assess if competition stemming from the new wave of technology-driven advances threatens banks differently from earlier technological developments. Previous experience suggests banks will fight off competitive threats and uncover ways to benefit from new developments. Banks, not all but certainly larger firms, are revising their business models and implementing new technologies to devise new value propositions or risk losing customers. This is being achieved by developing fintech services in-house or acquiring off the shelf fintech firms. Evolving market structures can expose vulnerabilities to known and

⁵ Digital finance is expected to allow firms to scale up to reduce costs and widen access at greater speed, accountability, and efficiency. Greater financial inclusion could benefit underserved and unbanked customers both in advanced economies and emerging market developing economies (EMDEs).

⁶ Micro-financial risks include credit risk, leverage, liquidity risk (run risk), maturity mismatch (rollover risk, price risk), operational risks including cyber risk and legal risk. Macro-financial risks include non-sustainable credit growth, greater interconnectedness and correlation, incentives for excessive risk-taking, procyclicality, contagion and systemic importance (FSB, 2017).

new risks, which can turn systemic if left unmonitored and improperly regulated.

It is too early to draw conclusions on future market structures. We can assess how the market structure is evolving. Seemingly, the future of banks involves a series of trade-offs, such as, how banks adapt to technological innovation and changes in customer demand; how competitors interact with banks; how regulators respond to benefits, risks, and competition arising from disintermediation; and on factors relating to the technology environment, regulatory framework, and ongoing financial system and political developments. *The Institutions* must monitor market developments to determine if and how fintech is disrupting financial services, and whether increases in competition lead to efficiency gains or financial instability (Navaretti et al., 2017).

11.2 THE INSTITUTIONS

The Institutions coordinate the design and implementation of rules and regulations to improve the functioning and safety of financial markets. They pursue three primary not mutually exclusive objectives. These are financial stability; competition and efficiency; and data rights and obligations. The FSB coordinates policy on financial stability. Competition policy can vary across borders although national bodies attempt to coordinate. Presently, global agreements on data rights and obligations in financial services are conspicuous by their absence. *The Institutions* are actively trying to close regulatory gaps notably cross-border shortfalls that are particularly evident.

We consider *the Institutions* with responsibilities for the financial sector and assess how responsibilities are adapting to incorporate fintech. A high level of multilateral cooperation exists alongside the absence of unambiguous lines of demarcation for fintech. Competition and data could be as important as financial regulations in shaping the extent to which technology firms permeate financial services.

The FSB promotes international financial stability.⁷ It coordinates national financial authorities and international standard-setting bodies (SSBs) with intent to develop strong regulatory, supervisory, and other financial sector policies. The FSB's priorities are to identify systemic risks in the financial sector, frame policy actions to address such risks, and oversee implementation of those responses. In July 2016, an additional priority required the FSB to monitor “potentially systemic implications of financial technology innovations, and the systemic risks arising from operational disruptions” (Carney, 2016, p. 2).⁸ Hence, the FSB assesses how fintech is affecting the resilience of the financial system via an examination of risks emanating from new and incumbent financial institutions and activities, and the market infrastructure. The FSB uses existing risk assessment frameworks to evaluate systemic risks around financial institutions and infrastructure, as well as risks outside the regulated sector. Responsibilities for macro-financial issues are embedded in the FSB SIFI (systemically important financial institutions) framework. Micro-financial risks associated with fintech fall under the FSB's shadow banking policy. The Basel Committee's Core Principles can assess innovations in banking and interaction between banks and fintech firms (FSB, 2017). The tension between innovation and regulation is acknowledged in the proviso that the regulatory framework must ensure “it is able to manage any systemic risks that may arise from technological change without stifling innovation” (Carney, 2016, p. 6).⁹

The Bank for International Settlements (BIS, founded 1930) is owned by sixty-three central banks. It promotes monetary and financial stability and is a forum for discussion and cooperation. Specific BIS committees issue guidelines and standards for the financial sector that are relevant to fintech: the *Basel Committee on Banking Supervision* (BCBS)

⁷ Established in April 2009, the FSB is the successor to the Financial Stability Forum (founded 1999). It was accompanied by expanding the G7 to the G20 countries. In spring 2021, the FSB has 24 member countries alongside international organisations (including the International Monetary Fund (IMF), World Bank, Organisation for Cooperation and Economic Development (OECD), European Commission and Central Bank (EC and ECB), Bank for International Settlements (BIS), and SSBs. Hosted at the BIS in Switzerland, the FSB plays a key role in promoting the reform of international financial regulation and supervision.

⁸ Letter dated 19 July 2016 from FSB chair, Mark Carney, to G20 Finance Ministers and Central Bank Governors.

⁹ See footnote 2.

considers prudential regulation of banks and cooperation on supervisory matters; the *Committee on the Global Financial System* (CGFS) focuses on improving the functioning and stability of global financial markets partly by identifying potential sources of risk; and the *Committee on Payments and Market Infrastructures* (CPMI) considers the safety and efficiency of payment, clearing, settlement, and other arrangements.

The IMF established an Interdepartmental Working Group on Finance and Technology and a High-Level Advisory Group on FinTech in 2016 and 2017, respectively, to study economic and regulatory implications of developments in finance and technology. The IMF assesses fintech's effects on cross-border capital flows, how the international monetary system is evolving, and the global financial safety net. Discussions between the IMF and its members on fintech topics take place through Article IV consultations, which typically involve a Financial Sector Assessment Programme (FSAP) and Financial System Stability Assessment (FSSA). In 2018, the IMF and World Bank launched the Bali Fintech Agenda, a framework on high-level FinTech issues countries should consider in domestic policy discussions (IMF, 2018). The Bali Agenda contains twelve policy proposals on how to enable fintech, ensure financial sector resilience, address risks, and promote international cooperation. The IMF/World Bank assess fintech's potential to widen access to financial services, deepen financial markets, and improve cross-border payments and remittance transfer systems; and evaluate the impact of fintech as part of an analysis of disruptive technologies and the digital economy (IMF, 2019).

Other international agencies consider fintech. The Financial Action Task Force (FATF) formulates international standards on anti-money laundering (AML) and combatting the financing of terrorism (CFT). The Organisation for Economic Cooperation and Development (OECD) Committee on Financial Markets considers fintech and the digitalisation of finance, and how they contribute to economic growth. Other SSBs, such as the International Organisation of Securities Commissions (IOSCO) and the International Association of Insurance Supervisors (IAIS) review implications of developments in fintech alongside accounting bodies. The IOSCO Objectives and Principles and the IAIS Insurance Core Principles are relevant for applications of fintech in securities markets and insurance, respectively, while the CPMI-IOSCO Principles for financial market infrastructures are relevant to fintech applications in payments, clearing and settlements (CPMI, 2020).

11.3 BANKS, MARKET POWER, AND BUSINESS MODELS

Banks enjoy “special” status because of their role in the financial intermediation process and payments system. As licensed deposit-taking institutions, banks have “privileged” access to customer deposits markets, a source of cheap and stable funds,¹⁰ and government safety-net arrangements (OECD, 2020). The “protection” of deposit insurance schemes, lender of last resort function, and implicit too-big-to-fail status are sources of competitive advantage that serve to instil *trust* in banks and the banking system.

Banks issue financial claims and transform the size, maturity, and risk characteristics of liabilities as they cross balance sheets to become assets which provides liquidity to borrowers. Frictions inhibiting intermediation impairs the efficient allocation of capital. Banks (and other financial intermediaries) are adept at overcoming information (adverse selection and moral hazard) and communications (match making) frictions (Boot et al., 2021). Banks eliminate frictions by collecting and processing large volumes of customer information. For instance, banks assess and manage credit risk by screening loan applicants and monitoring borrowers’ behaviour to ensure compliance with contractual terms. Engaging in repeat transactions and re-using proprietary information improves the efficiency of monitoring (and is a source of scale economies). Relationship banking and product distribution channels like branches resolve communication problems.

However, banks could use skills in information processing and communications to exploit market power. Boot et al. (2021, p. 4) note that “private information generates informational capture as outside competitors face adverse selection” while “search, switching, and transportation costs lead to communication-related ‘spatial’ capture, which allows banks to price discriminate among customers”. Frictions and licensed status are barriers to entry which dampens contestability in financial markets.

¹⁰ This constitutes a funding cost subsidy for banks. Petralia et al. (2019) report estimates of this subsidy which range from 15 to 250 basis points. Grimaldi et al. (2019) estimate the subsidy for Swedish banks and find it has fallen from a height of 250 bp in 2009 to 25 bp in autumn 2018.

Market power/rent extraction has unambiguous and negative connotations for consumer welfare.¹¹

Irrespective of market power issues, in banking competition policy is cognisant of a trade-off between competition and financial stability (Schaeck & Čihák, 2014). Until recently, regulators have granted banks some degree of market power on grounds that removing barriers to competition could incent greater risk-taking if the outcome was to compress net interest margins and profit (Berger et al., 2009). This charter value hypothesis attaches positive outcomes to licensing, for instance, making banks more forward-looking, and incentivising relationship building to establish the *trust* of customers. Thus, market power could incent lower risk-taking, which reduces bank instability and systemic risk (Boot et al., 2021).

Banking is heterogeneous. Banks are often classified by ownership and size. Such characteristics influence a bank's activities and choice of business model. An assessment of business models could indicate which might be more susceptible to competition from FinTech. It is worth emphasising that despite claims fintech will facilitate disintermediation at banks' expense, the fintech sector is small compared to banking with the bulk of fintech services in payments, which resides outside the regulatory perimeter. Boot et al. (2021) outline two ways in which fintech could prove highly disruptive: first, if new communications channels enable fintech firms to circumvent banks' distribution networks and offer financial services absent a balance sheet; second, if digital platforms insert themselves between banks and customers to capture rents.

Large systemically important banks and other larger firms operate as universal banks with activities spanning retail and wholesale banking, investment banking, trading, and insurance. Each activity faces potential competition from fintech firms. For instance, banks' retail lending decision-making is mostly transactional, automated, and based on credit scoring. Corporate lending decision-making, especially to large customers, uses hard and soft information gleaned from relationship banking and involves credit committees. Small and medium-sized banks are more reliant on traditional intermediation and serve smaller retail

¹¹ Proprietary information is a source of market power for banks that customers value and willingly pay for via higher interest rates and/or fees, say, on loan commitments. Imperfect information and weakly contestable markets can lead to credit rationing (Stiglitz & Weiss, 1981) to the detriment of financial inclusion.

and corporate customers. Smaller firms resolve information problems by building relationships with opaque customers like SMEs possibly underserved by larger banks.

The literature on bank business models attests that choice of business model affects performance outcomes and behaviour. Based on cluster analysis of balance sheet structures, researchers have identified commonly used business models: *Investment*, *Wholesale*, *Diversified Retail*, and *Focused Retail* (Ayadi & de Groen, 2016); *Specialised*, *Diversified*, *Trader*, and *Investment* (Hryckiewicz & Kozłowski, 2017); *Specialised Commercial Banks*, *Specialised Investment Banks*, *Diversified or Universal Commercial Banks*, and *Diversified or Universal Investment Banks* (Merck Martel et al., 2012). The choice of business model impacts bank stability (Kohler, 2015) while the structures of banks' assets, liabilities, income, and capital affects performance (Mergaerts & Vander Vennet, 2016). Adopting a financial markets valuation approach, Venturelli et al. (2020) find market-oriented banks achieve a better risk-return trade-off, which they attribute to higher levels of trading and other activities, such as custody, administration of securities, underwriting, portfolio management, and advisory service. Examining changes in business models, Ayadi et al. (2020) find higher risk and lower profitability banks are more likely to change and in ways that foster improvements in bank stability, profitability, and cost-efficiency. One can draw inferences on the impact of fintech and how banks might respond to disintermediation and competition.

11.4 FINTECH INNOVATIONS AND ASSOCIATED RISKS

The BCBS (2018) categorises fintech innovations into three product sectors relating to core banking activities: credit, deposit, and capital-raising services; payments, clearing, and settlement services; and investment management services.¹² Market services or new technologies support product areas, for instance, cloud computing, AI, and DLT. Termed enablers, fintech impacts the financial sector by utilising innovative technologies to reduce frictions and realise stability and societal gains. Classifying fintech developments by economic function isolates financial

¹² In their taxonomies, Thakor (2020) and the FSB (2017) include insurance as a fourth product.

stability implications of fintech by focusing on activities and outcomes rather than on firms and/or underlying technologies.

The FSB (2017, p. 11) predicts “material” implications for market structure resulting from changes to customer preferences, technology, and financial regulation either singularly or via interactive effects. Carney (2017) considers the impact of fintech on the financial services value chain. His hypothetical universal bank performs five core activities: customer relationships; retail and commercial banking; wholesale banking; payments services; wholesale payments, clearing, and settlement. Against each activity, Carney maps corresponding fintech services, qualifies their benefits, and identifies attendant risks associated with fintech’s development and disruptive influence on banking. Table 11.1 shows the mapping alongside a synopsis of each activity’s benefits and risks.

How market structures evolve is a critical issue. A priori unbundling is expected to increase competition and market contestability, improve efficiency, and widen consumer choice leading to welfare gains.¹³ Banking markets are commonly oligopolistic and characterised by explicit and implicit entry barriers; for instance, prudential and licensing requirements, network externalities, high fixed production costs, and values customers place on trust and reputation. While fintech’s user-friendly platforms and fast onboarding can incentivise switching behaviour, especially tech-savvy younger generations, bank customers are renowned for loyalty. It is uncertain whether, and/or to what extent, fintech will challenge banks’ market power, suggesting welfare gains might not materialise as expected.

An alternative scenario envisages market power shifting from banks to a small number of large, dominant tech firms. Fintech firms can achieve powerful network externalities due to their scalability with potential to create natural monopolies, which could instigate consolidation of financial services and increase concentration risk. This view perceives fintech firms as profit maximisers that fail to internalise the public good feature of financial stability (Aizenman, 2020). Rent extraction and associated societal costs remain.

The FSB (2017) identifies four potential benefits to financial stability from fintech. First, if decentralisation reduces entry barriers and enables smaller firms to compete more effectively, for instance, robo-advisory services and use of big data and automation in originating credit and

¹³ Degryse et al. (2019) provide an excellent review of competition in banking.

Table 11.1 Core banking and Fintech: competitive outcomes and risks

<i>Core banking</i>	<i>Fintech Services and Competitive Outcomes</i>	<i>Risks</i>
Retail payment services	Digital wallets, eMoney, cross-border payments <i>Fintech firms capture customer data and relationships from incumbent banks</i>	New concentration risk and single point of failure risks: <ul style="list-style-type: none"> • If banks rely on common hosts of online platforms/cloud
Customer relationships	Aggregators, price comparison and switching tools, robo-advisors, identity <i>Fintech's user-friendly platforms and fast onboarding challenge banks' legacy IT systems</i>	Weakening of bank-customer relationships: <ul style="list-style-type: none"> • Increases deposit volatility and liquidity risk • Pressurises bank profit and incentivises risk-taking
Retail and commercial banking	P2P lending, big data analytics, receivables <i>Fintech widens access to credit and reduces decision times. Big data: tailor services to maximise customer satisfaction; discipline credit underwriting; enable firms to borrow against invoice receivables</i>	Future business model risks and uncertainties: <ul style="list-style-type: none"> • Will P2P evolve without conventional risks? • How stable is P2P lending through the business cycle? • What are the tech lenders' tolerances to losses?
Wholesale banking	High-frequency trading Risk management algorithms	Excess volatility in asset prices: <ul style="list-style-type: none"> • From herding and/or highly correlated price movements Impaired market functioning: <ul style="list-style-type: none"> • If market liquidity is withdrawn during market disruptions

(continued)

Table 11.1 (continued)

<i>Core banking</i>	<i>Fintech Services and Competitive Outcomes</i>	<i>Risks</i>
Wholesale payments, clearing and settlement infrastructure	Distributed ledger technologies <i>Fintech could improve accuracy, efficiency, and security of processes, and enable better regulatory compliance. Cost savings expected</i>	Critical infrastructure providers High operational risks and costs Cyber risk

Source Adapted from Carney (2017), BCBS (2018)

reducing compliance costs. Diversification can lessen the probability of contagion effects from firm failures. Second, more contestable markets and application of productivity-enhancing technologies in front and back-offices realises efficiency gains. Third, greater transparency improves quality of information to enhance measurement and pricing of risks. Fourth, as a provider of “debt-based alternative finance”, fintech widens access to financial services yielding increases in financial inclusion for underserved customer groups. Alternative finance is especially important in EMDEs that have benefitted from applications like mobile banking. Greater inclusion, say, through equity crowdfunding and fintech lending, can diversify investment risk.

The Institutions classify risks to financial stability emanating from technology as micro-financial and macro-financial risks (FSB, 2017). Micro-financial risks fall into financial and operational risks and indicate vulnerabilities that might arise if fintech underestimates risks and/or shocks disrupt markets. Financial risks include credit intermediation arising from mismatches in maturity transformation, leverage, and liquidity (whether a bank or fintech provides the service). Marketplace lending poses a competitive challenge to retail banking though several uncertainties abound. First, can marketplace lending (P2P) evolve without assuming conventional risks (maturity transformation, leverage, and liquidity mismatches). Second, which quality of underwriting standards will emerge. Third, how might fintech lenders tolerate losses. Regulators must monitor the effects of increased competition. Greater fintech adoption suggests softening of customer relationships and fewer cross-selling opportunities for banks; this could destabilise bank funding and increase liquidity risk to pressurise net interest margins and profitability. Adversity often induces risk-taking to the detriment of financial stability.

Banks and fintech firms must manage operational risk including cyber risk.¹⁴ Single point of failure risks become more likely if players rely on a small number of shared hosts, for instance, providers of online banking services or cloud computing services. Disruptions to third-party services, say, cloud computing services could undermine systemic stability if services become dominated by large firms. Cyber-risk is expected to rise as larger numbers of different firms and systems become connected. Yet,

¹⁴ Operational risks generally arise from information systems, human error, managerial competencies, and external shocks.

fintech-enabled competition and diversity could lessen systemic severity of a single cyber-attack.

Legal and regulatory risks can materialise from weaknesses in governance and control of processes. Risks arise because fintech *firms* rather than the *activity* they perform lie outside the regulatory perimeter or are subject to lighter regulation. Ramifications exist for partnerships between well-regulated and weakly regulated firms. Regulatory treatments of fintech issues, such as privacy and data ownership vary across jurisdictions inferring that cross-border activities, say, in payments constitutes a challenge for regulatory frameworks. Lastly, business risks of financial market infrastructures can arise if critical financial services are adversely affected by other parts of a firm's business.

Innovations and fintech activities could amplify macro-financial risks to undermine financial stability. Increasing interconnectedness of larger numbers of different types of firms, and sharing of data and at faster speeds, create challenges in maintaining the security of the ecosystem. Domino effects/commonalities transmit contagion risk, say, reputational contagion risk should problems at a single fintech lead to sectoral concerns. Automation and/or limited human involvement, for instance, in trading creates new sources of contagion.

Procyclicality in lending, pricing of risk premia, and deleveraging under distress exacerbate downturns. Fintech activities like marketplace lending may face bigger changes in sentiment potentially disrupting credit markets. Ambiguity resides as to how credit standards will evolve and their accuracy. Whereas marketplace lending might increase financial inclusion, wider access can create dependencies and it is unknown how stable marketplace lending will be through-the-cycle. Automated trading based on common algorithms may cause herding behaviour to disrupt diversification and amplify swings in asset prices. While electronic trading has created market liquidity, it is uncertain how markets would respond to shocks and whether liquidity would be withdrawn when most required.

Excess volatility or market overreactions can create liquidity and solvency problems that impair asset and credit markets. Commonality of business models constitutes a transmission channel. The speed at which fintech firms' complete transactions can increase volatility. Aggregators, for instance, move cash quickly around the banking system in response to changes in prices and relative performance. This might increase the volatility of bank deposits to the detriment of bank liquidity positions.

The increase in numbers of systemically important firms deemed too-big-to-fail could amplify risks, say, by incentivising moral hazard behaviour that encourages risk-taking to exploit safety net arrangements. The emergence of dominant firms creates market power issues including anti-competitive behaviour like predatory pricing. New monopolies could emerge if a new technology comes to dominate activities essential for providing financial services, such as collection and use of customer information.

11.5 THE EVOLVING MARKET STRUCTURE

The emergence and fast growth of fintech has introduced new competitors and new technologies leading to predictions that fintech will democratise financial services and create economic and welfare gains. It is too early to say how market structures will evolve. Certainly, the paucity of data on fintech hinders any assessment. Financial market incumbents like banks hold comparative advantages in terms of lower costs of capital, large numbers of customers, and intimate knowledge of/compliance with regulations. Many financial markets are oligopolistic and dominated by a few, large firms with plentiful resources to meet competitive challenges. Fintech firms appear hesitant to undertake banking activities suggesting wariness of crossing the regulatory perimeter and having to comply with prudential regulations. Partnerships between fintech firms and banks are one solution that seeks to utilise each partner's comparative advantages. Larger banks, however, are developing fintech services in-house and/or acquiring off the shelf fintech firms.

11.5.1 *The Impact of COVID-19*

Since 2020, use of fintech services has increased sharply especially in digital payments and remittances (World Bank & CCAF, 2020).¹⁵ Fintech is perceived to support national regulatory objectives, particularly, financial inclusion (70% of respondents), market development (61%), adoption of digital financial services (53%), and promoting competition (47%). Fintech's highest perceived negative impact is on consumer protection

¹⁵ The World Bank/CCAF surveyed 118 central banks and other regulatory financial bodies from 114 jurisdictions between June and August 2020. Two-thirds of respondents reside in EMDEs.

with the pandemic increasing risks in cybersecurity (78% of responses place in top three risks), operational risks (54%), and consumer protection (27%).

CCAF et al. (2020) surveyed fintech firms to assess the impact of the pandemic.¹⁶ In H1 2020 and on average, fintech firms' transactions numbers and volumes increased year-on-year by 13 and 11%, respectively. Fintech firms in EMDEs achieved faster growth (numbers, 15%; volumes, 12%) than counterparts in advanced economies (11, 10%). Some sectors achieved above-average growth in transactions volumes, for instance, digital asset exchanges, digital payments, digital savings, and WealthTech (over 20%). Growth was more modest in digital banking, digital identity, and regtech (around 10%). However, digital lending has struggled with contractions in transactions volumes and numbers of new loans issued (8 and 6%, respectively), and increased defaults on outstanding loans (9%).

Fintech firms responded to the pandemic by making changes to products or services typically fee or commission reductions/waivers, and changes to qualifications/onboarding criteria. The pandemic has negatively affected firms' capital reserves, valuations, and outlook on future fundraising. Many firms perceived an increase in cybersecurity risk and introduced enhanced fraud/cybersecurity features. Increases in liquidity risk and FX exposure risk were also reported.

11.5.2 *Fintech Adoption Rates and Impact on Banks*

The latest Global FinTech Index of the adoption rate of fintech services shows a sharp upward trajectory: from 16% (2015) to 33% (2017) to 64% (2019) (EY, 2019). Classifying fintech services as either “disruptive” (incumbents offer the service, say FX trading), or “invented” (a new service based on technological developments, say, P2P lending and mobile phone payments),¹⁷ EY considers fintech a “sophisticated” competitor with global reach and no longer a disruptive influence. Demarcation lines between fintech firms and incumbents are blurring as banks and other

¹⁶ CCAF et al. surveyed 1385 fintech firms operating in 169 jurisdictions between 15 June and 18 August 2020.

¹⁷ Consumer awareness of “invented” fintech services can be extremely high. For instance, 89% of consumers are aware of the existence of in-store mobile phone payment platforms, and 82% aware of P2P payment systems and non-bank money transfers (EY, 2019).

Table 11.2 Consumer fintech adoption: an international perspective^a

<i>Rate (%)</i>	<i>Country</i>	<i>Rate (%)</i>	<i>Country</i>
87	China, India	58	Australia
82	South Africa	56	Spain
76	Colombia	51	Italy
75	Peru	50	Canada
73	Netherlands	46	USA
72	Mexico	42	Belgium and Luxembourg
71	Ireland, UK	35	France
67	Argentina, Hong Kong, Singapore, South Korea	34	Japan
66	Chile		
64	Brazil, Germany, Sweden, Switzerland		

Note ^aFintech adopters as a percentage of the digitally active population

Source Adapted from EY (2019)

incumbents now offer fintech services, which is driving fintech adoption rates (EY, 2019). Table 11.2 provides an international perspective on fintech adoption rates.¹⁸ Adoption is highest in EMDEs, such as China, India, and Latin America. In advanced economies, rates are highest in the Netherlands, UK, and Ireland, partially reflecting development of open banking. The adoption rate for SMEs is 25%; 56% of SMEs use a banking and payments FinTech service, and 46% a financing fintech service.

Chen et al. (2020) estimate the value of fintech innovations from published fintech patent applications in the US from 2003 to 2017. Values are indicative of gains to financial services firms from developing in-house fintech services. Private companies and individuals hold a higher percentage of patents (62.7%) than technology companies outside the financial sector (57.8%). Determining patent value through examination of stock market reactions to filing disclosures, the private value of a fintech innovation is \$46.7 million (at 2017 prices) far outstripping the median private value for other financial innovations (\$3.1 million). Blockchain and robo-advising are the most valuable types of fintech innovations. Value effects exhibit cross-sectional variation emanating from two sources: the relative disruptiveness of the underlying technology; and

¹⁸ EY (2019) constructs the adoption index from survey evidence obtained from 27,000 customers in 27 markets.

whether the innovator poses a competitive entry threat to the sector. Significantly more industry value is destroyed when the underlying technology is disruptive and when it originates from fintech start-ups. From the perspective of incumbents, larger firms are more able to withstand disruptive outside innovation than smaller counterparts, but this ability is linked to firms' R&D expenditures.

Cheng and Qu (2020) devise a FinTech Index to analyse the development of fintech at banks in China from 2008 to 2017. Although bank fintech is developing along an upward trajectory, variation exists between types of banks and across technologies; internet technology is fastest growing and artificial intelligence lagging. Bank fintech is associated with improvements in credit risk. This reflects fintech's beneficial effect on the efficiency of banks' risk management and/or internal governance and internal control processes.

Hong et al. (2020) investigate the effect of fintech adoption on risk-taking using account-level data obtained from China's Ant Group, which reveals an individual's investment and consumption behaviour. While fintech adoption fosters household risk-taking, risk-tolerant investors benefit the most. Fintech adoption helps individuals move closer to their optimal risk-taking levels with positive implications for financial inclusion.

Phan et al. (2020) consider the impact of fintech firms on bank performance. Their evidence from Indonesia exemplifies an emerging market and a country where the number of fintech firms has grown strongly (by roughly seven per annum over 1998–2017 to around 130 fintech firms). Increasing numbers of fintech firms correlate with significantly lower net interest margins, profitability, and yields on earnings assets at banks. Negative effects are felt by smaller and, particularly larger banks, and older banks. That fintech positively affects aspects of younger bank performance suggests younger firms can be expected to successfully adopt new technologies.

11.5.3 Impact of Fintech on Core Banking Activities

Petralia et al. (2019) survey nearly 60 market participants (banks, fintech, bigtech) to determine how competition is affecting provision of banks' primary functions (maturity transformation; payment services; information processing; risk pooling/liquidity provision). Respondents selected financial products and services: (1) most affected by technological developments now; (2) likely to be affected over the next five years; and (3)

seeing the greatest competition. Across (1) to (3), payment services are most important followed by products and services under maturity transformation and forms of information processing facing digital disruption. Survey respondents claim that technology developments have enabled improvements in service quality and better understanding of customer behaviour. Over time, better data, algorithms, and AI are expected to improve regulatory and security processes and success rates for detecting and preventing fraud.

Respondents answered two open-ended questions: (1) how are technological developments most significantly impacting existing products and services? (2) thoughts on the structure of the financial services industry in five years. For (1) most bank respondents cited digital transformation as a priority to improve efficiency and products, reduce product development times, downsize branch networks, and improve risk management particularly compliance. However, digital transformation is constrained by regulatory and compliance costs, customer protection legislation, the low interest rate environment, and competition.

In five years, respondents expect a more diverse ecosystem with banks, fintech and bigtech firms competing and partnering at the same time. It is unclear how this ecosystem will evolve. With consolidation appearing necessary, some respondents consider small-to-medium-sized banks to be targets whereas others look at larger banks particularly in Europe and those unable to effectively evolve their business model.

11.5.4 *Fintech and Credit*

Cornelli et al. (2020) consider the transformation of credit markets following the emergence of alternative sources of credit. Using data on fintech credit volumes from the Cambridge Centre for Alternative Finance (CCAF), Cornelli et al. examine new flows of fintech credit across global credit markets. The analysis distinguishes fintech credit from bigtech credit: typically, fintech credit is provided via decentralised platforms which match borrowers with lenders; for bigtech firms, lending accounts for only a small part of mainly non-financial business.

The global market for alternative credit reached \$795 billion in 2019. Although slowing down, growth averaged 15% per annum over 2017–2018 and 2018–2019. In 2019, bigtech credit accounted for around 72% and fintech roughly 28% of total alternative credit. Table 11.3 shows the

Table 11.3 Global credit markets—alternative credit and total financial sector domestic credit

Rank 2019	Country	US \$ millions				Change 2018–2019				2018	
		Tot. Alt	Fintech	Bigtech	Tot. Alt	Bigtech	Fintech	Tot. Alt (%)	TA/Dom Credit (%)		
1	China	626,714	110,836	515,878	42	42	-49	8	1.9		
2	US	78,455	70,208	8247	704	704	22	34	0.3		
3	Japan	27,866	2173	25,694	35	35	136	40	0.1		
4	UK	11,589	11,476	113	21	21	23	23	0.2		
5	Indonesia	4918	3803	1116	74	74	163	136	0.5		
6	Russia	2585	273	2312	14	14	135	20	0.2		
7	Kenya	2052	51	2001	100	100	62	99	3.0		
8	France	1813	1371	442	119	119	112	113	0.0		
9	Brazil	1752	1460	292	109	109	135	130	0.0		
10	India	1285	1115	170	0	0	123	92	0.0		
	Total	795,537	223,308	572,229	44	44	-25	16	0.6		

Source: Adapted from Cornelli et al. (2020)

top ten ranking countries in 2019. China has the largest flows of alternative credit followed by the US, Japan, and the UK. A strong emerging markets presence characterises the leading countries. Whereas credit from bigtech firms is more important in China and Japan, fintech credit holds sway in the US and UK. Table 11.3 reports growth rates over 2018–2019, and the ratio of (the flow of) total alternative credit-to-(the stock of) total domestic credit by the financial sector. This metric reaffirms alternative credit markets are small in comparison to traditional bank lending. The analysis suggests alternative credit markets complement traditional credit markets.

The entry of new competitors into credit markets raises important questions for incumbent firms and their competitiveness, regulators tasked with monitoring vulnerabilities and risks, and policymakers interested in households' borrowing and consumption patterns. For instance, which borrowers use the services of new entrants, whether new entrants attract and serve underbanked customers segments or customers with better creditworthiness, whether new entrants help customers improve their credit standing. In the US, fintech firms have targeted the large consumer credit market. Di Maggio and Yao (2020) use individual-level data to examine the market for personal credit for fintech and traditional lenders. Proponents believe fintech can reach customer segments that banks find unprofitable, which could reduce credit rationing and information asymmetries.

FinTech lenders enter the personal credit market by targeting less creditworthy individuals. Increases in market share precipitate advances in credit to more creditworthy borrowers. On average, personal credit from fintech firms is around 3% more expensive than traditional lenders. However, the difference in loan rates between the two types of lender is lower in areas where the market share of fintech is lower. This implies fintech lenders use an aggressive pricing strategy to attract new customers.

Observed variation in loan rates reflects information in customer credit reports for fintech lenders. This suggests fintech firms base their credit decisions on hard data indicating a soft information deficiency.¹⁹ Notwithstanding, loans granted by fintech firms have significantly higher

¹⁹ Flögel and Beckamp (2020) confirm the importance of soft information in reducing information problems and enhancing the screening and monitoring of loans to SMEs by regional savings banks in Germany. A scenario in which fintech lenders displace regional savings banks in the SME loans market is hypothesised to result in lower access to credit.

default probability than loans originated by traditional lenders by an estimated, economically meaningful 1.1%. Fintech lenders face adverse selection. Over-reliance on hard data leads to credit being supplied to borrowers rejected by banks. Fintech lenders account for this in their pricing which better predicts default probabilities (by 20%). With borrowers increasingly likely to use fintech lenders, positively affecting the lifetime value of loans, higher defaults do not produce worse outcomes for fintech lenders (Di Maggio & Yao, 2020).

Using loan-level data from a fintech in India, Ghosh et al. (2021) uncover a theoretical synergy between the growth of both fintech lending and cashless payments. Wider use of cashless payments produces borrower information outside of lenders; that borrowers expect lenders to screen based on verifiable information boosts usage of cashless payments. Since cashless payments vary in verifiability, the fintech lender uses this information to reduce adverse selection and be more efficient in screening high from low-quality applicants. Greater use of cashless payments improves borrowers' chances of obtaining loans, and at lower rates than previously paid to traditional lenders. For loans at comparable interest rates, borrowers that use cash have higher probability to default.

Yang (2021) considers the importance of trust in banks as an implicit barrier to entry to fintech in credit markets. Using the Wells Fargo scandal as an exogenous shock to trust in banks, an increase in exposure to the scandal is associated with an increase in the probability of borrowers using fintech firms as mortgage originators. The shock affects all banks irrespective of the fact the scandal occurred at Wells Fargo. Yang examines the role of trust in fintech adoption for minority borrowers. Whereas minority borrowers do not have a smaller loss of trust, they have a smaller increase in the adoption of fintech, which suggests minorities perceive trust as less critical in fintech adoption. The increase in fintech adoption resulting from loss of trust in banking does not affect fintech firms' loan pricing, which is consistent with fintech firms' use of hard data to price credit. Promotion of fintech adoption is unlikely to lead to higher loan rates at fintech firms.

11.5.5 *Linkages Between Fintech and Banks and the Financial Ecosystem*

One option for incumbents is to acquire an off the shelf fintech firm. Pancotto et al. (2021) consider bank acquisitions of fintech firms and

investigate which factors influence decisions to acquire. Acquisitions are more likely by better capitalised banks and more liquid banks, banks led by longer tenured CEOs, and banks with higher proportions of females on boards. Banks led by younger CEOs and banks with lower IT expenditures are also more likely to acquire fintech firms. In contrast, banks with higher IT expenditures are less likely to acquire, which suggests these banks favour in-house development of fintech services.

Two features could motivate partnership agreements. First, customers adopt banking services from non-traditional suppliers because of low-cost offerings, ease of use, faster service, better features, and personalised products. Second, despite banks increasing IT expenditures, customers appear largely dissatisfied.²⁰ Despite the rationale for fintech–bank partnerships, specific factors appear to inhibit success. For instance, the existence of cultural gaps and difficulties in communication between partners; and poor choices of partner which can cause project failure (Capgemini, 2020). Despite banks’ investing in front offices, their middle and back-office functions impact customer perceptions and are burdened by legacy IT, which hinders banks from creating “superstar” products and developing “long tails”.

Prospects for bilateral partnership agreements appear to be waning due to the emergence of fintech ecosystems involving incumbents, fintech firms, and other non-financial sector firms. The emergence of new technologies and increasing digitisation are factors with potential to shift the financial ecosystem, for a long time characterised by banks’ acting as trusted advisors to a loyal customer base. Arslanian and Fischer (2019) identify two interrelated developments: platformisation and open banking. In a platform-based marketplace model, the platform’s owner facilitates exchanges between decentralised customers and producers. Open banking requires banks to share customers’ financial data with third parties (subject to consent), which should establish a marketplace for financial services and facilitate more competition and innovation in the sector. That open banking regulations will end banks’ monopoly

²⁰ Banks increased IT expenditure by 4% per annum over 2016–2019. However, 50% of customers did not receive an integrated banking experience; 60% could not make direct banking payments on different platforms; 58% could not access all accounts from a single platform. The abandonment rate of UK banks reached 56% in 2018 from 40% in 2016 (Capgemini, 2020).

on ownership of customer data has market power/welfare implications alongside shocks to bank revenues and business models.

It is worthwhile to consider which, if any, firms could come to dominate open banking. Banks, particularly the largest, are in pole position due to their “ownership” of customer data, financial sector acumen, and capital to respond to market developments. Bigtech firms are banks’ main other competitors and offer IT capabilities in place of financial know-how. Bigtech firms are expanding into financial services and reports suggest customers’ trust in bigtech matches that in banks. Full commitment to open banking requires substantial investment, which heightens probability that banks and bigtechs will partner up, and, increasingly that fintech firms will move into any unoccupied spaces.

We can glean possible outcomes associated with open banking using a theoretical model that considers competition between a bank and a fintech in the credit market when borrowers can share information (He et al., 2020). Absent open banking, the traditional bank holds an information advantage or better screening ability than the fintech (even if the fintech uses advanced data analysis algorithms). Open banking induces competition. Data-sharing enables the fintech to utilise its analytical algorithms to improve credit screening and to even surpass the bank’s screening abilities. The model supports the proposition that open banking favours the fintech. Since data sharing is voluntary, in a perverse outcome all borrowers are worse off with lower welfare even though the financial sector is more profitable.

11.5.6 Fintech and Financial Inclusion

Despite technological advances, the unit cost of financial intermediation remained near to 200 basis points for around 130 years (Philippon, 2015). Recent estimates show a decline in unit costs following the GFC (Philippon, 2020). If fintech improves the efficiency of financial intermediation, consideration should be given to how the gains will be shared, and whether fintech will democratise financial services or widen inequalities.

Philippon’s (2020) theoretical framework shows FinTech could reduce the cost of financial intermediation but regulatory changes are needed for fintech to realise its potential. In the case of robo-advisory services, technological advances are changing the nature of fixed and variable costs in ways that will widen access for less wealthy customers but may not

reduce inequality across all customer groups. Similarly, fintech lending could reduce discrimination (statistical biases) in credit markets but also reduce the effectiveness of existing regulations to protect minorities.

Sahay et al. (2020) measure the contribution of digital finance (payments) to increasing financial inclusion. They construct a digital financial inclusion index and a traditional financial inclusion index (for financial intermediaries) for a sample of 52 EMDEs covering 2014–2017 (digital) and 2011–2017 (traditional). Pre pandemic, digital finance made a positive, significant contribution to financial inclusion (financial intermediation’s contribution remained constant). That digital financial inclusion is positively correlated with future GDP growth suggests fintech could contribute to growth and lower income inequality.

Jagtiani and Lemieux (2018) examine fintech lending for unsecured consumer credit against comparable lending by traditional banks to determine whether fintech can penetrate markets underserved by banks. Using loan level data from LendingClub and credit card loans data from banks’ Y-14M reports, fintech lending penetrates underserved areas characterised by highly concentrated or less competitive banking markets, greater preponderance of lower income borrowers, and low branch density. Further expansion of fintech services could fill credit gaps by supplementing existing consumer credit which can boost financial inclusion.

11.5.7 *Scenario Analysis*

The BCBS (2018) considers five forward-looking scenarios and associated risks (see Table 11.4). The scenarios are not mutually exclusive. The first is “Better Bank”, which envisages banks responding to competition by invigorating their business models with enabling technology to provide customers with new value propositions. Execution risk and outsourcing are potential concerns alongside increased cyber risk. The four other scenarios range from “New bank” in which banks face strong competition from new technology banks, such as challenger banks and neobanks, to “Disintermediate bank” which premises the end of banking and balance sheet intermediation with all customers’ financing requirements provided by platforms and technologies. From a financial stability perspective, the inherent risks include incentives for banks to take excessive risks as revenue streams and profits are competed away; supervisory challenges from monitoring third party relations; consumer protection, data privacy and security; greater interconnectedness and increased concentration risk

Table 11.4 Forward-looking scenarios: features and risks

<i>Potential scenario</i>	<i>Features</i>	<i>Risks</i>
Better bank	Banks' digitise to: <ul style="list-style-type: none"> • Retain customer relationships • Revise business models—enabling technologies • Develop new value propositions 	<i>Execution risk</i> : from managing/implementing changes in technology and business processes <i>Operational risk</i> : rises due to cyber risk/outsourcing, migrating from legacy IT
New bank	Technology-driven banks full-service digital platforms: <ul style="list-style-type: none"> • Provide cost-effective, innovative services • Incumbents burdened by legacy IT 	<i>Safety and soundness</i> : new tech firms win customers leading to loss of revenue/profit at banks Incumbents' scale/size hinders digitisation and modernisation
Distributed bank	Fragmentation of financial services: <ul style="list-style-type: none"> • Fintech firms and incumbents carve out niches • Partnerships, third-party relationships develop • Competition to own the customer relationship 	<ul style="list-style-type: none"> • Monitoring and managing end-to-end transactions across multiple parties' challenges banks' risk management processes and bank supervisors • Consumer protection/data usage; interconnectedness; lack of accountability
Regulated bank	Technology firms control customer relationships: <ul style="list-style-type: none"> • Tech firms use licensed banks for lending, deposit-taking, and risk management services 	<ul style="list-style-type: none"> • Limited ability of banks and supervisors to monitor end-to-end transactions and systemic risk • Increased automation: raises concerns over consumer protection, data privacy and security • <i>Concentration risk</i>/TBTF: arising from small numbers of platforms/bigtech firms become too large

(continued)

arising from service providers; the possibility that bigtech firms and other fintech firms that reside outside the regulatory perimeter become dominant and abuse market power.

While it is too early to say which, if any, of these forward-looking scenarios is emerging let alone which, if any, will come to dominate,

Table 11.4 (continued)

<i>Potential scenario</i>	<i>Features</i>	<i>Risks</i>
Disintermediate bank	End of banks: <ul style="list-style-type: none"> • No need for trust and balance sheet intermediation • Platforms/technologies service customer financing needs 	<ul style="list-style-type: none"> • Activities occur beyond the regulatory perimeter • Weaker standards, oversight/monitoring of systemic risk • Greater risk exposure for customers

Source Adapted from BCBS (2018)

available evidence shows incumbents digitising and modernising (Better bank), and of the New bank scenario in countries, such as the UK and US, the Netherlands, Germany, and China. Features of the Distributed bank scenario are observed in joint ventures and third-party agreements between banks and fintech firms. Examples abound of the Relegated bank, which provides services to a tech firm that owns the customer relationship; for instance, bigtech firms using their social media platforms to collect and leverage customer data to offer customers tailored financial services from other providers including banks. Though the Disintermediate bank scenario may seem far-fetched, examples exist including P2P lending platforms implementing credit scoring and approval processes that are trusted by customers, and cryptocurrencies being used for payments and value transfers using DLT technologies and absent incumbent banks.

11.6 CONCLUDING REMARKS

This chapter has reviewed the light and dark sides of fintech through the lens of *the Institutions*. Fintech is fast growing and offers opportunities to enhance quality of financial services, improve customer satisfaction, increase financial inclusion, support economic growth, and welfare gains. Yet, potential exists for known and new risks to emerge and threaten financial stability, growth, and welfare. Notwithstanding, fintech firms are yet to reach the scale whereby they constitute a systemic risk (FSB, 2017). Nevertheless, financial markets are inherently oligopolistic with market power issues that competition policy is yet to resolve. Noting the possibility of a fintech or bigtech firm gaining market power and extracting

rents, *the Institutions* must resolve if *activities* should fall within the regulatory perimeter even if the *firm* does not. The implication is for regulators to address vulnerabilities as they come to fruition by adapting existing regulatory frameworks.

The appetite of fintech firms to provide core banking services appears diminished by the prospect of crossing regulatory boundaries. Together with banks' revising their business models to capture opportunities afforded by new technologies, cooperation might prove more fruitful than full-blown competition. Recent evidence is supportive: banks are developing in-house fintech services and/or acquiring off the shelf fintech firms; partnership agreements are plentiful (irrespective of success); fintech is boosting financial inclusion by helping to complete markets for underserved customers. In sum, available evidence implies fintech is complementing rather than disrupting traditional finance (for the time being at least).

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