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Edited by Thorsten Beck and Yung Chul Park

Fostering FinTech for Financial Transformation

The Case of South Korea

CEPR PRESS

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The Korea Institute of Finance (KIF) was founded in 1991 as the first institute of its kind in Korea. In the years that have followed, the efforts of our team of leading scholars have propelled our institute to become Korea's preeminent comprehensive financial research center, conducting policy research to further the development of Korea's financial industry and working closely with financial institutions to boost their competitiveness.

Through in-depth research on both short- and long-term issues, the KIF seeks out future-oriented financial policy schemes and devises concrete, feasible strategies for the development of Korea's financial industry.

In addition to these tasks, and in keeping pace with the changes in the international financial order, we shall greatly bolster our efforts to raise the general public's understanding of, and address its curiosity regarding, today's principal financial issues and to demystify the complex terminology of finance.

Our entire team is now doing its utmost to construct efficient and appropriate financial policy proposals that will help Korea overcome the present economic difficulties. We shall do our best to ensure that the KIF firmly holds onto its place in the eyes of the public as the most trusted and highly regarded institute for the advancement of Korea's financial industry.

President Jongkyu Park

Contents

<i>Acknowledgements</i>	<i>vi</i>
<i>Foreword</i>	<i>vii</i>
Introduction	9
Thorsten Beck and Yung Chul Park	
Finance and technology: What is changing and what is not	13
Stephen G. Cecchetti and Kermit L. Schoenholtz	
Digital technology and financial innovation: A literature survey	47
Thorsten Beck	
Market structure, regulation and the FinTech revolution	73
Antonio Fatas	
Cryptocurrency regulation and enforcement in the US and Europe	107
Demelza Hays and Andrei Kirilenko	
Fostering FinTech for financial transformation: The case of South Korea	143
Thorsten Beck, Taiki Lee, Yong Tae Kim and Yung Chul Park	

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Foreword

Financial innovation has been a characteristic of thriving and efficient financial systems for centuries. The latest wave of financial innovation related to digitalisation, however, has the potential to change the landscape of financial service providers quite dramatically, including with the rise of FinTech and BigTech companies disrupting the current structure of the financial system. This new eBook takes stock of financial digitalisation over the past decade and applies global lessons to the regulatory debates in Korea.

The first four chapters draw on international experience and comparison, discussing the impact of financial digitalisation on the future structure of the financial system, providing a literature survey on the impact of financial digitalisation on the efficiency and stability of the financial system, focusing on innovations in money and payments, specifically the combination of new forms of digital assets with new forms of payment technology, and describing the regulation of cryptocurrencies across different jurisdictions.

The final chapter tries to adopt these lessons to the specific case of Korea, documenting the oligopolistic structure of Korean banking and the limited innovation that has taken place within the sector. It documents the development of the FinTech sector over the past decade and the regulatory challenges that this has posed. It ends with general and Korea-specific recommendations for regulatory reform.

Earlier versions of the individual chapters were presented and discussed during an online conference on digital technology and financial innovation hosted by the KIF in October 2020. The authors have benefited from the comments of Xavier Vives, Olena Havrylchyk, Leonardo Gambacorta, Manju Puri, and other participants at the conference. The editors are also grateful to Stephen G. Cecchetti and Thorsten Beck for his help in drawing up an analytic framework for this study and would like to thank for the general support and encouragement provided by former president of the KIF Sangho Sohn, KIF senior researchers Bonsung Gu and Jeong Ho Suh, as well as Chairman Sung Soo Eun of Financial Services Commission(FSC), and First Senior Deputy Governor Kun Ik Kim and Deputy Governor Dong Sung Kim of Financial Supervisory Service (FSS) in Korea.

CEPR and KIF are grateful to Thorsten Beck and Yung Chul Park for their editorship of this eBook. Our thanks also go to Sophie Roughton and Anil Shamdasani for their expert handling of its production.

Tessa Ogden
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August 2021

Introduction

Thorsten Beck and Yung Chul Park

European University Institute and CEPR; Korea University

Financial innovation has been a characteristic of thriving and efficient financial systems for centuries. The latest wave of financial innovation related to digitalisation, however, has the potential to change the landscape of financial service providers quite dramatically. This book comprises five papers that analyse the pattern and progress of financial digitalisation across the globe and across a number of different dimensions, and draw conclusions for regulatory policies. While the first four chapters draw on international experience and comparison, the final chapter tries to adopt these lessons to the specific case of Korea.

There is no established and widely accepted definition of FinTech, but it contains several components. In the first chapter, Stephen Cecchetti and Kermit Schoenholtz offer an implicit definition (“take different financial services, and then list the new firms that are providing them in innovative ways”) and an explicit definition that focuses on (i) application of technology to finance and (ii) new technology-driven players entering the financial services industry, concluding with the following definition: “FinTech is the application of technology to finance that lowers the unit costs of providing financial services, and makes them better, faster, cheaper, broader, and more accessible.”

While there has been a new entry into the financial system over the past 50 years and a markedly declining role for banks, the unit cost of financial service provision has been stuck at 1.5–2%, as Philippon (2016) shows. Cecchetti and Schoenholtz point to three challenges for FinTech companies: first, they must overcome the costly screening and monitoring that arise from information asymmetries in financial service provision; second, FinTech is a trial-and-error process in which only a few efforts will be successful; and third, it is difficult to anticipate which innovations will survive this very Darwinian selection process.

Recent technological advances have the potential to overcome both cost and risk challenges: modern technologies such as mobile phones and the Internet allow quick and efficient transactions and the exploitation of economies of scale and scope. Specifically, information technology creates what the BIS (2019) describes as the DNA loop: a tech firm uses a large stock of user data (D) to offer a range of services exploiting natural network effects (N), generating further user activity (A), which then results in more data. This DNA loop also gives BigTech companies such as Alibaba, Amazon, Facebook, Google, and Tencent a competitive and first-mover advantage, possibly resulting in market-dominating positions. Scope economies across different types of financial services are still important, even though FinTech companies have entered specific services, most prominently payment services, which have reduced the role of banks.

Regulatory responses to these developments have varied. On the one hand, some regulators have openly encouraged some forms of innovation, such as through the establishment of regulatory sandboxes; on the other hand, many regulators view selected innovations as a potential threat to the safety and soundness of their financial systems, as with the recently proposed stablecoin Libra/Diem by a consortium under the leadership of Facebook.

Finally, the authors describe two possible scenarios for the future of the financial system in the US. In the first, the four BigTech firms – Amazon, Apple, Facebook and Google – take over a large part of the US payments system, much as Tencent and Ant Financial have done in China, cutting costs and improving the efficiency and quality of intermediation. In the second scenario, big banks respond aggressively to the threat from BigTech and continue to dominate the US payments mechanism, partly in cooperation with a handful of smaller FinTech entrants who find and develop profitable niche products. The role of central banks and regulatory authorities will be critical in determining which scenario will come about.

The second chapter by Thorsten Beck surveys the recent literature on novel digital technology driving financial innovation and discusses the impact of these innovations on the efficiency and competition of financial systems and financial stability. Specifically, mobile technology, the Internet and Internet application programming interfaces (APIs) have enabled quicker information exchange, new delivery channels and better exploitation of scale economies, while the IT revolution has facilitated the creation and processing of ‘big data’ and applied statistics for financial risk measurement and management. A third innovation is distributed ledger technology (DLT), the most prominent of which has been blockchain.

These innovations have allowed new providers to enter the financial system, including FinTech companies providing novel payment services, peer-to-peer (P2P) lending platforms and the already mentioned BigTech companies. While several recent papers have explored the relationship between traditional banks and FinTech lenders, it is not clear whether they are competitors or rather complements. One specific concern regarding the creation and processing of big data is whether this allows not only better targeting, but also shrouding information, cream-skimming and discrimination. However, there are also the financial stability concerns stemming from new entry. It is not clear whether banks will react to the reduction in their franchise value with more risk-taking or by concentrating on relationship-intensive services. Cooperation between BigTech and banks can also bring challenges in terms of aligning incentives properly. Finally, there are concerns about the possible introduction of central bank digital currencies and their impact on the banking system.

As in the previous chapter, the author points to a variety of regulatory challenges, ranging from licensing of FinTech and BigTech providers over implications for competition and consumer protection to prudential regulators facing new types of risks related to the regulatory perimeter and IT-related sources of fragility.

The third chapter, written by Antonio Fatas, focuses on innovations in money and payments, specifically the combination of new forms of digital assets with new forms of payment technology. Cryptocurrencies such as Bitcoin are a new type of digital asset (not backed by a sovereign or any other entity) created and traded with DLT, effectively eliminating all intermediaries of payments. Stablecoins, on the other hand, can be exchanged at a prefixed rate for a regular currency, thus avoiding the volatility of cryptocurrencies. Electronic wallets (such as mobile payment networks), finally, are closed loop payment systems that can be accessed easily and can be used to execute payments or transfers between individuals or companies but denominated in regular currencies.

Innovations relying on existing currencies but creating new payment technologies still have to be linked to the existing payment system. These innovations constitute new challenges for central banks and regulators alike regarding how to treat the new types of assets and which players to allow access to the payment system. The author also discusses the differences in the financial landscape that have emerged across countries and region in recent years: mobile digital money has gained importance in Africa; BigTech has been dominating payment services in China; super-apps have gained in importance in other Asian countries; and credit card companies dominate in the US, while banks continue to dominate in Europe. These differences are partly driven by path dependence but also by regulatory decisions. Finally, the author discusses financial innovation beyond payment services, including in wealth management (robo-advisers), insurance (insurtech and Internet of Things) and lending (P2P lending, crowdfunding and initial coin offerings, or ICOs).

The fourth chapter, written by Demelza Hays and Andrei Kirilenko, focuses on cryptocurrencies and their regulation in Europe and the US. The regulation of cryptocurrencies is made difficult by the fact – as mentioned above – that cryptocurrencies are incorporeal rights to a digital object with no intrinsic value and that the ledger of transactions is not only distributed but also decentralised. This implies that cryptocurrencies like bitcoin are not regarded as securities, while other cryptocurrencies might if they pass the Howey Test that an investment contract exists if there is an “investment of money in a common enterprise with a reasonable expectation of profits to be derived from the efforts of others”, which is the case for many ICOs, utility tokens, and other crowdfunding efforts. Finally, the authors provide an overview of recent legal and regulatory developments in anti-money laundering and know-your-customer regulations concerning crypto-currencies, securities laws and taxation across US federal and state law and European legal systems.

The final chapter, by Thorsten Beck, Taiki Lee, Yong Tae Kim, and Yung Chul Park, focuses on Korea. Specifically, the authors start by documenting the oligopolistic structure of Korean banking and the limited innovation that has taken place within the sector, as banks can rely on comfortable margins and limited competition in their

core business lines. This reluctance of banks to move aggressively into the digital space contrasts with the high take-up of digital service across Korean society. At the same time, FinTech companies have started to offer more convenient and faster payment solutions, while several BigTech companies have started to offer various intermediation and non-intermediation services.

The chapter also discusses the regulatory framework for FinTech in Korea and options for future reforms extensively. FinTech services have been regulated under a specific framework established in 2006, which has turned out too narrow. At the initial stage of FinTech development, Korea's financial regulatory authorities chose to embrace a market-led approach to fostering the FinTech industry in line with a general move towards financial liberalisation. A decade later, however, a series of market failures and inefficiencies of the laissez faire approach has begun to take its toll, with P2P lending platforms losing their credibility and reliability as they became shrouded in widespread fraud and deception of investors and borrowers, the number of FinTech startups ballooning but few of them being efficient, and the FinTech industry developing into an oligopoly controlled mostly by financial subsidiaries of BigTechs.

The financial regulatory authorities have reacted to these problems with a law restricting entry and lending in the P2P sector, which has effectively driven all platform operators out of business. The FSC also plans to establish a "FinTech assistance centre" as part of the programme arranging policy loans, business consulting, and startup support for small FinTech firms. In addition, there are current discussions underway to reform the broader legislative and regulatory framework for FinTech. The authors offer a number of critical observations on these reform plans, including the need for a more comprehensive framework, fostering competition given the existence of network externalities, and the need for regulating transactions between BigTech firms and their parent platform companies and consumer protection.

Some of the recent regulatory interventions could be justified to rectify market failures, but others could not. What may be concerning is that once the regulatory authorities start to intervene, they are likely to acquiesce to political pressure to introduce other financial regulations for social harmony and distributive equity to eradicate much of the gains from financial liberalisation over the past two decades in Korea.

Continuous technological innovations result in ongoing and rapid financial innovation and a changing landscape in financial service provision. As a result, there is a need for a flexible regulatory framework that can accommodate these changes while safeguarding stability. The chapters in this book provide a snapshot of where research and policy discussions currently stand, but the debate will certainly continue in the next years and decades.

CHAPTER 1

Finance and technology: What is changing and what is not

Stephen G. Cecchetti and Kermit L. Schoenholtz¹

Brandeis International Business School and CEPR; NYU Stern School of Business

1 INTRODUCTION

How is technology influencing the structure of the financial system? How are traditional intermediaries evolving? To answer these questions, we distinguish between the financial services and the institutions or mechanisms that deliver them. Driven by changes in technology, both have changed significantly over recent decades, and are continuing to evolve.

We have gone from paying with coins and paper to cards and electronic wallets. Online creditors now provide loans within moments of receiving an application. Virtually anyone can trade corporate equities using a mobile phone or tablet. Index-linked mutual and exchange-traded funds have fuelled a shift toward low-cost, passive investing, while robo-advising supplies customised portfolio selection. Derivatives make it possible to separate and price virtually any set of payments and risks. The list goes on.

To understand the evolving relationship between finance and technology, we start with a description of the fundamental services that finance provides to society. How do individuals and businesses use finance? What are the functions of the system?

Simply put, traditional intermediaries – banks, insurance companies, asset managers, pension funds, and the like – exist for fundamental reasons that technological progress has not changed and will not change. We will always need access to the payments system and financial markets, the ability to diversify risk, for loans, and safekeeping, among others. In addition, every effective financial system must contend with the information asymmetries that are inherent in all financial relationships. To overcome pervasive adverse selection and moral hazard problems, nearly all intermediaries collect and process information to screen and monitor counterparties.

¹ We thank Antonio Fatas, Yung Chul Park, and an anonymous reviewer at the Korea Institute of Finance for very thoughtful comments.

Technological progress in recent decades has vastly reduced these costs of collecting information, just as it has slashed the costs of transactions – such as the cost of implementing, communicating and verifying payments, purchases and sales. So, it is natural to think that technical advances will continue to change the financial industry. Will they alter the delivery of financial services, the organisation of the industry, or both?

The answer is almost surely *both*.

Examples of changing services abound. Cloud computing services provide storage and analytics for extremely large data sets. Combined with artificial intelligence and machine learning systems, these improve the speed and accuracy of credit assessment, aid regulatory compliance and help prevent fraud. Smart phones, in use by more than half of the world's adult population, provide access to a broad array of services including payments and online banking, even for people who have never been near a physical bank.²

With regard to the organisation of the industry, the most obvious change is the large increase of small, new firms. Around the world, thousands of startups are vying to provide financial services, either directly to users, or to the intermediaries currently serving them.³ In some markets – especially China – what were startups less than a decade ago have become the dominant players in areas like e-commerce payments and online credit provision.

To explore how technology will further transform the financial industry, we begin by describing the traditional functions of the financial system and discussing the configuration of intermediaries providing them. This simple exposition makes clear where incumbents are relatively competitive. Unsurprisingly, we currently see the most entry in the areas where cost-cutting opportunities and gains from scale are greatest, such as the provision of electronic payments and credit. To continue, we discuss where technological innovations are likely to lead legacy institutions to change and where they are more likely to lead to (potentially disruptive) entry. Next, we look at examples of FinTech entrants by service. Who is doing what?

In the final sections of the chapter, we ask what regulators are doing to meet their established objectives of protecting consumers, ensuring markets operate effectively and safeguarding the resilience of the financial system. Finally, we speculate on what the financial system will look like a decade now. Will incumbent banks retain and expand their dominance, or will Big Tech firms take their place? The two are becoming more alike, so which one wins the race is anyone's guess.

2 See Gomber et al. (2018) for a discussion of the key forces driving what they call the FinTech revolution and Gomber et al. (2017) survey of recent academic research.

3 Findexable (2019) counts 7,000 companies in 230 cities across 65 countries in 2019. Other sources, such as statista.com, suggest that, globally, there are over 20,000 FinTech firms.

BOX 1 WHAT IS FINTECH?

There are two approaches to defining the term 'FinTech'. The first is implicit: take different financial services, and then list the new firms that are providing them in innovative ways. For example, Van Loo (2018) provides such an implicit definition when he writes that FinTech "focuses on consumer services such as bank accounts, payments, financial advice, and loans". KMPG (2019) take a similar approach in their publication entitled *FinTech 100: Leading Global Innovators*. Based on observing the activity of firms, an implicit definition means that you know FinTech when you see it.

An alternative approach (and the one we follow) is based on a set of explicit attributes. Here are a few examples:

- Arner et al. (2015): "the application of technology to finance".
- Boot (2017): "new technology driven players entering the financial services industry".
- Ehrentraud et al. (2020): "technological innovations in financial services".
- FSB (2017): "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".
- Navaretti et al. (2017): "the novel processes and products that become available for financial services thanks to digital technological advancements".
- Thakor (2020): "the use of technology to provide new and improved financial services".
- Philippon (2016): "digital innovations and technology-enabled business model innovations in the financial sector. Such innovations can disrupt existing industry structures and blur industry boundaries, facilitate strategic disintermediation, revolutionize how existing firms create and deliver products and services, provide new gateways for entrepreneurship, democratize access to financial services, but also create significant privacy, regulatory and law enforcement challenges".
- World Bank (2017): "companies or innovations that employ new technologies to improve or innovate financial services".

From these, we derive the following working definition:

FinTech is the application of technology to finance that lowers the unit costs of providing financial services, and makes them better, faster, cheaper, broader, and more accessible.

2 SETTING THE STAGE

To set the stage, we start with a definition of FinTech. While no definition can be both precise and comprehensive, simplicity has its own virtue. As a working definition in this chapter, we use the following:

FinTech is the application of technology to finance that lowers the unit costs of providing financial services, and makes them better, faster, cheaper, broader and more accessible.

In practice, FinTech may alter both how financial services are delivered and who delivers them. While regulators generally should welcome these changes, FinTech also may have undesirable side effects (for example, with regard to privacy, criminality and cross-border capital flows) that require that authorities remain vigilant. (See Box 1 for various alternative definitions of the term *FinTech*.)

To build on this definition, we provide some evidence on costs and on the composition of the financial sector and illustrate using two examples of where FinTech is trying to make inroads.

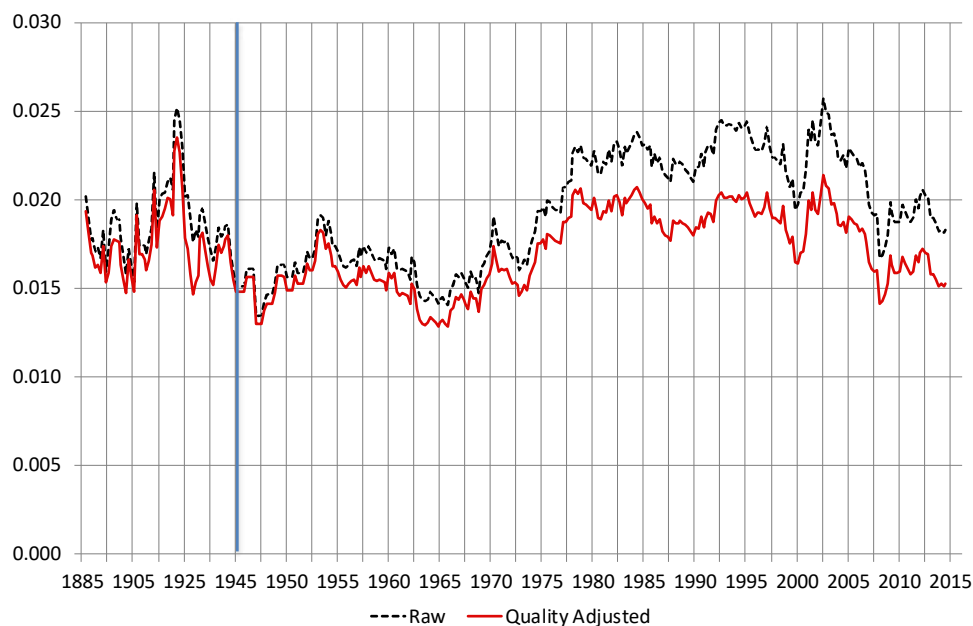
The most striking fact that we know of in finance is that, despite massive and continuous technological advances over many decades, the unit cost of financial intermediation (measured as the ratio of financial institutions' income to the volume of liquidity, credit and asset services they provide) has changed little. Thomas Philippon (2016) estimates that, in the United States, this unit cost has been stuck in the 1½% to 2% range for the past 130 years (see Figure 1)! That is, it still costs nearly 2 cents for the financial industry to create one dollar's worth of assets. Put differently, intermediaries have not passed on the full benefits of technological progress to finance's end-users: the providers and the users of funds. This raises the obvious question: Who will reap the benefits of the rapid changes we are seeing now?⁴

Yet, despite the stubbornness of unit costs, over the past half-century, advances in financial theory and operations, combined with changes in the regulatory environment, have transformed the structure of the financial system around the globe. In domestic financial services, the biggest trend is the move away from bank-based finance toward a combination of market and non-bank intermediation. Illustrating this shift over a long period of time is difficult because of the lack of consistent data for a broad cross-section of countries.⁵

4 Recently, Philippon (2019) suggests that these costs may be falling. Time will tell.

5 The World Bank database allows us to compute for OECD countries since 1960 the ratio of domestic credit to the private sector to broad money. That measure rose from just over 1.0 to 1.25, suggesting that on average, banks' role has declined quite a bit. Additionally, the BIS reports that over the period 1999 to 2019, bank credit to the private nonfinancial sector in advanced economies fell from 51.6% to 48.3% of total credit.

FIGURE 1 UNIT COST OF FINANCIAL INTERMEDIATION IN THE UNITED STATES, 1886-2015 (AS PERCENT OF ASSETS INTERMEDIATE)



Notes: The data is annual through 1944 and quarterly thereafter, with the horizontal axis expanded from 1945 to make the data more visible.

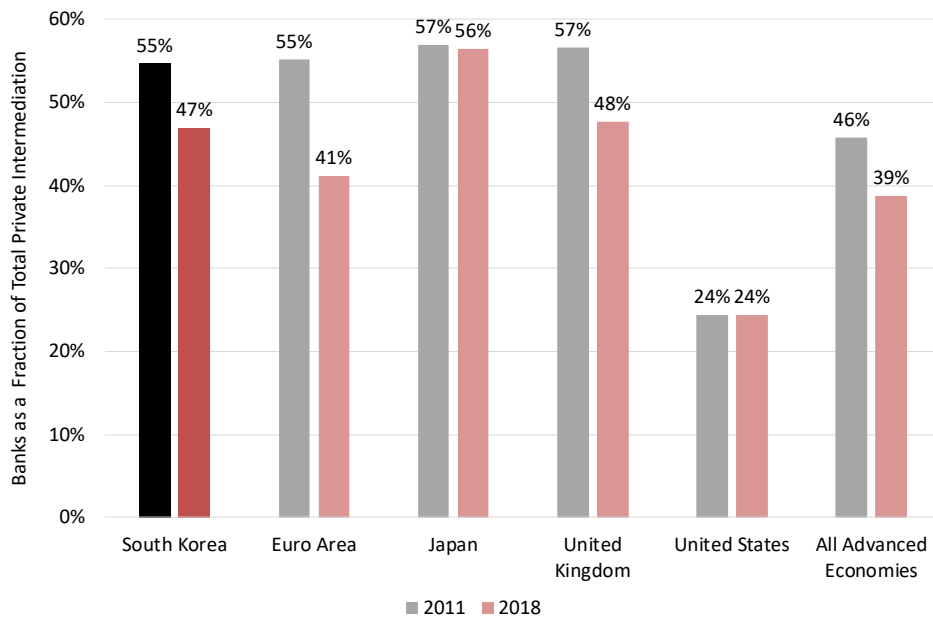
Source: Figure 3 in Philippon (2016).

In an attempt to fill this gap, the Financial Stability Board (FSB) collects information on the distribution of financial intermediation. Panel A of Figure 2 shows the change in the share of intermediation performed by banks in advanced economies over the 2011 to 2018 period. With the exceptions of Japan and the United States, banks are less important today than they were nearly a decade ago. Focusing on Korea in the lower panel, we see that the role of banks has diminished notably. However, nonbank intermediaries engaging in banking activities (the FSB’s ‘narrow’ measure of de facto banking) barely increased. Instead, other traditional intermediaries – pension funds, insurance companies and asset managers – grew notably as market-based finance expanded.

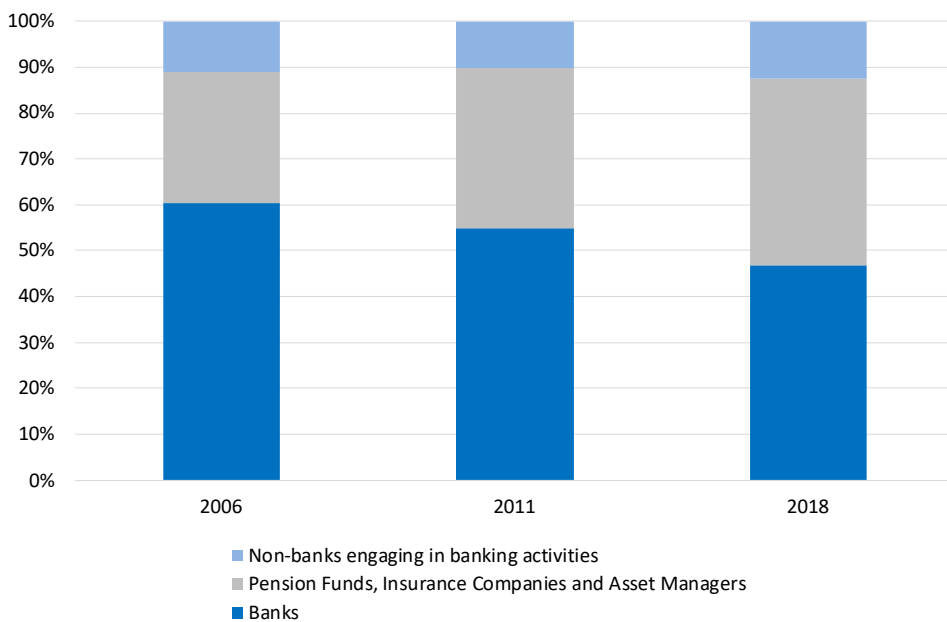
Reducing reliance on commercial banks has various benefits. First, it lessens the likelihood that trouble in the banking system will undermine the supply of credit to healthy borrowers. Second, by limiting the scale of runnable liabilities and of what are likely to be very large and complex banking organizations, it can reduce systemic risk. Third, the expansion of capital markets diversifies the sources of funding. Finally, the entrance of small, nimble rivals can raise the quality of services, lower prices, and broaden access, while motivating large incumbents to compete more effectively.

FIGURE 2 CHANGING COMPOSITION OF FINANCIAL INTERMEDIATION, BANKS AND NONBANKS

A) SHARE OF ASSETS INTERMEDATED BY COMMERCIAL BANKS



B) COMPOSITION OF INTERMEDIATION IN KOREA

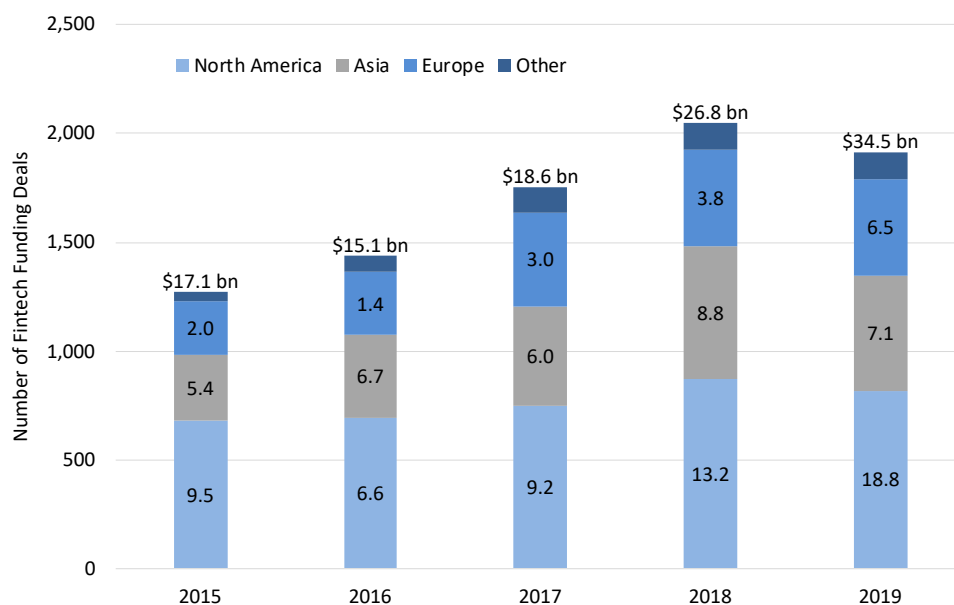


Notes: Data are all based on assets of financial intermediaries.

Source: FSB (2020).

Turning to FinTech, there is little comprehensive data on a global basis. One proxy for the scale of FinTech is the number of FinTech-related venture capital (VC) financing deals by region. According to CB Insights, from 2015 to 2019 there were 8,425 deals worldwide, with a total value of \$112.1 billion. (This excludes \$18.5 billion raised by Ant Financial in 2018.) It is important to emphasise two things about these numbers. First, there may be ten times this many FinTech startups overall, but the vast majority fail even before initial VC funding. Second, the CB Insights sample is only a fraction of total startup financing. For example, KPMG (2020) estimates that, over the 2015 to 2019 period, there was roughly \$80 billion in FinTech financing per year globally. This is nearly three times larger than the value reported by CB Insights, but the figure still seems low compared to the overall investment in financial services. That is, if total investment in finance were roughly proportional to its share of global value added, then at \$80 billion per year, FinTech investment would account for only about 5% of overall investment in finance.⁶

FIGURE 3 NUMBER OF FINTECH FINANCING DEALS GLOBALLY, 2015-2019



Source: CB Insights (2020).

⁶ To compute this number, we start with the IMF's WEO database for January 2020, which allows us to estimate global gross investment at an average of \$21 trillion per year from 2015 to 2019. Next, using information from the World Bank, we know that finance accounts for roughly 6 percent of value added in the advanced economies. Assuming that investment is proportional to the share of value added, the annual gross investment in finance is approximately \$1.5 trillion per year. FinTech deals of \$80 billion per year is 5.3% of this total. The German Council of Economic Experts (2019) also emphasises that, outside of China, FinTech remains small.

In our view, any catalogue of FinTech innovations ought to include closely related public infrastructure improvements and the expanded provision of financial services by governmental entities. For example, a number of central banks have developed small-value payments systems that the private sector can utilise to make instantaneous transfers from one bank account to another across the central bank's balance sheet. Such systems already exist in the United Kingdom and in India, while the Federal Reserve is in the process of developing FedNow to serve this need.⁷

We provide an overview of financial services and their delivery in the next section. Before we do, however, it is worth illustrating the FinTech challenge by examining two specific financial services where the arrival of a substantial number of new entrants has *not* yet led to a plunge in unit costs, or to a large improvement of service. We focus here on *cross-border remittances* and *peer-to-peer lending*.

Remittances

When migrants send money across borders to their families, it promotes economic activity and supports incomes in some of the poorest countries of the world. Prior to the Covid crisis, annual cross-border remittances exceeded US\$700 billion, three quarters of which flow to low- and middle-income countries. To put that number into perspective, total development assistance worldwide is \$150 billion. Indeed, for many countries, these transfers account for a significant fraction of people's incomes. For example, in Haiti, Nepal and Honduras, remittances exceed 20% of GDP.

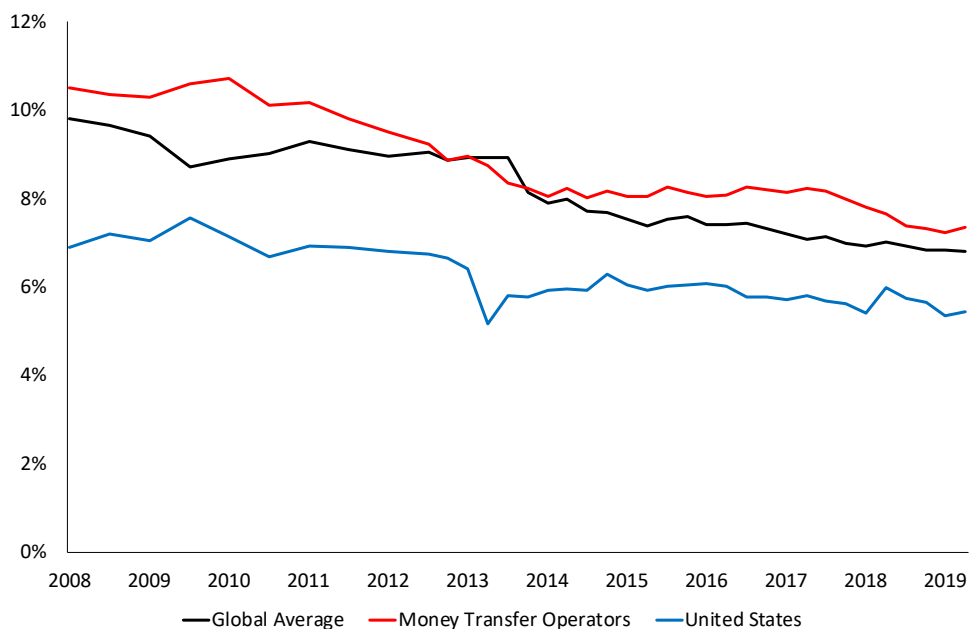
Yet, despite the remarkable technological advances of recent decades, remittances remain very expensive. On average, the charge for sending \$200 – the benchmark used by the World Bank to evaluate cost – is over \$13. That is, the combination of fees (including charges from both the sender and recipient intermediaries) and the exchange rate margin typically eats up nearly 7% of the amount sent. It is less expensive to send larger amounts, with the global average cost of sending \$500 closer to 4½%. Even so, the aggregate cost of sending remittances in 2019 was about US\$36 billion, roughly equivalent to the total non-military foreign aid budget of the United States.

You might think that the massive volume of remittances would promote cost-reducing advances in technology, but there is little evidence of a big FinTech-driven improvement. Rather, as Figure 4 shows, costs have trended lower only gradually, while the differences across types of transfer agents and across sender countries remain glaringly persistent. The black line is the simple, unweighted average for all providers – banks, money transfer operators (MTOs, including FinTech companies) and post offices – of sending \$200 from the full sample of 48 sending countries. Over the past decade, this global average has fallen from 9.8% to 7.3%. Despite the hope for a FinTech- and competition-related

7 For the United Kingdom, see www.fasterpayments.org.uk/; for India, see www.npci.org.in/product-overview/upi-product-overview; and for the United States, see Brainard (2019).

slashing of unit costs, the pace of decline for MTOs since 2008 is about the same as the global average. Moreover, in the United States (the blue line) the cost has declined even more slowly, falling from just over 7% in 2009 to roughly 6%, where it has stayed since 2013.

FIGURE 4 AVERAGE COST OF SENDING US\$200 ACROSS A BORDER, 2008-19 (PERCENT OF TOTAL)



Source: World Bank (2019).

Going forward, can a combination of education, competition and technology reduce these costs? Perhaps. But this would require overcoming a key challenge – most forms of cross-border funds transfer need the cooperation of a bank at some point in the process. An MTO, for example, utilises accounts at banks on both ends of the transfer corridor. However, in response to stronger anti-money-laundering (AML) standards, banks have been terminating or restricting their relationships with MTOs.

The question is whether technology can reduce the substantial compliance costs associated with know-your-customer (KYC) regulations. One way to do this would be to institute trusted personal identification (ID) systems that make it easier to track whether a person is engaging in some criminal behaviour.⁸ While it is possible to imagine such

⁸ A recent report from the Committee on Payments and Market Infrastructure (CMPI 2020) highlights an array of obstacles, including the lack of common standards across jurisdictions.

structures, they come at substantial expense and require a willingness for individuals to forgo personal privacy.⁹ They also may require extensive government coordination, as in India's comprehensive biometric ID programme.¹⁰

Peer-to-peer lending

Our second example is peer-to-peer (P2P) lending. Even in wealthy economies with the most sophisticated financial systems, it can be difficult for individuals and small businesses to obtain credit. To counter this, firms like Lending Club in the United States, Zopa in the United Kingdom, Auxmoney in Germany, LenDenClub in India and Lendit in Korea seek to match individual borrowers and lenders. Yet, the market remains small. Most estimates put 2019 volumes at well below \$50 billion worldwide. Similarly, in China – once the global leader in P2P lending, with more than 3,500 lenders and outstanding loans exceeding ¥1 trillion – the market has shrivelled following a 2018 tightening of regulation, when a number of Internet lenders shut down (Chao and Xie 2020).

Can schemes like these deliver credit to underserved households and firms? Determining a person's creditworthiness and ensuring they repay are difficult and costly activities. As we discuss below, one of the most important functions of the financial system – possibly the single most important – is to screen and monitor borrowers to ensure that resources are allocated to their most productive use. For borrowers with a credit history, traditional lenders have advanced statistical models based on very large data sets that allow them to do this fairly well.

Peer-to-peer sites that we know of specialise in unsecured lending. Such lending suffers from a severe problem. As the probability of default rises, a lender will require a higher interest rate to compensate for the risk. But, higher interest rates attract borrowers who are worse risks. Put differently, the pool of willing borrowers at a high interest rate shifts adversely relative to the universe of those wishing to borrow at a rate they expect to pay. The stark implication is that as the interest rate on loans rises, lenders' profit margins will at first increase, but then fall.

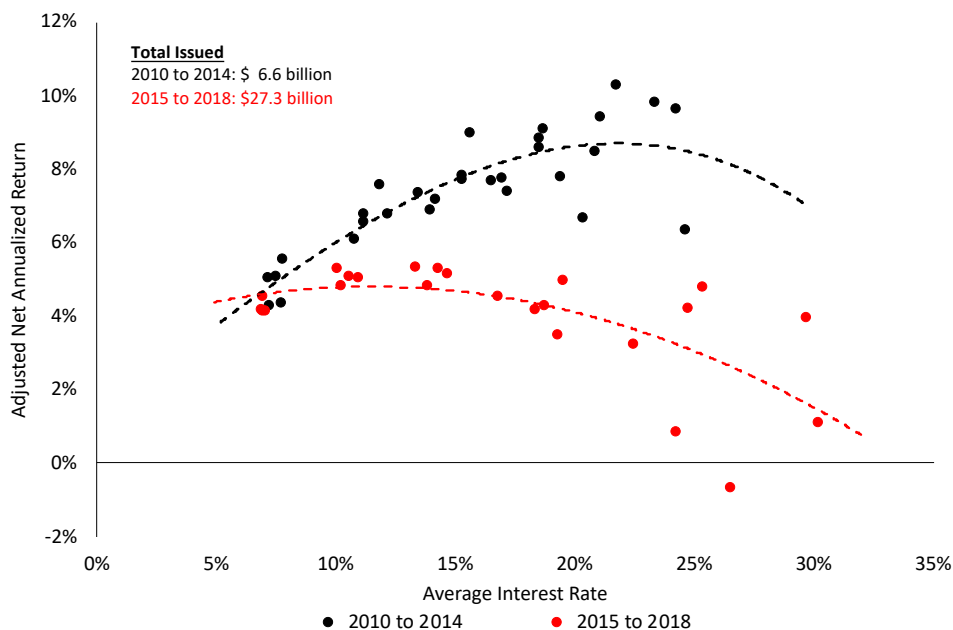
Knowing that higher interest rates attract a riskier pool of borrowers, banks and other traditional lenders have a number of mechanisms to reduce loan losses and increase profitability. Not only are there rigorous screening processes, but many lenders require collateral. Auto loans, secured by the cars themselves, are a clear example. For consumer credit, at the first sign of trouble, banks can reduce credit lines. For corporate loans, banks use covenants to restrict borrowers' activities and to require repayment should borrower cash flow slip.

9 For more detail on remittances, including further discussion of the challenges of reducing costs, see Cecchetti and Schoenholtz (2019a).

10 To understand the extraordinary impact of India's ID program on financial access, see Cecchetti and Schoenholtz (2018b).

As it turns out, data from the largest US peer-to-peer lender, Lending Club, show exactly what theory predicts. In Figure 5, we plot the adjusted net annualized returns against the average interest rate charged on loans for two sample periods. The black dots (and dashed fitted line) use data from 2010 to 2014, a period when the P2P lender originated \$6.6 billion of loans. The red dots and indicative fitted line are for the 2015-2018 interval, when origination surged to \$27.3 billion.

FIGURE 5 RELATIONSHIP BETWEEN INTEREST RATES CHARGED AND REALIZED RETURNS, 2010-2018



Note: We note that, since Lending Club loans are all between 24 and 60 months, much of the data beyond the end of 2016 relies on the firm's projected, not actual, loss rates.

Source: www.lendingclub.com.

The figure highlights the impact of adverse selection on the expanding pool of loans. Looking at the 2010 to 2014 period, the black line turns down, but only starting at an average interest rate above 20%. However, as new originations attract more borrowers, the pool becomes markedly worse. Looking at the red line, we see that the realised return starts to turn down at an interest rate that is somewhere between 10% and 15%. Not only that, but with interest rates of 25% or more, realised returns are close to zero or negative. Over the past few years, as far as we can tell, Lending Club severely cut back originations in the lowest credit category.¹¹

¹¹ For more detail on peer-to-peer lending, see Cecchetti and Schoenholtz (2020).

We draw three conclusions from the experience with remittances and P2P operations. First, to be effective, FinTech must overcome the well-known and costly screening and monitoring challenges that pervade all financial services. Second, as with business innovations more generally, FinTech is a trial-and-error process in which only a few efforts prove robust and gain scale. Third, it is difficult to anticipate which innovations will survive this very Darwinian selection process.

There is, however, promising news for *digital* lenders more broadly. Using large databases, machine learning, and non-traditional information on entrepreneurs' online payments, e-commerce, social media behaviour and networks, lenders can improve the quality of credit scoring of small and medium-sized enterprises (SMEs) that lack a credit history (Gambacorta et al. 2019).¹² Presumably, this approach will be of greatest value not just to small P2P lenders, but to large intermediaries that already have extensive internal information about payments who can augment it with behavioural (soft) data to assess credit applications.¹³ In China, for example, three banks currently are granting about 10 million SME or personal loans annually with nonperforming loans of just around 1% (Huang 2020).

To sum up, over recent decades, financial innovations have vastly altered the mix of services that households and businesses use. The key shift is towards market-based and away from bank-based finance. Some promising innovations can aid in expanding access to credit for firms and households that lack a credit history. However, there is little evidence that innovation has lowered the unit cost of intermediation substantially. In addition, peer-to-peer firms have had little impact on the market for uncollateralised loans, even as other online lenders – including specialised banks (in China) – have had greater success. Perhaps the greatest disappointment is the stubborn cost of cross-border remittances, reflecting the need to control money laundering and other illicit use of finance.

3 THE ROLE OF FINANCE IN THE ECONOMY

To understand how technology might change the financial system going forward, we start with a discussion of the role of finance in the economy. Financial firms provide a broad array of services to individuals and firms. We all use these on a virtually constant basis. The payments system allows us to transfer funds. Individuals and firms can save and lend to smooth consumption and expenditure in the face of volatile income and revenue. We all need a place to store our financial assets safely, as well as methods to turn them into a means of payment (what most people call think of as 'money'). Through a combination of contingent contracts (like insurance) and access to both underlying and derivative

¹² The incremental information benefits appear to erode once a credit history is established, but these non-traditional scoring tools can help provide access to credit where it did not exist to firms that are likely to repay.

¹³ As Vives (2017, 2019) discusses, these techniques also allow for increases in price discrimination, which can also increase access; see also Consumers International (2017).

securities, the financial system provides methods for households and firms to diversify, hedge and pool the risks that they face. In addition, the system allows firms to issue equity and bonds into financial markets. Box 2 summarises these financial services.¹⁴

BOX 2 PRIMARY SERVICES OF THE FINANCIAL SYSTEM

Payments system access: offering methods to transfer funds between individuals and firms.

Lending and credit provision: supplying funds both for investment and to allow individuals and firms to smooth expenditure in the face of volatile income and revenue.

Safekeeping and accounting: keeping customers' financial assets safe and providing information to help them track their income and expenditure.

Deposit taking and liquidity provision: providing liabilities that can serve as or be transformed into money reliably, quickly, easily and cheaply.

Diversification and risk pooling: giving investors the ability to diversify even small amounts and to pool and hedge risks of all kinds.

Financial market access and market making: providing individuals with the ability to purchase and sell securities or derivatives reliably, quickly, easily, and cheaply.

Equity and debt underwriting: allowing firms to issue new securities into markets.

Derivatives-based risk transfer: allowing individuals and firms to transfer risk using contingent contracts.

This is already a very long list, but there is one activity underpinning all of these services. Financial intermediaries *collect and process information*. Information allows intermediaries to screen and monitor users of funds in an effort to reduce the impact of information asymmetries.

Arguably, the primary goal of finance is to channel funds from savers to users of funds; from those who have income in excess of their consumption to governments and firms who provide public services or invest in projects. To channel these resources to their most productive use, intermediaries require sophisticated information. The challenge is that those attempting to obtain loans, or to issue bonds or stocks, know much more about the factors influencing their ability to repay (such as their business and employment prospects) than do the fund providers. The same information problems are relevant for insurance, where the insurer knows far less about the insured's risks or risk-avoidance efforts.

¹⁴ For more details on the financial services, see Chapter 11 of Cecchetti and Schoenholtz (2021).

Asymmetric information creates two obstacles to the smooth provision of financial services: adverse selection and moral hazard. Adverse selection refers to the problem of distinguishing a good feature from a bad feature. The degree of adverse selection depends on how costly it is for the uninformed actor to observe the *hidden attributes* of a product or counterparty. Adverse selection occurs *before* a transaction. For example, the supply of used cars will shift toward lemons if buyers are unable to distinguish the good from the bad. In the world of finance, when such key characteristics become sufficiently expensive to discern, adverse selection can make an otherwise healthy market suddenly disappear (Cecchetti and Schoenholtz 2017b).¹⁵

Moral hazard arises when a principal cannot costlessly observe the *hidden actions* of an agent, and so cannot judge whether a particular outcome – good or bad – reflects the agent’s effort or mere fortune. Moral hazard occurs *after* a transaction when the agent already has received funding or insurance.¹⁶

Solutions to the adverse selection and moral hazard problems are of two types. The first is to try to collect more information, while the second is to align the incentives of the agent (the user of funds or the insured) with those of the principal (the provider of funds or the insurer). In the case of adverse selection, there is government-required disclosure and private information collection to lower the cost of *screening* prior to a transaction; and requiring users of funds to invest their own resources (‘skin in the game’) as well as to pledge collateral to align incentives. For moral hazard, solutions include post-transaction reporting requirements to facilitate *monitoring*, restrictions on activities and requirements that users of funds invest their own resources.

Financial systems have been managing information asymmetries since the rise of civilization. Evidence of various banking and insurance systems date back 4,000 years to the Babylonian Code of Hammurabi. Rome already had jointly held firms (Malmendier 2005). Banking as we know it is a creation of the Italian Renaissance; the bank Monte dei Paschi di Siena, founded in 1472, has been operating in its current form since 1624. Modern property and life insurance first arose in 17th century Europe. In 1602, the Dutch East India Company issued shares tradable on the first official stock exchange in Amsterdam. Moreover, the first modern limited liability law – the legal cornerstone of contemporary financial markets – dates from New York in the early 1800s. While we have an image of finance as a sector that is constantly evolving, the basic challenges have persisted for a very long time.

Turning to modern finance, we can list the types of firms that characterize the early 21st century financial system. In Box 3, we briefly describe these institutions and their current activities. While we list each of these separately, financial firms often combine these activities into one organisation. Universal banks, for example, may offer the services of

¹⁵ Note that the key problem of peer-to-peer lending, described in the previous section, is adverse selection.

¹⁶ For further discussion of adverse selection and moral hazard, see Cecchetti and Schoenholtz (2017a, 2017c).

a depository bank, an investment bank, an asset manager, an insurer, a pension fund and a custodian. Market utilities, such as central clearing parties and exchanges, tend to be separate, although large financial institutions may be their owners. In an attempt to reduce the potential for conflicts of interest, credit rating and credit scoring agencies tend to be independently owned and operated.

BOX 3 TRADITIONAL FINANCIAL INSTITUTIONS

Depository bank: provides deposit liabilities and holds cash, securities, and loans.

Investment bank: offers advisory services and raises funds through issuance of securities

Pension fund: holds assets in order to make payments to beneficiaries in retirement.

Asset manager and hedge fund: offers investors stakes in funds holding a portfolio of assets.

Private equity and venture capital fund: investment firms that acquire and restructure existing companies, or invest in new ones.

Life insurer: offers policies protecting against loss of earning from disability or death.

Property and casualty insurer: offers policies that protect against losses from theft, accident, fire, and natural disaster.

Central clearing party: an entity that takes on counterparty credit risk between parties to a transaction and provides clearing and settlement services for trades.

Exchange: an organised market where commodities, securities, or derivatives trade.

Custodian: safeguards a firm's or individual's financial assets.

Credit rating and credit scoring agencies: assess the willingness and ability of a firm or individual to repay debt in a timely way.

Putting the services or activities and the institutions together, we can create a matrix that shows who does what in a traditional financial system. Table 1 is the result. The columns show the institutions and the rows are the activities, with some activities conducted directly and others indirectly.¹⁷ We order the columns and the rows by the item with the most entries. For example, asset managers tend to provide the widest range of services, while the focus of credit rating agencies is quite limited.

Looking at the rows, everyone collects information. At the other end of the spectrum, only depository banks provide access to the payments system.

¹⁷ We include activities that are incidental to the primary business of the intermediary. For example, private equity and venture firms engage in safekeeping and accounting as a byproduct of this funding business.

TABLE 1 FUNCTIONS PROVIDED BY TRADITIONAL INTERMEDIARIES

Function/ activity	Traditional intermediaries and delivery systems										
	Asset managers and hedge funds	Investment banks*	Depository banks	Life insurers	Pension funds	Private equity & VC	Central clearing parties (CCPs)	Exchanges	Property and casualty insurers+	Custodians	Credit rating and scoring agencies
Collecting and processing information	x	x	x	x	x	x	x	x	x	x	x
Diversification and risk pooling	x	x	x	x	x	x			x		
Safeguarding and accounting	x	x	x	x	x	x				x	
Lending and credit provision	x	x	x	x	x	x					
Derivatives-based risk transfer	x	x	x	x	x		x				
Financial market access and market making	x	x		✓	✓		x			x	
Liquidity provision	x	x	x	x							
Deposit taking	✓		x								
Equity and debt underwriting		x				x					
Payments system access	✓		x								

Note: X's represent direct provision of services and ü's represent indirect or partial provision of services. * Investment banks include both brokerage and underwriting services. + Property and casualty insurers engage in roughly 5% of the derivatives-based risk transfer of life insurers; so we ignore this. See NAIC (2015).

One way to think about this table is that as we go from the top to the bottom, the traditional financial system appears less and less competitive – at least in terms of the range of providers. Access to the payments system offers the most obvious example. In the past, depository banks faced little competition from other types of intermediaries. This could explain why there are now so many entrants into this line of business.¹⁸

There is no such pattern along the columns. However, some of the firm types exhibit extreme returns to scale that limit competition. This applies particularly to central clearing parties (where large network externalities promote the concentration of transactions) and to custodians, where unit costs appear to decline with scale, creating natural monopolies.

4 HOW IS TECHNOLOGY CHANGING FINANCIAL SERVICES?

Finance and technology have a long history, with progress coming in both *theoretical* and *operational* form. Practitioners developed or refined concepts like double-entry bookkeeping, joint stock companies and limited liability in the 14th, 17th and 19th centuries, respectively. More recently, we have securitisation, options-pricing theory and the creation of numerous contingent claims such as credit default swaps. On the operational side, advances in communication and computation have made feasible vast increases in the scale and speed of transactions. Arner et al. (2016) divide the last 150 years into three eras, starting with the introduction of the telegraph in the mid-1800s; continuing with electronic payments, ATMs and online banking during the 50 years to 2008; and then the most recent era, defined less by the products or services than by who delivers them.

According to the most recent World Bank survey of financial inclusion, as of 2017, 93% of adults in high-income economies and 79% of those in developing economies have a mobile phone, while half of those with accounts at financial institutions access them using the Internet (Demirgüç-Kunt et al. 2018). Because of the extraordinary diffusion of mobile telephony, the delivery of financial services in many emerging economies has leap-frogged the tools and practices that were widespread in advanced economies until quite recently.

Modern technology provides us with information at low cost and allows us to transact quickly and efficiently. Yet, it does not change the fundamental services we require. That is, the question is not whether we need the financial services discussed in the previous section, but how we will obtain them and how we will supplement them.

An example helps to illustrate what we have in mind. Starting with payments, many of us recall the days when we used paper – currency and cheques – to make payments. Over the course of several decades, debit cards slowly replaced a portion of this. Today, we use bank

¹⁸ We should note that there are alternative categorizations (e.g. CB Insights 2019, Ehrentraud et al. 2020). Differences in the category architecture then lead to slightly different ways to classify new FinTech firms.

websites, smart phones, and a range of bank and nonbank digital payment providers. The welfare gains from these changes are clearly enormous. Fifty years ago, someone wishing to make a purchase might go to a bank to withdraw the requisite amount of currency and then hand it to a merchant, who would then have to take it to the bank. This process was time consuming and risky. Today, shifting the fund balance from the buyer to the seller requires no more than the tap of a phone. There is no need to travel, and no risk of theft or loss of the paper currency.

BOX 4 RECENT TECHNOLOGICAL INNOVATIONS THAT ENABLE FINANCE

A number of recent innovations are helping to lower transactions and information costs, as well as barriers to entry, in finance. In some cases, these innovations also ease regulatory and compliance requirements.

A partial list based on Ehrentraud et al. (2020) includes:

- *Mobile phones* allow transactions with or through a financial institution from almost anywhere at any time. In addition to cutting costs, this improves the availability and reliability of services, as well as the speed of delivery.
- *Open source frameworks* provide low-cost (or free) modular software that can be quickly adapted to enhance products.
- *Applied programming interfaces (APIs)* standardise protocols for the use of software applications, enabling non-banks secure and regulated access to the financial information of individuals.
- *Artificial intelligence and machine learning* algorithms facilitate the use of large amounts of data, lowering the costs of product pricing, risk assessment, fraud detection, compliance, advising and trading.
- *Cloud computing* delivers computing services (including storage, database management, networking, analytics, and software) over the Internet. It offers security, speed, scalability, continuity and flexibility, and limits barriers to entry by reducing the IT capital investment needed by new financial entrants.
- *Biometric identification* facilitates authentication of users, improving security, preventing fraud, and lowering the cost of complying with KYC rules.
- *Cryptography* (including advances such as distributed ledger technology, or DLT) permits secure, transparent, tamper-proof transactions, provides an audit trail and allows for decentralisation that reduces the risk from single points of failure in a financial network. In theory, it also eliminates the need for a trusted third-party intermediary.

In various combinations, these technologies make possible large changes in both the scope of financial services and the structure of the delivery system.

Advances in the payments system are just the most visible innovations.¹⁹ There have been analogous developments elsewhere in the financial system. The combination of a theoretical advance (an idea) and an operational mechanism (an organisational arrangement) underlies the provision of mutual funds composed of various combinations of commodities, real estate, bonds, equities and cash instruments. Similarly, the spread of securitisation across a wide range of loans – including residential and commercial mortgages, auto loans, credit card receivables and student debt – is the result of both intellectual and operational innovations.

But recent technological innovations (such as those we list in Box 4) could change the provision of finance far more extensively. Importantly, using their access to data and high-quality algorithms, FinTech firms can improve screening of potential borrowers and customise products at individual prices to meet the needs of specific customers. Information from mobile devices can help overcome adverse selection and moral hazard. As a result, FinTech providers can offer superior products at lower costs, focusing on business areas and activities with relatively high returns on investment where competition has been lacking (Vives 2019). And, new FinTech entrants can provide specialised services either to existing financial institutions or to customers directly. Through peer-to-peer networks, they can link customers directly.²⁰ Table 2 presents a set of current financial delivery mechanisms and providers organised by the function or activity that they perform. While several firms included in this table are independent providers – such as the online Internet banks in China – the bulk of them overlay their systems on top of the existing financial infrastructure of traditional intermediaries. For example, while Betterment is a registered adviser and regulated broker-dealer, firms like Square and Transferwise are payments providers that connect to banks.

As Cortina and Schmukler (2018) and FSB (2019a) point out, the frequent linkage of incumbent institutions and FinTechs means that their relationship is complementary and cooperative. One reason for this is that most FinTechs are small. They do not have access to low-cost funding or a large customer base, nor do they have the resources to meet what can be relatively high fixed-cost barriers to entry in numerous financial services.

The few exceptions, however, are notable. A handful of Internet banks in China have tapped a previously unexploited opportunity of lending to SMEs. Two of these (WeBank and MYBank) can benefit from the massive databases of the payment firms operated by their largest shareholders (Tencent and Ant Financial, respectively). Similarly, M-Pesa offers bank-like services using proprietary structures that are not a part of the traditional ecosystem.²¹

19 See Chapter 4 of Carletti et al. (2020) for a comprehensive discussion of how private payments system are evolving.

20 See Consumer International (2017) and IMF (2019) for a general discussion of the types of FinTech firms. Thakor (2020) identifies peer-to-peer interaction as the critical innovation in FinTech.

21 Frost (2020) notes the uneven adoption of FinTech around the world, suggesting that it is most likely to arise where there are unmet demands for financial services, high costs of traditional finance, and a supportive regulatory environment.

TABLE 2 **EXAMPLES OF HOW TECHNOLOGY IS CHANGING DELIVERY OF FINANCIAL SERVICES**

Function/activity	Alternative delivery systems	Examples
Payments system access	Mobile payments platforms, cryptocurrencies	Waymo, Stripe, Ripple, Square, Transferwise, Alipay, WeChat, M-Pesa
Liquidity provision	Provided through mobile wallets or using API links to depositories	(same as above)
Lending and Credit Provision	Automated small business lending and consumer credit; Peer-to-peer systems	WeBank; MYbank; XW Bank; Affirm, Prosper, Lending Club, Kabbage, Sofi
Diversification and risk pooling	Robo-advising	Betterment, Wealthsimple, Acorns, Sofi
Screening and monitoring	Automated (AI) credit rating and scoring	Credit Karma, Wecash, modeFinance
Financial market access	Market platforms	Robinhood, IEX, kantox, Sofi
Equity and debt underwriting	Automated underwriting, direct firm issuance, and crowdfunding	Kickstarter, AngelList, Crowdfunder
Financial market making	Smarter, faster machines and new market structures	Axon
Derivatives-based risk transfer	Improved multilateral netting and trade compression	Axon
Deposit taking	Digital wallets	Atom
Safekeeping	Blockchain	Bitfury

Sources: CB Insights (2020) and KPMG (2019).

Before speculating about the future of FinTech and the financial system, we turn to three questions. First, how is technology affecting the economies of scale and scope in finance? Second, what is the impact of technology on financial competition and concentration? Third, what is the impact of FinTech on financial stability?

Starting with scale economies, information technology creates what the BIS (2019) describes as the *DNA* loop – a tech firm uses a large stock of *user data* (D) to offer a range of services exploiting natural *network effects* (N), generating further *user activity* (A), which then results in more data. This is the Big Tech model driving the successes of Alibaba, Amazon, Facebook, Google and Tencent. The result is enormous scale. Google’s market share of search engine business is 87% worldwide, while Amazon has half of the US e-commerce business. In China, Alipay has more than a 50% share of the online

payment market, while its competitor Tencent reported for the fourth quarter of 2019 more than one billion daily commercial payment transactions (involving 800 million active users and 50 million merchants) (Ge 2020).

Several Big Tech firms are building on their foothold in key financial services to expand their footprint more broadly. A recent Financial Stability Board report enumerates how the largest technology firms have a presence in payments, lending and short-term credit, asset management and insurance, among others (FSB 2019a).

Turning to economies of scope, we can ask where there are important complementarities in the provision of financial services. Put slightly differently, which of the services currently frequently offered in combination can be profitably unbundled from the others?²² To see what we mean, start by looking back at Table 1. Note that exchanges, custodians and credit rating agencies each provide only one service (other than information processing). One might think, as a result, that certain aspects of information collection, safekeeping and market access are not complementary to any other service. However, we doubt that this accounts for the organisation of these activities. More likely, the mix of high fixed costs and extensive network externalities in the operations of exchanges and custodians favours declining unit costs, while credit rating agencies face potentially costly conflicts of interest if linked too closely with other financial services. So, while it may be possible to unbundle these activities, economies of scale and diseconomies of scope create significant barriers to entry.

In contrast, looking at Table 2, we see significant entry into the provision of payments services. In some cases, entrants overlay their systems on existing institutions, taking advantage of banks' compliance and access to interbank transfer networks. If a provider becomes large enough, so that the bulk of their transactions takes place among their own subscribers, then they can evolve into proprietary systems. As we have noted, the most successful examples are the digital payments providers in China that, having entered the business just a few years ago, now dominate it. We note that the ability to enter the payments business has likely been greater in Asia than elsewhere. This reflects the standardisation of digital personal identification and the widespread use of QR codes. In the absence of regulatory obstacles that exist in many advanced economies, these digital technologies facilitate real-time person-to-person funds transfers.

There is, however, an important limit in the unbundling of payments from other financial services. Making a payment requires the transfer of liquid assets from one party to another. This is the reason that banks, which historically have been the only real liquidity providers, also provide payments. The implication is that a FinTech company providing

22 As Vives (2019) points out, technologies like APIs support the unbundling of some services.

payments will have to have access to liquid assets. As we survey the landscape, this is what we see – payments system providers either have a relationship with banks or they become a (possibly de facto) bank.²³

Another limit to unbundling arises from the strong complementarities between deposit services and lines of credit to potential borrowers. That is, an institution specializing in providing liquidity can do it on both sides of its balance sheet. Historically, such institutions have been banks (Kashyap et al. 2002).

In comparing banks with FinTechs, Petralia et al. (2019) and FSB (2019b) argue that banks have the advantage of size, brand, customer loyalty, lower cost of funding, data and privacy protection schemes, and political power. By comparison, FinTechs have cutting-edge technology, limited regulatory burden and network externalities. However, when incumbent banks fail to compete effectively, entrepreneurial FinTech firms can grow rapidly (as in China), quickly developing many of the size/power advantages that have been associated with the largest banks.

Finally, FinTech raises several additional concerns. The most obvious is a virulent form of cyber risk – namely, the risk that a hostile actor disrupts the system. A financial network is only as strong as its weakest link. A network that links a large number of small firms is more difficult to fortify and police. At the same time, a network that is heavily dependent on a few key nodes (like central counterparties) also can be vulnerable. Indeed, precisely because of their massive interconnections, the largest CCPs are vital to financial resilience, so any resolution scheme must focus on continuity of service (JP Morgan 2020). And, what is true for disruptions is true for data breaches and identity theft as well.²⁴ The more firms that have our financial information, the more risk of it being stolen and misused.²⁵

Another concern is that, by improving access and information, technology can increase opportunities for exploitation. For example, there is the risk of basing credit decisions on inaccurate information. If you feed incorrect data into an automated system, you will get a fast answer that is wrong. And, if you train the automated system on data that contains biases, the system will provide advice that accentuates those biases. Related to this, FinTech systems may be able to exploit behavioural biases of customers by offering them products at inflated prices that are not in their best interest. Protecting individual users of financial services against such manipulation may be difficult, but it is essential.

We should also mention that, by enabling monitoring, technology facilitates price discrimination that can undermine the provision of financial services. Casualty insurance is the most obvious example. By utilising information from a driver's smart car

23 Navaretti et al. (2017) note that it is hard to see how FinTechs can offer liquidity management services on their own.

24 Ironically, improving fraud protection reduces the incentive to monitor the system in the first place, so there is a delicate balance.

25 This also brings up the question of who should own personal data. Jones and Tonetti (2020) show that under quite general circumstances, the optimal outcome is what we intuitively expect: individuals should own their own data. As a result, we are likely to see the creation of *data custodians* who offer to safeguard our personal data while we control (and receive compensation for) the access of large data users.

or smartphone, an automobile insurer can cream the lowest-risk customers, reducing the ability of individuals at large to pool risks. Of course, the insurer also encourages safer driving habits.

5 REGULATORY RESPONSES

The wide array of FinTech innovations has prompted a similarly broad range of regulatory responses. In some financial centres, regulators have sought to attract FinTech innovation to their jurisdiction in order to enhance the efficiency of financial services. For example, they have introduced regulatory ‘sandboxes’ to allow testing of FinTech ideas in the presence of temporary regulatory forbearance. At the same time, many regulators view selected innovations as a potential threat to the safety and soundness of their financial systems (see Box 5).

BOX 5 PRIVATELY ISSUED DIGITAL CURRENCY: THE CASE OF LIBRA*

On 18 June 2019, Facebook announced the creation of a Geneva-based entity with plans to issue a digital currency called **Libra**. Their stated objectives are to improve the efficiency of payments, reducing costs and speeding transfers; and to improve financial access. Will a privately issued digital currency meet these goals while keeping the financial system safe? Our answer is an emphatic no.

The idea behind Libra is that every individual with a smartphone will be able to purchase tokens using their own domestic currency, with the proceeds invested in a portfolio of bonds and in bank deposits denominated in a few major currencies. Owners can then use their tokens to purchase goods and services, or to extinguish debts.

Will Libra really make payments faster, cheaper and safer both domestically and internationally? In most advanced countries, the vast majority of the population already has access to low-cost payments technologies (like bank debit cards or digital wallets). As for cross-border remittances, there a number of systems in place, but they rely on the banks’ compliance operations to ‘know your customer’ and ensure against money laundering and terrorist finance. That is, payment systems are cheap when someone else bears the high fixed costs of verifying that criminals are neither sending nor receiving the funds. So, we doubt that Libra will be faster or cheaper than existing systems.

As for financial access, bringing the 1¼ billion unbanked adults into the financial system will yield large economic and social benefits. Experience in places like India suggests that doing so requires lowering costs of knowing your customer (through something like universal biometric identification) along with the provision of subsidised access to the banking system. Libra is not proposing either of these, so it is hard to see how it can do better than a government.

Perhaps most important, were it to be successful, Libra would likely become a source of systemic risk for the global financial system. If Libra replaces a significant fraction of the existing payments system, then its failure would be catastrophic for those who rely on it. In addition, if the Libra Association guarantees convertibility into a national currency, then the Libra Reserve will operate as an open-end mutual fund that would be subject to runs.

BOX 5 (CONTINUED)

Finally, for three reasons, it would be unwise for any country whose currency is not in the Libra basket to allow its citizens to use the new currency. First, the shift from domestic currency to Libra would reduce the government's seignorage revenue, damaging public finances. Second, if domestic residents are transacting in Libra, the central bank risks losing control of the country's monetary and payments systems, making it difficult to maintain price stability. Third, since acquiring Libra rather than a domestic asset constitutes a capital outflow, it reduces resources for domestic investment and facilitates capital flight in a crisis.

Perhaps the ultimate challenge a privately issued currency like Libra poses comes from the fact that it would operate across multiple jurisdictions without a true 'home'. For the most part, payments systems are set up to handle domestic institutions operating within national boundaries under domestic law. Even 'global' banks have a home supervisor that examines them on a consolidated basis. The prospect of Libra serves to dramatise the existing asymmetry between this largely domestic approach and the rise of global, multi-jurisdictional entities that could choose any home temporarily and could shift at will.

The bottom line: Facebook's proposed creation of Libra is a wake-up call. It makes inescapable the need for rapid, international coordination of financial regulation. Without mechanisms to ensure consistent application of coherent global rules, we may find ourselves in a world full of 'low-quality finance havens' that exist to evade financial regulations – just like 'tax havens' that exist merely to evade taxes.

*This box is a condensed version of Cecchetti and Schoenholtz (2019b). We note that since the original announcement in June of 2019, Libra has responded to criticism by shifting away from currency issuance toward payments provision (Libra 2020).

Philippon (2016) proposes guidelines for regulators that would enhance the competitive impact of FinTech innovation. First, officials should actively encourage entry, especially where incumbents are large and entrenched (as one might expect in the presence of state-sponsored banks or too-big-to-fail institutions). Second, to encourage resilience while supporting competition, regulators should require high equity ratios and discourage leverage, especially in the form of runnable liabilities. Third, authorities should be wary of a large incumbent's acquisition of FinTech startups, as this can hinder competition and reinforce market power.

Ehrentraud et al. (2020) describe a set of public policies that *enable* the provision of FinTech services (see their Table 10 on page 37). Their list includes:

- digital identity systems (such as India's [Aadhar](#) biometric ID programme);
- data protection regimes that provide clear rules for ownership, access and sharing;
- cyber security strategies that support efforts to prevent (and to recover from) attacks;
- open banking initiatives that promote data sharing, given customer consent; and

- various forms of innovation facilitation, including ‘hubs’ that provide information on regulatory practices, sandboxes that allow for testing of new tools and services, and ‘accelerators’ that involve partnerships with (and possibly funding from) central banks and supervisory authorities.

At the same time, some innovations pose a severe challenge to regulatory goals and practices. Private digital currencies are probably the leading example. Where these instruments provide anonymity, they facilitate the criminal use of finance. They also may enable the violation of financial rules (such as cross-border capital controls). Not surprisingly, some jurisdictions (such as China) have virtually shut down the trading of private digital currencies (Cecchetti and Schoenholtz 2017d).

In other jurisdictions, regulators are still trying to determine which rules (in addition to standard anti-fraud and anti-money laundering provisions) should apply to private digital assets. In the United States, for example, the Securities and Exchange Commission has rejected several applications for exchange trading of funds that include a digital currency. They also have warned about the potential for fraud and manipulation in the case of initial coin offerings (ICOs), noting that “the markets for these assets are less regulated than traditional capital markets” At the same time, the SEC’s Strategic Hub for Innovation and Financial Technology has published a framework for deciding whether to treat a digital asset (such as an ICO) as a security for regulatory purposes (SEC 2018, 2019, 2020).²⁶

Before speculating on where the financial system is heading, we should note one more big challenge for regulators: technology facilitates cross-border finance. With further innovation, we can expect reductions in the cost both of transferring funds across jurisdictions and of obscuring transactions from authorities. This raises the importance of global cooperation and coordination of authorities in both setting regulations and in supervising compliance. Since no one will allow the weakest and most lax authorities to control global financial standards, the alternative will be fragmentation or bans on cross-border activity. (The discussion of Libra in Box 5 describes some of the risks.)

6 WHERE IS THE US FINANCIAL SYSTEM HEADING?

What might the financial system look like a decade from now? To explore this question, we focus on the case of the United States. Here, we can envision two quite different futures. In the first, the four Big Tech firms, Amazon, Apple, Facebook and Google, take over a large part of the US payments system – much as Tencent and Ant Financial have done in China – cutting costs and improving the efficiency and quality of intermediation.²⁷ In this scenario, two things seem likely. First, the Big Four capture a significant share of US value

²⁶ See www.sec.gov/ICO, www.sec.gov/corpfin/framework-investment-contract-analysis-digital-assets and www.sec.gov/rules/other/2018/34-83723.pdf. See also Chapter 4 in Casey et al. (2018).

²⁷ We do not include a third scenario in which China’s two mobile payment leaders also become the leaders in the United States. We doubt that U.S. regulators would welcome that outcome. However, we note that Tencent and Ant Financial are expanding abroad and appear aimed at gaining global share. See *The Economist* (2020).

added in finance. Second, through a mix of cost-cutting and aggressive competition, they could lower the unit cost of financial services.²⁸ Compared to incumbent banks, Big Tech new entrants have incentive to innovate radically, not incrementally. This is consistent the Schumpeterian notion of creative destruction.²⁹

In the second scenario, leading financial-sector incumbents respond aggressively to the threat from Big Tech. In this case, Big Banks continue to dominate the US payments mechanism, partly in cooperation with a handful of smaller FinTech entrants who find and develop profitable niche products. For the largest incumbent banks to maintain their share of value added in the face of Big Tech competition, their evolving platforms would need to reduce costs, while exploiting internal information resources from the payments mechanism to improve the allocation of credit. As a result, just as in the first scenario, the result could be lower unit costs.³⁰

Of course, every day seems to bring new small FinTech entrants. However, because network externalities are so strong in key areas of finance – including the payments system and the trading of many financial instruments – technological progress likely will continue to favour economies of scale. Put differently, where FinTech has been most successful at changing the financial landscape in recent years, it has had a ‘winner takes all’ character. Consequently, concentration in the US financial sector is likely to be at least as great ten years from now as it is today.

It is important to consider the role of the central bank in the evolution of the financial system. This can take several forms. First, the central bank can introduce digital currencies, offering nonbank firms and households direct access to its balance sheet. We see this as very unappealing, and doubt that large, advanced country central banks like the Federal Reserve will go down this road. But, if they do, it has the potential to completely change the structure of the financial system (see Box 6 for details).

The second form of intervention is through the payments system, where central banks have always had a strong presence. As the Fed develops its 24/7/365 instant payment scheme ([FedNow](#)) in coming years, it will create numerous ways to unbundle payments from the provision of other intermediated financial services. For example, this new service could allow service providers to disintermediate large credit card firms and their point-of-sale systems.³¹ Moreover, the US central bank could tilt the balance between the two scenarios described above.

28 For a detailed discussion of the role of Big Tech in finance, see BIS (2019), Frost et al. (2019) and Carletti et al. (2020: Chapter 3).

29 See Section 15.1 of Cabral (2017).

30 In both the case where Big Tech takes over and the one where the Big Banks maintain their dominant position, total value added in finance could go up or down depending on what happens to demand for services at the lower unit cost.

31 A number of central banks already offer small-value retail payments systems, so some of this could already be happening. Furthermore, in large closed systems, such as those in developing economies have already moved in this direction.

BOX 6 CENTRAL BANK DIGITAL CURRENCY*

The appearance of cryptocurrencies is driving central banks to reconsider their role in the issuance of currency (BIS 2020). Should they shift from issuing paper bank notes to providing central bank digital currency (CBDC)?

First, in advanced economies, about half of the monetary base - currency plus commercial bank reserve deposits at the central bank - is already digital. Second, nearly all of the money that households and businesses use for transactions is digital, including more than 90% of broad money aggregates like M2. Given this, it is unsurprising that almost all payments are digital.

In a world dominated by digital money, should central banks issue *retail* digital currency? Put differently, should central banks offer accounts to nonbanks, private individuals, and nonfinancial firms, as they do for banks and governments?

The concept of retail central bank digital currency raises some interesting questions. Would it be anonymous? In unlimited supply? Have universal access? And pay zero interest? For central bank *paper* currency, the answer to all of these questions is yes. For wholesale CBDC - the stuff commercial banks now have and people call reserves - the answer is no, except that supply is effectively unlimited.

Retail CBDC is again different. On anonymity, to address problems of money laundering and financial fraud, international standards mandate verification of the identity of all account holders. On unlimited supply, central banks exist to provide an elastic supply of currency, preventing scarcity, so that is what they do. As for universal access, it would be hard to keep any legitimate user from opening an account (although foreigners might need to access it through domestic representatives). Finally, on interest payments, it would be difficult to pay interest on bank reserve deposits (as many central banks do) without paying interest on others' holdings, so again the answer is yes.

To summarise, retail CBDC would almost surely be supplied elastically, be universally accessible, and pay interest, but *not* be anonymous. What happens to the financial system in the presence of retail CBDC? How would it alter the central bank and the role of commercial banks?

The introduction of retail CBDC probably would cause a substantial fraction of deposits to shift to the central bank, with the remainder prone to exit in a period of financial stress. Moreover, if a large and trusted central bank in a politically stable jurisdiction were to issue retail CBDC, the impact would not stop at its borders.

Over time, the central bank could displace commercial banks in the provision of credit. As its CBDC liabilities grow, its assets will need to expand as well, while commercial banks lose funding and trim assets. In theory, the central bank could fund financial intermediaries that on-lend these resources to nonbanks. However, it may be tempted to become a 'state bank', substituting for the discipline of private suppliers and markets and inviting political interference in the allocation of capital and slowing economic growth.

While technology will allow the issuance of retail CBDC, the associated risks are enormous.

*This box is a condensed version of Cecchetti and Schoenholtz (2018a).

The Federal Reserve has promised to “enable financial institutions of every size” to deliver payments safely and efficiently. However, among private entities, only banks today have access to accounts at the Federal Reserve. Assuming, as we do, that this restriction persists, the banks would maintain a start-line advantage over the Big Tech firms. However, the banks would still need to innovate with sufficient speed and effect to win the competitive race. If they become complacent oligopolists, then they will not be able to maintain their market share. Indeed, if the banks fail to innovate, the Big Tech Four could introduce a de facto bank (like a money market fund) to enhance their competitive position.³²

Of course, there are good reasons why no one knows how this competition will play out. Above all, the enormous potential reward for success means that there are many people and firms trying to invent new ways of providing financial services. And both groups – Big Tech and Big Banks – have deep pockets and technological know-how.

We suspect that what matters most is who gets there first, creating a strong motive to invest early and aggressively. Even in China, where the central bank has occasionally squeezed the largest FinTech firms (for example, by requiring that they hold all customers’ funds at the central bank without compensation), they have remained successful in part because have utilised their payments system dominance to provide additional services that their customers find attractive. In effect, they are strengthening their clients’ attachment to their networks while their competitors, the big state banks, lack an effective strategy. In addition, the FinTech leaders have now developed operations of such large scale – covering most of e-commerce and serving so many customers – that they are very difficult to displace (unless, of course, the state takes them over).

7 CONCLUDING REMARKS

The financial system facilitates the flow of resources in the economy, enabling commerce and investment. However, information problems plague virtually all financial activities. The fundamental role of modern finance is to collect and process information to ensure safety and improve efficiency. Thousands of private firms are working to employ new technologies to reduce information and transactions costs, improve the nature and scope of services, and increase access at all levels of the financial system. Simultaneously, governments are exploring the social benefits of these innovations, while remaining attentive to any risks to consumer and investor protection, as well as to systemic resilience.

As in any area of business, innovation in finance is a matter of trial and error. In advanced economies with well-developed private financial systems, the result of many FinTech attempts over the past decade is only modest changes in the organisation of financial services. Even when innovations are successful, as in the case of payments, what we frequently see is the overlay of new technology on incumbent banking institutions’

³² As White (2017) notes, the US government has prevented firms engaged in commerce – that is, nonfinancial services – from establishing or acquiring banks. However, the promise of FinTech could elevate political pressures to relax this restriction.

platforms. There are, however, a few stunning successes. China is the prime example, where Ant Financial and Tencent are completely reshaping finance for households and SMEs.

It is difficult to know how widely these changes will diffuse. There is clearly potential in emerging market countries where incumbent financial institutions remain either rigid or less sophisticated. What happens depends both on the willingness of incumbents to modernise and compete in the FinTech arena and on whether regulators promote or discourage entry of technologically advanced competitors.

Conditions in advanced economies are different. This leads us to speculate about how FinTech innovation could influence the US financial industry over the coming decade. In our view, there are two quite different possibilities. In one, Big Banks consolidate their current position; and in the other, Big Tech comes to dominate.

Importantly, large modern financial intermediaries are already technology companies. They employ tens of thousands of engineers and invest heavily in both hardware and software. To give some sense of the scale, the four largest US banks' combined technology budget averages \$10 billion a year – twice the global value of FinTech financing that we reported in Section 2 (Shevlin 2019). That said, Big Tech firms are entering the financial services business. They are doing it both in partnership with banks and on their own, exploiting their platforms to offer financial services to their very large customer base.

In other words, financial intermediaries and Big Tech companies are looking increasingly alike. Who wins the race is anyone's guess.

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CHAPTER 2

Digital technology and financial innovation: A literature survey

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1 INTRODUCTION

Financial innovation has happened throughout the centuries. New providers (such as investment banks in the late 19th century and money market funds in the late 20th century), new products (such as derivatives and new security types in recent decades) and new techniques (such as credit scoring enabled by the IT revolution in the late 20th century) have emerged throughout history. Often, financial innovation is driven by a mix of technological innovation, regulatory changes, and competition. While the positive effect of financial innovation on the efficiency and depth of financial institutions and markets has been widely documented (Lerner and Tufano 2011, Berger et al. 2005, Laeven et al. 2015, Beck et al. 2016), there are also strong concerns over the negative financial stability implications of financial innovation, further fuelled by the Global Financial Crisis (Brunnermeier 2009, Gennaioli et al. 2012, Henderson and Pearson 2011).

The past decade has seen an important wave of technological innovation that has triggered a new wave of financial innovation, including new techniques, new products and – maybe most consequential – the entry of new players. This will have critical implication for the future shape of the financial sector, with trends possibly being further accelerated by the Covid-19 economic crisis. This chapter surveys the recent literature on financial innovation triggered by recent technological changes. Specifically, it will discuss different financial innovations driven by new technological possibilities, new entrants into the financial sector – most prominently, FinTech and BigTech companies – the implication of these changes for the efficiency, competition and stability of the financial system as well as regulatory and supervisory implications.

The main elements of the new wave of technology-driven financial innovation are the digital revolution, most notably the internet and mobile phones, the consequent explosion in available data, and machine learning and artificial intelligence. The internet has enabled new distribution channels and quicker communication, as well as the rise of platform companies such as Google and Facebook that recently have shown interest in expanding into financial service provision. More generally, it has reduced the apparent need for

personal contact and allowed more arm's-length transactions. Artificial intelligence and machine learning have allowed the explosion of data to be processed, providing more precise risk assessment and investment advice.

These innovations have enabled new products (such as digital wallets and mobile money), new lending mechanisms (such as peer-to-peer, or P2P, lending) and new transaction and data storage techniques (such as distributed ledger technologies). Some of these innovations have been introduced by new players, collectively known as FinTech companies. It has allowed additional competition from outside the regulated banking system, with the potential for higher efficiency benefiting customers but also the potential for new sources of financial fragility. The explosion in data has raised questions over the ownership and use of such data, as well as privacy concerns. Ultimately, the changes in the structure of financial service provision have important regulatory repercussions in terms of which institutions should be subject to prudential regulation, how to regulate providers of different (combinations of) financial services and how to adapt consumer protection to new realities.

Before proceeding, I would like to offer a definitional remark. Recent financial innovations driven by digital technology are often referred to as *FinTech*. There are different definitions, however, that put the focus on different elements. On the one hand, FinTech can refer to the integration of technology into product and service offerings by the financial industry in order to improve their use and delivery to consumers. On the other hand, it can also be understood as new technology-driven players that aim to compete with traditional financial institutions in the delivery of financial services. In the broadest sense, FinTech refers to “technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services” (FSB 2017). As already mentioned above and as I will discuss further below, another important distinction is between FinTech institutions that use digital technology to challenge incumbent financial service providers with specific financial solutions and BigTech companies that use their data and network advantages gained in nonfinancial service provision to enter the financial sector.

This is not the first and certainly will not be the last survey of the FinTech literature. Among others, Thakor (2020) reviews the literature on FinTech and links new products and services to the basic theory of financial intermediation. Allen et al. (2021) provide a comprehensive literature survey and policy discussion around FinTech. Beck and Frame (2018) provide an early overview of technology-driven financial innovation, while Beck (2020) discusses the importance of FinTech for financial inclusion, a topic that will be less of a focus in this chapter.

The remainder of this chapter is structured as follows. The next section focuses on specific new financial technologies and products enabled by digital technology. Section 3 discusses new players in the financial sector and their interaction with the incumbent

banking system. Section 4 focuses on the implication of this financial innovation wave for efficiency, competition and stability of the financial system and Section 5 gauges the implications for the regulatory framework. Section 6 concludes.

2 FROM TECHNICAL TO FINANCIAL INNOVATION

The digital revolution has enabled an ongoing transformation of financial service provision. This section discusses new financial technologies and products, while the next section focuses on the rise of new providers using these innovations.

While financial innovation has been a characteristic of efficient and competitive financial systems for centuries, this time seems different. Technological advances have driven financial innovation (and disruption) before – think of the invention and introduction of the cash machine (ATM) in the United States in the early 1970s. Together with a court decision that an ATM does not constitute a branch, this undermined geographic activity restrictions and ultimately resulted in the demise of intra- and inter-state branching restrictions (Kroszner and Strahan 1999).

The recent technological changes enabling financial innovation are mostly related to the digital revolution and the consequent explosion in data creation and availability and the possibility to process these data in an efficient manner. In the following, I will discuss several of these new technology-enabled innovations, while the next section discusses the new players that have been driving the introduction of these innovations.

First, mobile technology, the internet and internet application programming interfaces (APIs) have enabled quicker information exchange, new delivery channels and better exploitation of economies of scale. Mobile money accounts and transactions, first introduced by M-Pesa in Kenya, have revolutionised financial services in many African countries. Their success has to be seen against the background of very limited access to banking services by large parts of the population, illustrated by the fact that a higher share of the population have a mobile phone than have a bank account. While initially limited to payment services, mobile money services have been extended to investment, credit and even insurance services, though often in cooperation between Safaricom, the mobile network operator (MNO) operating M-Pesa, and banks and insurance companies. A rapidly growing literature has shown the positive effects that access to and use of mobile money can have on the use of financial services (Mbiti and Weil 2016, Aggarwal et al. 2020), more consumption smoothing and effective risk-sharing (Batista and Vicente 2016, Blumenstock et al. 2016), reducing poverty (Suri and Jack 2016) and higher firm productivity (Beck et al. 2018). The internet has also enabled the move of incumbent banks to online banking, reducing the reliance on bricks-and-mortar branches. As surveyed by Beck and Frame (2018), a small literature has explored the factors behind the adoption of on-line banking and its effects. The internet has also enabled more competition, allowing

customers to compare products and prices across providers for different financial services, including with platforms allowing customers to shift deposits across different banks as conditions change.

Second, the information technology revolution has facilitated the creation and processing use of 'big data' and applied statistics for financial risk measurement and management. Artificial intelligence and machine learning allow an improvement of screening and monitoring models over existing techniques. In the context of lending, such technology should result in lower loan origination costs and possibly a reduction in asymmetric information between borrowers and lenders, thus expanding credit supply along both intensive and extensive margins.

Several studies have shown the advantage that big data can provide in predicting default using their platform data compared to banks relying on credit registry data, such as Björkegren and Grissen (2020) with mobile phone call records, Berg et al. (2020) with 'digital footprint' data used by a German e-commerce company, Frost et al. (2019) with data from Mercado Libre in Argentina, an e-commerce platform, and Jagtiani and Lemieux (2019) who compare loans made by LendingClub, a large FinTech lender, and similar loans originated by traditional banks and show that LendingClub credit scores are more informative for loan performance than FICO scores. The advantage of big data can also be inferred indirectly, as done by Iyer et al. (2016), who compare the prediction power of credit scores with information available to individual lenders on the lending platform prosper.com, with interest rates set by lenders predicting default 45% more accurately than the borrower's credit score.

Big data can also be used for other financial services, including insurance and investment advice. Insurance technology – InsurTech – is a subset of FinTech in the insurance industry.¹ As in other segments of the financial sector, big data can be used for more precise measurements of underlying insurance risk, which will allow for the issuing of more insurance contracts at lower costs, thus completing markets and expanding insurance markets both on the intensive and extensive margins. Customers can thus have a wider range of better tailored products and services, but the more effective risk assessment might also result in the exclusion of riskier people from the insurance markets. Insurers can also use such data for monitoring purposes, developing more effective protection against operational risks and preventing insurance fraud or money laundering.

Replacing human advisors, robo-advising leverages data provided by investors to construct and manage a tailored appropriate investment portfolio for them; it can also help monitor the portfolio, thus working in three steps: (1) initial investor screening, (2) investment strategy implementation, and (3) monitoring and rebalancing the strategy (Allen et al. 2021). Robo-advising can reduce the effects of behavioural biases shown by that traditional human financial advisors (Foerster et al. 2017). Robo-advising reduces the

1 Thakor (2020) briefly discusses the development in InsurTech.

cost of financial advice, as shown by Ringe and Ruof (2019), and increases diversification and improves investment performance, as shown by D'Acunto et al. (2019) for a sample of Indian investors. However, it does not necessarily reduce conflicts of interests, as argued by Ji (2018), as algorithms can be programmed to reflect a firm's existing conflicts of interest.

A third innovation is distributed ledger technology (DLT), which describes decentralised data architecture and cryptography and allows the keeping and sharing of records in a synchronised way while ensuring their integrity through the use of consensus-based validation protocols. The most prominent DLT has been blockchain, based on Nakamoto (2008), who reintroduced it as a method of validating ownership of the cryptocurrency bitcoin. Blockchain is a decentralised distributed database that maintains a continuously-growing list of records locked into a chain of hacking-proof 'blocks'. Among the decisive characteristics are that there is no centralised authority but changes are rather based on consensus; that it has a perfect memory (i.e. a complete chronological record of transactions that is all but impossible to change); and that one has to obey the rules in order to participate.

DLT also allows 'smart contracts' – contracts based on decentralised consensus and hacking-proof algorithmic execution. Such contracting allows inter-temporal transactions (both financial and real) where trust between agents is very low and enforcement of contracts by courts or other government agencies is deficient. It reduces the reliance on relationships or collateral and broadens the universe of possible arm's-length transactions. Tinn (2018) develops a theoretical model of contract design where blockchain eliminates the need for costly verification, as incoming revenue is split between the lender and the borrower according to a dynamically adjusting splitting rule that depends on the history up to that point. The optimal financing contract would make external funding as cheap as internal funding.

One practical example for the use of DLT for financial transactions is BitPesa, which uses blockchain technology for cross-border payments between African countries without having to use the US dollar as an intermediary currency, thus reducing transaction costs and reducing regulatory costs associated with using the dollar payment system.

DLT can also be used for data storage, ensuring that information cannot be manipulated. In countries where land and collateral registries are still paper-based or on rudimentary computer systems, such a use can be very attractive to reduce corruption and improve private property rights. Georgia decided in 2016 to trial a move of the land registry onto blockchain (Shang and Price 2018). DLT can also be used for purposes of AML/CFT,² containing information about individuals that can be shared broadly and thus allow easier access to financial services. More generally, it allows a higher degree of transparency (of transactions, ownership, etc.), often seen as important for expanding financial systems

2 Anti-money laundering/combating the financing of terrorism.

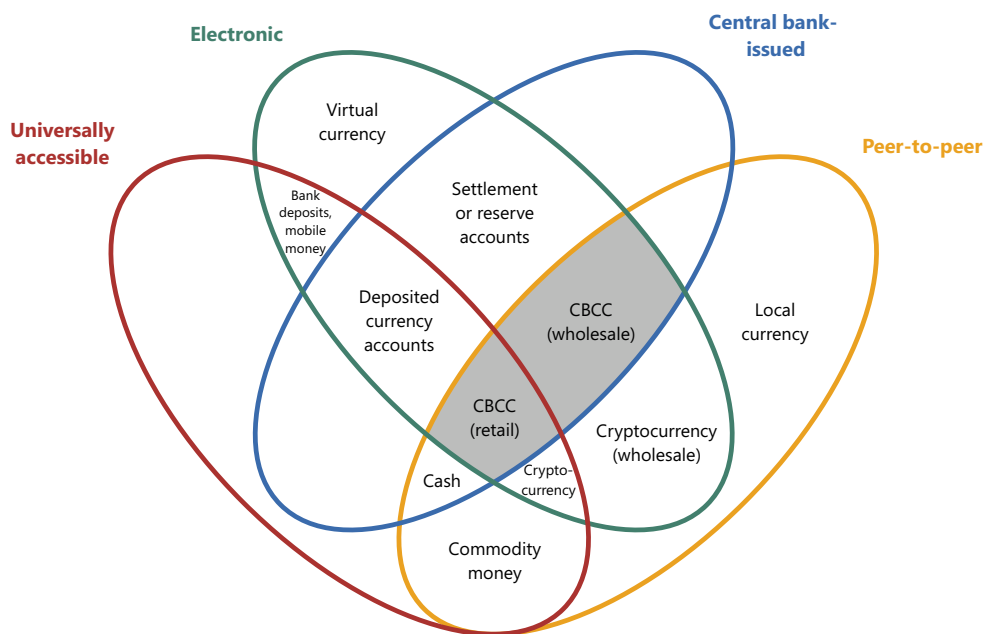
both at the intensive and extensive margins. By increasing transparency, DLT has the potential to increase market liquidity and efficiency (Yermack 2017). Major central banks and stock exchanges have been exploring the usage of DLT in payments, clearing and settlements, as detailed by Mills et al. (2016).

However, there are also some downsides to DLT and it certainly does not constitute a free lunch. If a private or centralised DLT is controlled by a central gatekeeping authority, this would concentrate operational risk, while at the same time it might result in monopoly rents being charged to users. In the case of decentralised blockchain (such as for Bitcoin), on the other hand, these rely on energy-intensive computing power for mining. Abadi and Brunnermeier (2018) summarise the problem of blockchain (and other decentralised DLTs) in the blockchain trilemma, suggesting that no ledger can satisfy the following three properties at the same time: correctness, decentralisation and cost efficiency. Decentralisation by DLTs might result in higher correctness but reduces cost efficiency, given that achievement of consensus is costly.

Based on DLT, cryptocurrencies have seen success in recent years. Before going into details, it is important to discuss different forms of money, with Figure 1 presenting the 'money flower' by Bech and Garratt (2017) that illustrates the different forms, along four dimensions: issuer (central bank or other), form (electronic or physical), accessibility (universal or limited) and transfer mechanism (centralised or decentralised). Traditional cash is issued by central banks, takes physical form, is universally accessible and is transferred in a decentralised form (person to person). Bank deposits are not issued by central banks, but rather commercial banks. They are in electronic form, universally accessible and transferred in a centralised form (through the payment system). Mobile money – discussed above – is also digital and universally accessible. DLT has enabled new forms of money, including cryptocurrencies, which are electronic, privately issued, universally accessible but transferred peer-to-peer rather than in a centralised manner.

Cryptocurrency tokens (or coins) are digital assets, designed as means of exchange and a store of value; their ownership is recorded on DLTs. The best-known cryptocurrency is Bitcoin, launched in 2009 by Nakamoto (2008). As in the case of blockchain, one of the attractions of Bitcoin is its decentralised nature, as opposed to central bank-issued fiat money. Over the past years, there have been hundreds of initial coin offerings (ICO), which is the launch of a cryptocurrency in the form of crowdfunding, where tokens or coins not only serve as a mean of payments but also provide cheap and efficient way for entrepreneurs to fund an idea. As of early 2020, more than 3,000 digital coins are now listed on exchanges, although only about 45 of them have a daily trading volume of more than \$50 million (Carletti et al. 2020, based on [coinmarketcap.com](https://www.coinmarketcap.com))

FIGURE 1 MONEY FLOWER



Source: Bech and Garratt (2017).

The value of different cryptocurrencies (relative to traditional fiat currencies) has proved to be very volatile, which undermines their claim of being alternative currencies to fiat money. While cryptocurrencies certainly do not match the textbook characteristics of money (medium of exchange, store of value and unit of account) currently, the intrinsic value of cryptocurrencies should – like fiat money – ultimately depend on whether or not it has value for transaction purposes. However, as shown by Zimmerman (2020), speculative demand for bitcoin crowds out transaction demand, ultimately reducing monetary usage and driving high price volatility of bitcoin.

Given the volatility of cryptocurrencies, there has been a trend towards stablecoins – cryptocurrencies that are pegged to another asset (such as the US dollar, national currencies or commodities) and whose value is guaranteed by holding sufficient reserves in these assets, similar in construction to a currency board.³ Most prominently, in June 2019, Facebook announced its Libra initiative, which would be built upon a ‘permissioned’ or private blockchain platform. However, there has been quite a backlash against this proposal, including by many regulators, causing several signers of the initiative to abandon the proposal and Facebook moving towards suggestions for stablecoins that would be only tied to one currency.

3 Tether is by far the largest of this type of stablecoin, with a value pegged to the US dollar and a supply of well over \$4 billion (Carletti et al. 2020).

Stablecoins can also be created for wholesale rather than retail purposes. One such example is the Utility Settlement Coin (USC) launched by Finality, where a consortium of banks provides a digital asset that is backed one-to-one by reserves held at the central bank and improves in terms of speed and efficiency on the existing wholesale payment system (Carletti et al. 2020).

In addition to, as well as in reaction to, the increasing importance of private cryptocurrencies, central banks around the world have started exploring the value of central bank digital currencies (CBDCs). Figure 1 presents two different options for such currencies: on the one hand, wholesale CBDC can improve on the speed and efficiency of settlement efficiency; on the other hand, retail CBDC has the potential to replace not only cash but also bank deposits, thus having a direct impact on the funding of the banking system. We will discuss this further in Section 5.

Fourth, technological advances have also transformed trading on exchanges. Electronic trading has crowded out manual trading since the 1970s. However, recent advances in IT, which enable trade execution in milli-seconds, has led to a rapid increase in high-frequency trading, defined by the SEC (2010) as associated with the use of extraordinarily high-speed and sophisticated algorithms, the use of co-location services and individual data feeds, the very small and short-lived positions in margin accounts, and the submission of numerous orders and cancelling shortly. According to estimates, 50% of all trading activities involved high-frequency trading by 2010 (SEC, 2010). In Section 4, we will return to the question whether this has been beneficial or not for market liquidity and stability.

3 FINTECH AND BIGTECH - NEW PROVIDERS

The recent wave of financial innovation has come mostly from outside the incumbent banking system in the form of new financial service providers. Again, this is not a new phenomenon. Financial history has been characterised by the emergence of many new institutions and intermediaries over the centuries, often addressing new demands or regulatory constraints. The early 20th century saw the rise of investment banks to fund railroad expansion in the US, while the 1960s saw the rise of money market funds in response to Regulation Q, which prevented banks from paying interest rates on demand deposits. Similarly, digitalisation has brought new intermediaries in the form of P2P lending platforms, but also allows nonfinancial companies to enter the financial service markets, with mobile network operators (MNOs) and BigTech companies (such as Ant Financial, Amazon, Facebook, etc.) being prime examples.

Across the globe there has been impressive growth of FinTech firms, with large diversity in the services they provide. Most FinTech companies are smaller players, often startup companies that focus on specific services, with payment being the segment that has attracted the largest number of entrants. They typically use digital technology to offer a specific financial service targeted at a specific clientele, which they perceive as

underserved or unserved by incumbent financial service providers. While they were initially regarded as competitors to incumbent banks, there seems to be increasingly more of a complementarity, with banks offering startup FinTech accelerator hubs and investing in FinTech companies or acquiring them. From the banks' viewpoint, the advantage of buying FinTech solutions in the form of startups rather than developing such solutions in-house is that innovative activity often requires a different culture than that prevalent in the banking sector.

P2P lending platforms that match lenders/investors and individuals or small firms looking for external funding have emerged over the past decade. Typically, applicants register on the platform, are subject to a standardised screening (including a credit score or a platform-specific proprietary score), and investors can choose whether or not and for how much they are willing to fund different requests. The lending platforms work primarily as a conduit and generally have no direct exposure themselves to the credit risk of the loans; they principally generate revenue from loan origination and servicing fees. While originally it was mostly individual investors that were active on these platforms, most of the funding is provided nowadays by institutional investors. Balyuk and Davydenko (2019) document with data from the two largest P2P platforms that less than 10% of P2P funding is provided by retail investors and that platforms have moved towards 'reintermediation', with platforms picking borrowers and loans rather than investors deciding through an auction process.

In some countries, FinTech lenders have achieved a significant share in specific business lines. For instance, online lenders like Quicken Loans now account for about 8–12% of new mortgage loan originations in the United States (Buchak et al. 2018a, Fuster et al. 2019) and Quicken Loans became the largest US mortgage lender in terms of originations at the end of 2017.⁴ FinTech lending accounts for about a third of personal unsecured loans in the US (Balyuk 2019, citing TransUnion data). One of the attractive characteristics of FinTech lenders is that they process loan applications more quickly and have a more elastic loan supply (Fuster et al. 2019). An additional reason for the focus of FinTech lenders on mortgages in the US is that they can be sold easily to government-sponsored enterprises (e.g. Fannie Mae and Freddie Mac) if below the conforming loan threshold. More generally, Buchak et al. (2018b) find that the post-2008 increased regulatory burden on traditional banks can explain up to 55% of the recent growth of nonbanks in the US mortgage market. And as Braggion et al. (2019) show for China, platform lending can be used by mortgage borrowers to circumvent loan-to-value restrictions for regular bank borrowing if the regulatory framework is not adjusted accordingly.

FinTech firms compete with banks for specific financial services; FinTech firms are relatively lightly regulated, not part of inflexible organisations, and not saddled with legacy IT systems. BigTech companies, on the other hand, are technology companies

4 It is important to note that Quicken is a broker, which warehouses the loans before securitising them.

whose business model is focused on exploiting digital technologies. They have potential big advantages compared with banks and FinTech firms; they not only have all the technical knowhow and up-to-date systems that FinTech companies aspire to, but also the scale that large banks have. Other than these benefits, they also have access to a wide range of data that banks and FinTech firms do not have access to, but without the legacy or the organisational problems. All these advantages put BigTech firms in a more privileged position than FinTech companies to replace traditional banks. This is why Carletti et al. (2020) correctly refer to “nimble FinTech firms and giant BigTech”.

Unlike FinTech companies, BigTech (or techfin) companies are existing digital platform companies that expand into financial service provision. Examples include Vodafone’s M-Pesa in East Africa, Egypt, and India, expanding from mobile telephony into payment and other financial services; Mercado Libre in Latin America, an e-commerce platform with growing financial activities; and in the United States payment services offered by Amazon, Apple, Facebook, and Google (Frost et al. 2019, Zetsche et al. 2017). However, it is the People’s Republic of China (PRC) where BigTech companies have so far gained the largest market share. By 2017, Alipay (launched in 2004) and WeChat Pay (launched in 2011) had acquired 500 million and 900 million monthly active users, respectively, and together accounted for 94% of the \$16 trillion mobile payments market (Carletti et al., 2020). Ant Financial’ subsidiary MyBank, Tencent’s (part) subsidiary WeBank, and Baidu’s (part) subsidiary Du Xiaoman provide lending to millions of small and medium-sized firms (Frost et al. 2019).⁵ I will discuss some of these examples in more detail in the following.

Safaricom launched M-Pesa, the world’s most successful mobile money provider, in 2007 in Kenya, building on its dominant position in the mobile telephony market and against strong lobbying efforts by the banking system. Building up an impressive agent network of over 100,000 made it the channel of choice for most people in Kenya to send payments to friends and families and pay bills within a few years. While Safaricom initially challenged incumbent banks, ultimately banks started operating with Safaricom and other MNOs.

One striking advantage of BigTech companies vis-à-vis FinTech companies can be captured by data analytics, network externalities and interwoven activities (summarised as DNA by BIS 2019). There are strong network externalities as participants’ value from participating on one side of a platform (for example, as an online merchant) grows with the number of users on the other side of the platform (for example, buyers). At the same time, a larger number of users allows more data to be collected and analysed. Such analysis, in turn, can improve existing services and attract further users. This also makes them a dominating provider in their respective business line and allows them to extend into new business (including financial services) through a platform envelopment strategy

5 See BIS (2019) for an overview of BigTechs that have gone into financial service provision.

(De la Mano and Padilla 2018). Artificial intelligence, including machine learning, allows them to turn the vast amount of data, including soft information, into (credit) scores and targeted and tailored offers to clients.

There are different factors that can drive the emergence of FinTech and, more specifically, BigTech. On the one hand, there might be a gap in financial service provision and thus unmet consumer demand. Before Safaricom launched M-Pesa, domestic remittances were mostly made informally. One of the critical success factors for M-Pesa was that it met this demand. On the other hand, the regulatory framework can be critical for allowing new entrants into a market. M-Pesa's launch in 2007 provides the best example of this, as it was not based on new regulation but rather on a letter of comfort and against the (self-interested) concerns of banks.

The importance of FinTech and BigTech varies substantially across countries, as documented by Frost et al. (2019). Claessens et al. (2018) find that FinTech credit volumes are higher in richer countries and economies with a less competitive banking system. FinTech credit volumes are also greater in countries with less stringent banking regulation. Focusing specifically on crowdfunding, Rau (2019) finds that it is more prominent in richer and larger economies and countries with strong regulatory regimes and more efficient legal systems.

4 THE EFFECTS OF FINTECH AND THE FUTURE OF FINANCE

Financial innovation has important repercussions for the efficiency and stability of the financial system, as shown by an extensive literature referenced above. As shown in cross-country analysis by Beck et al. (2016), different measures of financial innovation, capturing both a broad concept and specific innovations, are associated with faster bank growth, but also higher bank fragility and worse bank performance during the Global Financial Crisis. Overall, however, the evidence points to a positive net effect of financial innovation on economic growth, especially when it comes to exploiting growth opportunities. This literature, however, does not capture recent innovations discussed in this chapter, although it does provide guidance on how the new wave of innovation might influence the efficiency and stability of financial service provision in the future. This section will discuss possible implications of FinTech for competition, efficiency and stability of financial service provision. Closely linked, the next section will draw regulatory and broader policy conclusions.

The cost of financial intermediation

Philippon (2015) shows that the unit costs of financial intermediation have been stable at 2% over the past century in the US, shedding doubt on consumers benefitting from financial innovation. In more recent work, however, Philippon (2018) notes that there are

indications that this ratio has finally decreased, suggesting that stronger competition and contestability might benefit customers. This points to a positive effect of the recent wave of financial innovation for consumers.

One reason for the lower intermediation costs are most likely economies of scale, i.e. the possibility to use digital technology to reach a large number of clients. Tailor-made digital and IT solutions for financial service provision allow FinTech companies to offer such services at lower prices than incumbent banks with often outdated IT systems, while at the same time not incurring the regulatory costs bank face. At the same time, this competition forces banks to upgrade their IT and digital systems and innovate, either in-house or – as already discussed above – by acquiring FinTech companies (thus buying these solutions). In the following, we will discuss what this new competition implies for the structure of the financial system.

FinTech, BigTech and competition for banks

Considering the advantages of FinTech, BigTech and banks, one might conclude that the increasing importance of FinTech and BigTech might lead to unbundling of financial services provided by the banks. Specifically, payment services might be more efficiently offered by FinTech companies; similarly, easily commoditised lending segments (such as consumer and mortgage credit) might be more effectively supplied by FinTech and BigTech companies.

There has been an expanding empirical literature assessing new financial service providers, specifically on whether FinTech companies, such as P2P lending platforms, and traditional banks are substitutes or complements. Tang (2019) exploits a regulatory change in the US in 2010 that reduced affected banks' small business lending and mortgage approval rates, showing that borrowers shifting from banks to the platform LendingClub were of lower quality than existing borrowers on the platform. This suggests that banks and lending platforms are substitutes rather than complements, though lending platforms can complement banks with respect to small loans, as borrowers migrating from banks to P2P platforms applied for larger loans than did existing platform borrowers. Similarly, De Roure et al. (2019) find for Germany that P2P lending increases when banks reduce lending due to regulatory constraints and riskier borrowers shift to platforms. Balyuk (2019) finds, using application data from Proper Marketplace, that obtaining a platform loan leads to easier access to bank credit for consumers, with an overall increase in credit supply, suggesting that P2P lending provides a certification function for bank credit. Chava et al. (2019) show similar effects using credit bureau data. Buchak et al. (2018a) find that FinTech shadow banks stepped into the mortgage market in the US, where banks reduced lending for regulatory reasons, charge a premium of 14–16 basis points, suggesting that they appear to provide convenience rather than cost savings to borrowers.

A broader question is how the incumbent banking system will adjust to a forceful entry of BigTech companies into the financial sector. While BigTech companies have a scale and operating cost advantage, Boissay et al. (2019) estimate that their weighted average costs of capital (WACC) is some 3.25 percentage points higher than that of the largest global systemically important financial institutions (G-SIFIs). As discussed by Carletti et al. (2020) and De la Mano and Padilla (2018), banks can cooperate with platform companies, turning into utility-type companies on both the funding and lending side, with the main intermediation process being undertaken by BigTech companies. Alternatively, banks might withdraw from business lines where BigTech companies have a cost and data advantage and focus on profitable market segments, most likely market segments that are private information-intensive and rely on relationships.

Challenges of big data

As discussed above, the entry of FinTech and BigTech companies in the lending segment of the financial sector is due to big data, i.e. the ability to draw on a large amount of data from their clients' digital footprint by scraping the Web or – in the case of BigTech companies – using data readily available on potential customers from their nonfinancial transactions with them. This undermines one of the key advantages – and sources of rent income – of banks, namely, their ability to collect and process information – both hard and soft, and both public and private – about their clients, including their borrowers (see the survey by Liberti and Petersen 2019).

So far, we have taken the view that more data and thus more information is better. We can call this the 'rational' or 'credit constraints' view of the effect of digitalisation on access to finance. However, one can also take a behavioural (myopic, literacy) view, as more data allows financial institutions to better exploit behavioural biases among consumers. Marketing tools, including deceptive advertising, can have a major impact on consumer decisions, as a randomised control trial in South Africa shows (Bertrand et al. 2010). Loan offers were mailed to some 50,000 customers but differentiated with randomised interest rates and different advertising material. Loan demand was sensitive to the quoted interest rates, but also to several features of the advertising. For example, including a photograph of a woman in the accompanying literature (as opposed to a man) was, in terms of the influence on loan take-up, equivalent to lowering the rate of interest by over 4 percentage points per month.

More (granular) data also allows financial institutions more consumer-specific targeting and thus a better discrimination. Ru and Schoar (2017) show that access to detailed customer data allows credit card companies naïveté-based price discrimination, in the form of different credit card offers to different segments of the population. The main differentiation in credit card offers sent to more and to less educated households is in shrouding important information and in front- versus back-loaded costs. Less-educated consumers receive more back-loaded and hidden fees (which only kick in when late for payment), and more shrouded credit card offers.

As more information about (potential) customers becomes available, combined with the increasing use of machine learning and artificial intelligence, more precise targeting will become possible at a lower cost, exploiting behavioural biases. It might also result in cream skimming and crowding out, such as in insurance, where *ex ante* riskier (albeit exogenously) individuals might be excluded from insurance policies.

This raises the important question of defining the ownership of personal data. Tang (2020) shows – using an experiment with an online lending platform in the PRC – that loan applicants attach a positive value to personal data; lower disclosure requirements significantly increase the likelihood that online applications are completed. While the monetary values that she attaches to personal data might be specific to this setting, it is clear that people value (including in monetary terms) privacy and thus control over their personal data. The Open Banking Initiative in the EU allows customers to share data across different banking institutions, while BigTech companies are not included in this requirement. As the use of personal information becomes more and more valuable and politically sensitive, further discussions and regulatory and legal changes in this area can be expected in the coming years (BIS 2019). Jones and Tonetti (2020) show theoretically that given the nonrival nature of data (i.e. they can be used by several companies at the same time), an equilibrium where firms own customer data is inferior to an equilibrium where consumers own the data and can sell them, trading off the benefits from doing so (including the price) and privacy concerns. On the other hand, an equilibrium where the government restricts the use of data, might address privacy concerns but reduces benefits from the possible uses of data.

FinTech and financial market efficiency

While the discussion so far has primarily focused on financial intermediaries and other service providers, FinTech might also have an impact on financial markets. Hendershott et al. (2011) employ the implementation of an automated quote system at the New York Stock Exchange in 2003 and show that at least for large-cap stocks in that period, an increase in algorithmic trading causes an improvement in stock market liquidity, thus enhancing the informativeness of price quotes. Menkveld (2013) examines the entry of high-frequency market-makers into the trading of Dutch stocks in July 2007 and finds that because of the higher degree of competition, compared with untreated (but comparable) Belgian stocks, the bid-ask spreads of Dutch stocks are about 15% narrower and adverse selection is also less. Overall, evidence strongly indicates that high-frequency trading is good for average market quality and liquidity. However, its impact on market quality in stressed conditions might be less benevolent and is therefore of particular concern to regulators and investors. Kirilenko et al. (2017) analyse the Flash Crash of 2010 and show that high-frequency trading did not trigger the crash, but the responses by high-frequency traders to the extreme selling pressure exacerbated the price decline.

In summary, and as discussed by Allen et al. (2021), the empirical evidence suggests that quantitative strategies can work well in stable environments but often work very poorly when there is a crisis or some other unexpected events, calling for certain circuit brakes.

Financial stability concerns

The increasing importance of FinTech and – even more so – BigTech also has implications for financial stability and the relationship between competition and financial stability. On the one hand, the entry of BigTech companies can reduce the franchise value of banks and encourage more risk-taking by these banks, as predicted by the competition-fragility hypothesis. On the other hand, as scalable transaction-based arm’s-length lending is being taken over by non-bank institutions such as FinTech companies, banks have a stronger incentive to focus on information-intensive relationship lending where franchise values play a larger role, thus reducing fragility in the banking system itself while shifting risk towards other segments of the financial system (Boot and Thakor 2000). At the same time, increasing concentration in financial service provision due to the dominance by a few BigTech companies creates new sources of fragility, as these companies might become too big to fail. Further, given that disruption and winner-takes-all market processes have been a constant feature of the platform economy, there might be transition risks as one dominant BigTech company is replaced by another.

One important question is the extent to which the entry of BigTech companies will influence lender incentives. If BigTech platforms serve primarily as conduit, bringing together lenders (i.e. banks and other financial institutions) and borrowers, with no risk for the platforms, there is a clear incentive for aggressive (over-)lending. If BigTech companies enter financial service provision themselves (thus acquiring banking licenses), they will most likely focus on low unit-cost, scalable lending activities, where franchise value has little importance and assets can be easily securitised.

There are also stability concerns concerning the introduction of central bank digital currencies. One of the concerns among central banks in issuing CBDCs is the impact on the banking sector (the risk of a bank run as people would prefer an account with a central bank) and the stability of the financial systems overall. If central bank accounts become available for all, there would be few incentives left for bank clients to keep current account balances in banks, which ultimately undermines the fractional reserve banking system. Even if clients do not have direct access to central bank accounts but rather to narrow payment banks, this could undermine the current banking model (Carletti et al. 2020). However, several studies show that CBDC does not necessarily have to undermine bank deposit and thus financial stability. Brunnermeier and Niepelt (2019) show theoretically that under certain conditions and if the liquidity contribution of securities is not changed, the introduction of CBDC would not have any effect on the banking system beyond changing the composition of banks’ liabilities. Keister and Sanches (2019) argue that there might be a trade-off – while a digital currency can promote efficiency in exchange, it can also crowd out bank deposits, thus raising bank funding costs and decreasing investment.

5 REGULATORY CHALLENGES

There are numerous challenges for regulators and public policy authorities arising from FinTech in general and the increasing importance of BigTech companies, which we will detail in the following. They partly relate to some of the challenges outlined in the previous section. These challenges are plenty and I will not be able to do justice to all them; they also arise on different levels, as summarised by Ehrentraud et al. (2020) in the form of a FinTech tree, distinguishing between regulations that “(i) ... adjust the regulatory perimeter and/or directly target FinTech activities; (ii)...that focus on the use of new technologies in the provision of financial services; and (iii) ...that facilitate financial innovation or promote digital financial services more broadly.”

Licensing

There are different regulatory responses possible vis-à-vis FinTech, ranging from outright ban and prohibition over benign neglect to either amendment of existing frameworks or creation of new frameworks. One challenge for authorities is an overlap or a gap in responsibilities of different regulators and supervisory capacities to assess and supervise new products and activities. Finally, there are several trade-offs, already discussed above, including efficiency/inclusion versus stability and efficiency versus integrity, which might be decided upon differently across countries.

The objective of financial innovation and competition has led authorities to offer regulatory sandboxes – regulatory frameworks that allow the time-bound testing of new financial products, technologies, and business models under a set of rules and supervisory requirements, with appropriate safeguards. Such frameworks can be a win-win-win situation for everyone involved. Supervisors learn about financial innovations, FinTech companies can experiment with legal certainty, and the broad population of customers will be exposed to providers and products only once they are vetted. The objective of such sandboxes is to allow the product to see the light of day with a lower initial regulatory burden. Jenik et al. (2019) report that most regulatory sandboxes are dominated by payment, market infrastructure, and wholesale innovations, but most of these innovations do not target excluded or underserved segments of the population. UNSGSA and CCAF (2019) concludes that regulatory sandboxes are “neither necessary nor sufficient for promoting financial inclusion,” and there might be more efficient and less costly and complex tools to foster inclusion-targeted financial innovation, such as innovation offices that facilitate regulator–innovator dialogue and engagement. Different from regulatory frameworks are innovation facilitators, hubs, or accelerators, private facilities that allow innovators to test their products. Such arrangements can be attractive for banks who hope on technological spillover effects.

In addition, some countries have opted for special FinTech licenses (ASBA and IDB 2019), often with product-specific authorisations, usually in two broad service areas: payment services and innovative lending. These again can be time-bound or permanent. One such

license is for mobile or e-money providers. For such providers, customer funds have to be segregated from the provider's own funds and are, in most cases, held at a regulated financial institution as deposits or in trusts. These FinTech licenses require a formal authorisation with a different and less stringent set of requirements than those applied to traditional financial institutions.

There is also the question to what extent ownership interlinkages are allowed between banks, FinTech and BigTech companies. As discussed above, FinTech companies are often small startup companies, but later on – if successful – are acquired by banks. Keeping innovative units in separate subsidiaries can be beneficial if such units require a different work culture; on the other hand, if being used for regulatory arbitrage (as special purpose vehicles in the run-up to the Global Financial Crisis) they can create new sources of fragility. Critically, there are competition and stability implications in the case of acquisition of a market-dominating FinTech (e.g. in payment services) by one specific bank. Other challenges come from the entry of BigTech companies into financial service provision, even if done via a wholly owned regulated bank subsidiary, given the potential spillover effects from the non-regulated non-financial part of the business.

Partnerships between banks and BigTech companies also pose stability concerns. As discussed above, separation of decision process and risk assumption can result in excessive risk-taking, a situation that arose during the Global Financial Crisis, when mortgage loans that could be easily sold were originated without the necessary screening and risk assessment (Keys et al. 2010).

Competition and consumer protection

As discussed above, while the entry of FinTech and BigTech companies into the financial system can increase competition and efficiency, there can also be fragility consequences of this entry, which call for regulatory responses. First, ensuring a level playing field and competition across different financial service providers is an important challenge for policymakers. For example, in the case of mobile money provision, interoperability between different providers is important, in terms of transactions between providers and access to agents (Claessens and Rojas-Suarez 2016). This policy goal, however, does not map into one specific policy tool, as different market situations call for different policy solutions. In Kenya, M-Pesa gained an early market domination and was forced through the threat of regulatory action to open up its agent network; in neighbouring Tanzania, where several competing MNOs dominate the market, there was a voluntary agreement between different providers. This reflects a broader discussion on access to financial infrastructure elements, such as credit registries and payment systems beyond regulated banks. While opening these infrastructures to non-banks has the potential to increase competition at the expense of banks, BigTech companies currently have the advantage of not having to share data with other (financial) service providers. For example, in the

EU, banks are obliged under the Open Banking rule to share data of their customers with other banks while BigTech companies are not, creating a competitive advantage for the latter.

Second, there is the trade-off between efficiency and privacy, resulting in the question of the ownership and use of customer data by banks, FinTech and BigTech companies. Regulatory responses include industry-based self-regulating guidelines, a robust consumer protection framework or a more revolutionary approach to data ownership, which, to the author's best knowledge, has not been taken anywhere. There are also concerns of an excessive regulatory burden for financial institutions catering to clients with few and small transactions and these clients. Simplified know-your-customer (KYC) rules for accounts and transactions below a threshold have therefore been adjusted across a number of countries, especially in the developing world.

Third, another important trade-off, already discussed above, is that between integrity and privacy, i.e. between ensuring the formality and correctness of all financial transactions and respecting the privacy rights of consumers. While the use of cash has always permitted privacy for certain transactions, a move to exclusively digital transactions allows a recalibration of this trade-off. This challenge is exacerbated in the case of cryptocurrencies, which allow complete anonymity. As discussed in more detail in ASBA and IDB (2019), as a minimum, strict client identification and source-of-funds verification procedures on the crypto trading platforms are necessary, especially at the point of exchange between fiat cryptocurrency.

Prudential regulation

A very different challenge from the regulatory sandbox is to define the regulatory perimeter, i.e. institutions and market participants that fall under financial stability regulation and supervision and thus also under the financial safety net.⁶ Ample experience has shown that tighter regulation leads to evasion efforts by financial market participants and shifting of risky activities outside the regulatory perimeter. Over the past ten years (partly as a reaction to the Global Financial Crisis), expanding the regulatory perimeter towards shadow banks has been high on the agenda. Recent financial innovations might pose new challenges in this respect. On the one hand, lending platforms that connect investors/lenders and borrowers are clearly outside the regulatory perimeter and thus should not be covered by the financial safety net and deposit insurance. But what if the investor population on these platforms grows to a size that makes them all but 'too many to fail'? As reported by ASBA and IDB (2019), peer-to-peer lending platforms can provide a fertile ground for fraudulent schemes long prohibited in traditional banking.

⁶ Examples of institutions that were outside the regulatory perimeter and caused significant financial fragility include LTCM in 1998, whose failure forced regulators to have all counterparties agree to a resolution that stabilized the system. The failure of Lehman Brothers in 2008 is considered the trigger of the global financial crisis.

The failure of a large P2P lending platform in China in 2016, Ezubao, affected almost 1 million customers, with losses exceeding \$9.2 billion. Three years later, another wave of failures closed down over 380 P2P platforms in that country.

Another challenge are cryptocurrencies, already discussed above under the integrity angle. While some countries outright prohibit exchanges trading them and/or ICOs, others allow but might treat them as securities rather than as cash or cash-equivalent, which has implications, for example, for investment advisors. In the US, this decision is ultimately based on the Howey Test.⁷ Looking beyond private cryptocurrencies, but also beyond the scope of this chapter, there are stability implications of stablecoins and central bank-denominated cryptocurrencies.

Similarly, BigTech companies might pose a similar challenge for regulators as they move into financial service provision. Even if such provision is made via a regulated subsidiary, there are risks of spillover from the non-regulated non-financial part of the business to the regulated financial part. An additional concern is that many of the BigTech companies are international in nature, while financial sector regulation is – with few exceptions – national in nature.

In addition to financial risks, there are also significant non-financial or operational risks to be considered, a few of which will be outlined in the following. First, there is an increasing concentration in the provision of basic services, such as cloud computing (FSB 2019). On the one hand, cloud computing can reduce costs exploiting scale economies and automation benefits and improve resilience for individual financial institutions. On the other hand, operational incidents at third-party service providers can create temporary outages affecting services the financial institution provides to its customers. Misconfigurations could result in data breaches, compromising private data of millions of clients and resulting in high fraud costs. Second and more generally, while conversion of legacy to modern IT systems can eliminate latent vulnerabilities, services that are too exclusively automated or IT oriented, can be more prone to cyber-attacks. For example, screen, web or data scraping, a technique to collect financial users' transactional data to assess creditworthiness, is subject to such risks. This risk is further exacerbated in the case of unsupervised parallel payment systems. Third, excessive reliance on automatisations and IT might offer new scope for money laundering, as some mobile payments networks in some jurisdictions may operate in ways that may potentially make it harder for authorities to trace money flows and to identify potential money laundering or tax evasion.

⁷ Based on a Supreme Court case from 1946, the Howey Test determines that a transaction represents an investment contract if "a person invests his money in a common enterprise and is led to expect profits solely from the efforts of the promoter or a third party."

Finally, there is a more general risk of excessive trust in technology rather than human skills and a central authority. This risk is exacerbated where a technology proves to be obsolete and is to be replaced by a new technology. There might be a rapid loss of confidence in case of security breaches or outages that might be hard to overcome in the absence of a central authority that can instil confidence.

In summary, important new challenges have arisen for regulators: new sources and new transmission channels of fragility raise the question of the regulatory perimeter; changing market structures and dynamics put into question existing models of the competition and fragility paradigm; and the increasing importance of data and privacy concerns raise challenges for public authorities. Critically, these issues are interlinked, demanding a close cooperation between regulators and public authorities across different market segments. A dynamic regulatory approach is needed; as much as the mantra ‘function matters more than institution’ has been advertised, this is about to become more important than ever.

6 CONCLUSIONS

This chapter has surveyed recent financial innovations driven by technological innovations as well as the entry of new players that come with this wave of financial innovation. I distinguished between FinTech and BigTech companies given the important difference their entry into financial service provision offers for efficiency and stability. Financial innovations have the potential to increase the efficiency of financial service provision as well as competition among providers, to the benefit of customers. It can increase access to and use of financial services, which is still a challenge in many developing economies. However, more effective screening and monitoring might also lead to the exclusion of customers, and the increasing importance of scale and network economies in the collection, processing and use of information might result in new monopolies. Finally, there are important stability challenges, with new products and services creating new sources of fragility as well as posing challenges for the banking sector as services are being unbundled.

Critically, there are important implications for the regulatory and supervisory frameworks, both in terms of competition and consumer protection as for the regulatory perimeter and the financial safety net. In addition to the competition/efficiency versus stability trade-off that is often faced by regulators, the large amount of data available and processed by FinTech and BigTech companies has also created an efficiency versus privacy trade-off to be considered. The entry of new providers faces new challenges for regulators in terms of a level playing field and the regulatory perimeter. New sources of risk and fragility and opportunities for concentration and correlated exposures put further emphasis on macroprudential policies and tools. Finally, a dynamic and forward-looking approach to regulation is needed (Beck et al. 2017), with swift adjustments as the nature and structure of finance changes.

FinTech will continue to dominate the regulatory and academic debate in the years to come. Big data has not only enabled financial innovation but also new research in finance. The digital revolution and its financial innovations have challenged existing theories of financial intermediation (Thakor 2020) and require new tests on the role of asymmetric information, agency conflicts and competition in financial service provision. While the variety of regulatory approaches and market developments across countries have allowed for a multitude of different studies, cross-country comparisons will be important in comparing different experiences and their implications for efficiency and stability.

Finally, what will be the impact of Covid-19? The trend towards digitalisation might increase even further in the wake of the pandemic, as social distancing might become the new norm and personal interactions between banks and clients carry even higher costs. In addition, BigTech companies are likely to come out of the crisis further strengthened, with a large cash pile and in a strong position (and possibly a strong appetite) to expand into financial service provision, while banks might come under further profit pressures given that low, if not negative, interest rates are likely to stay for quite some time. These two tendencies might put additional competitive pressure on banks in their core business lines. In the short term, bank fragility, if not outright failures, might result in a restructuring of the banking system, especially in Europe, opening new possibilities for the entry of new providers but also cooperation between banks and non-banks such as BigTech companies. Finally, in the medium term, we can expect a new round of regulatory reform; while the post-Global Financial Crisis reforms were focused on banks and markets, we can expect the new round to include more prominently FinTech and BigTech providers.

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CHAPTER 3

Market structure, regulation and the FinTech revolution

Antonio Fatas

INSEAD, CEPR and ABFER

1 INTRODUCTION

Recent technological changes in financial and banking services are seen as potentially disrupting the traditional actors in these markets (banks, asset managers, etc.). These technology shifts are driven by changes in both the demand and supply side. On the demand side, customers are requesting immediate and costless transactions and an always-mobile experience. On the supply side, the online interactions facilitated by mobile technology, the availability of big data and processing power and the developments in new forms of electronic money and payments are all examples of technology opening up new possibilities.

From a market structure and competition point of view, there are different types of players – some driving these changes, some seeing them as a threat and needing to react to them. Traditional financial institutions, in particular banks, need to adapt to a more competitive and fast-moving environment. FinTech companies are bringing innovations from the technology side, either in specific services or as full competition to established institutions. Finally, BigTech firms that dominate platforms driven by ecommerce (Amazon, Alibaba), social media (Facebook, Google) or the mobile hardware (Apple, Samsung) are also venturing into this space, looking for ways to leverage those platforms while strengthening the reach of their ecosystems.

The degree of change and the type of disruption caused by these technology innovations varies across countries. These differences are partly the result of a different starting point when it comes to market structure, but they are also shaped by the reaction of policymakers (regulators) to these new technologies. In many emerging markets we have seen mobile telecom companies becoming ‘banks’ due to the initial low level of banking and the omnipresence of mobile telephones. In Asia, mobile payments have grown at rates not seen anywhere else, driven by companies that are looking to create overreaching ecosystems (Alibaba, Tencent, Grab). In Europe, traditional banks are holding their position but open banking and new digital banks represent a significant challenge. And in the US, the dominance of the credit card culture and the power of the companies behind them has resulted in a slower pace of innovation on payments and a focus on other areas of finance (asset management or lending).

This chapter provides an analysis of the FinTech cross-country experience using a framework that emphasises the role of market structure and regulation as the key factors driving the shape and speed of disruption. We focus our analysis on the digital money and payments sector. This is a sector that is central to financial and banking activities and one where the attention and funding by investors, as well as entry by new players, are clearly ahead of the other activities. Although our focus is on digital money and payments, we also provide a brief discussion on how other parts of the financial system are changing and how those changes can be mapped into our analysis.

2 A TAXONOMY OF FINTECH

2.1 FinTech: The reality behind a buzzword

The term ‘FinTech’ is used to refer to a set of tasks, activities or new products being implemented or developed in financial and banking services that integrate new technologies,¹ where ‘new technology’ is understood in a broader sense as a combination of processes and specific technology solutions that are either making current activities more efficient or adding dimensions to their services that were not present before.

FinTech has received a lot of attention in recent years and has attracted increasing amounts of funding (Carstens 2018). Like with any new technology development, FinTech can be seen as an overly generic term and possibly a buzzword that overhypes ongoing long-term trends. There is some truth to this. The use of technology, digital assets and processes in the financial sector is not new and, as with any new technology, we have witnessed some excessive euphoria. However, there are several trends that have come together in recent years that are possibly accelerating developments that have been in place for years. The changes are coming both from the supply side and the demand side of the market.

On the supply side, while processing of large amounts of digital information has been central to financial institutions, the recent increasing ability of computing power, partly through the use of cloud services, represents an important change in the cost but also the scalability of these tasks. Similarly, while online banking has been around for decades, the widespread use of smartphones has opened up opportunities that were not possible before. It is not just online, it is ‘*always* online’ that matters. The ability of customers to constantly interact with financial institutions can truly be a game changer.

Also on the supply side, some new technologies can be seen as the ultimate enablers for financial markets of a promise of a decentralised world that the Internet started more than 25 years ago. With the Internet, the sharing of information via a browser led to an explosion of content creation and processing of information by individuals and companies that previously did not have the means or the scale to do so. Developments in financial

1 See FSB (2017) for a definition of FinTech.

markets such as cryptocurrencies or, more generally, distributed ledger technologies are seen as a large step in the direction of decentralisation. These technologies have widened the access to financial services and produced a set of business ideas built on those platforms.²

On the demand side, the increasing use of new technologies, combined with the growing importance of digital platforms and ecosystems in our daily life, has changed both the profile of customers and their demand. The always online presence and the expectation of immediate outcomes has translated into demands for fast, efficient and costless financial transactions. The most obvious example here is payments, where expectations of seamless and instant transfers of money by clicking on a virtual button of a smartphone app are becoming universal. The recent global crisis caused by Covid-19 is likely to accelerate some of these trends. For example, when it comes to international remittances, we have seen progress in the use of digital remittances in the last two months that are equivalent to the progress of four years.³

2.2 FinTech activities

There are many areas in the financial sector that are being affected by new technologies, and these areas are linked by significant interactions between them when it comes to both the customers' side and the technologies being used. The traditional players in these markets, banks, have always operated in many business lines: deposit taking, loans, payments, wealth management and even insurance. While some of the innovations we are witnessing create new entrants in a particular segment, some of these new entrants might quickly expand into the rest of the market.

There are many different ways to create a taxonomy of FinTech activities and their origin (IMF 2019 and Ehrentraud et al. 2020 are good examples). There is a set of new enabling technologies, including cloud computing, mobile access, application programming interfaces (APIs), cryptography and biometric authentication. These technologies are creating opportunities for new companies to enter particular business lines, but also allow incumbents to innovate and create new channels for their services.

These technologies are affecting all financial and banking services. Payment technologies are being disrupted by a variety of new technologies that allow for the seamless execution of payments using mobile devices. Cross-border payments are being disrupted by new players that propose solutions that are much faster and cheaper than the traditional channels. New forms of saving and wealth management services are appearing, in some cases by making use of peer-to-peer (P2P) markets where savers and borrowers meet without intermediaries. In the area of wealth management, artificial intelligence (AI) is

2 The fact that one can today create a financial service that handles monetary payments using a platform like Ethereum resembles the revolution of decentralised and small-scale information providers and ecommerce merchants that the Internet created.

3 See www.forbes.com/sites/danielwebber/2020/05/28/how-money-transfer-companies-squeezed-four-years-of-digital-growth-into-just-two-months/

allowing for the automation of the role of investment advisors. The same P2P networks and AI technologies are changing the way we borrow. Credit scoring can now be done by AI processes and intermediaries can be removed via P2P lending. Analysis of big data combined with better processing techniques can also help financial institutions manage risk better. Finally, there is a large number of technology innovations affecting operational aspects of these businesses, from the ability to store and share information across lines of businesses or financial institutions to the use of technology to manage regulatory compliance.

In all these areas we see the combination of small FinTech startups, incumbents (banks, asset managers) reacting by innovating or partnering, and BigTech companies making use of their technologies and the reach of their platforms to diversify into one or several financial lines of businesses.

In our analysis we focus on the area that has received the most attention and where larger disruptions are seen – digital money and payments. One of the reasons why we have seen more activity in the area of payments is that this is one of the most attractive segments, with a higher return on equity (ROE). In addition, it offers one of the highest levels of engagement with customers and access to data. This is true both in emerging and advanced economies. Other similar activities with high engagement and high ROE are asset management and, to some extent, consumer finance. At the other extreme, capital markets and investment banking or commercial and transaction banking are the areas where engagement and ROE are lowest (McKinsey 2019).

It is also the case that the payments and digital money area is central to most other activities in financial markets as payments have to be associated with any financial transaction. And it might potentially be the most disruptive area because it touches on the backbone of the banking system through its influence on bank deposits.

One final advantage of focusing in the area of payments is that this is an area where differences across geographies are large. This diversity will allow us to explore differences in market structure and regulation and how they play a prominent role in shaping innovations and disruption.

3 DIGITAL MONEY AND PAYMENTS⁴

3.1 Innovations in money and payments

Digital money and payments have been around for many decades. The most common form of digital money has been the combination of a bank account (a digital record on the bank's databases) and a payment technology. The payment technology here is usually a credit card or a debit card on the customer side and a point-of-sale terminal on the merchant side.

4 This section is partially based on Chapter 4 in Carletti et al. (2020).

Innovations are happening both on the digital asset side and in payment technology. When it comes to the asset itself, new technologies allow for the creation of alternative representations of value that can serve the purpose of both a store of value and a means of payment. Innovation in these assets has taken two forms. First, cryptocurrencies such as Bitcoin represent a radical deviation from traditional forms of money as they introduce their own unit of account with their own monetary policy. They rely on a technology where the transfer and ownership of the assets can be verified safely by a decentralised system. A second innovation has come from a variety of new forms of digital money (e-money, electronic wallets, stablecoins) that rely on the traditional unit of account but create new networks and channels through which the assets can be used.

Payment technology was evolving rapidly even before the FinTech revolution. From the original credit card imprinter we had moved on to the use of the magnetic card, then to PIN codes, and more recently to contactless payment. On the merchant side, the ability to instantly query the customer's bank for the existence of funds reduced the risk of the payment not going through. More recently we have seen the use of QR codes as an alternative form of contactless payments and biometric authentication as a replacement for the signature or the PIN code used before.

But the true innovation in this space has happened when we combine the new forms of digital assets with a particular payment technology. After all, for money to be a medium of exchange you need a payment technology. Most of the FinTech startups in this area fall into this category. Electronic wallets are a way to combine a digital representation of value with a payment technology – one that is adapted to a mobile, digital form of life as the asset can be accessed via a variety of devices. These electronic wallets have taken over mobile payments in some countries (e.g. WeChat or AliPay in China), become a way for individuals to gain access to electronic payments (e.g. M-Pesa in Africa), and become the entry point into banking (e.g. Revolut or Moneo in Europe) or a dominating force in ecommerce payments (e.g. PayPal).

3.2 From physical to digital money

Economics textbooks define money as an asset with three properties. First, money serves as the medium of exchange. Second, money is denominated in the unit of account and in some cases defines it. Third, money is a store of value. Strictly speaking, all assets are a store of value, but we ask for money to be a *stable* store of value.⁵

⁵ This is in many ways a desirable property but not a necessary one. Countries with high inflation are still using their currencies as money even if they are not a good store of value.

This definition of money is anchored in the historical evolution of money and fits very well with physical currency. Banknotes define the unit of account, they are a good store of value (if inflation is properly managed) and they serve as a medium of exchange. The physical exchange of banknotes represents the transfer of value given in exchange for goods, services or other assets.

As we move from physical cash to bank accounts, two of the functions of money are still easy to identify. Bank accounts are denominated in the unit of account as they are redeemed at a fixed value (against banknotes). And because this value is guaranteed by strict regulation as well as deposit insurance, this makes them a good store of value.

But the function of a medium of exchange is less obvious. To use the value of a bank account in exchange for goods or services requires a payment technology. More modern forms of payment make use of technology that involves credit or debit cards, online banking or smartphone apps to transfer the value. In all these cases, the information is transmitted via computers and networks, so we can refer to both the payment and the asset as digital. Many of these technologies have been used for decades; digital money is not really new.

Where things can get complicated is when we look at the details of payments. The payment technology used by bank deposits and other forms of digital money might require the participation of several other organisations or networks. As we will argue below, most of the FinTech innovations are about disrupting this complex, and in many cases inefficient, payment infrastructure. But, interestingly, by doing so they might also be redefining the concept of digital money even if they do not fundamentally change the nature of the asset that underlies the transaction.

3.3 The traditional payment infrastructure

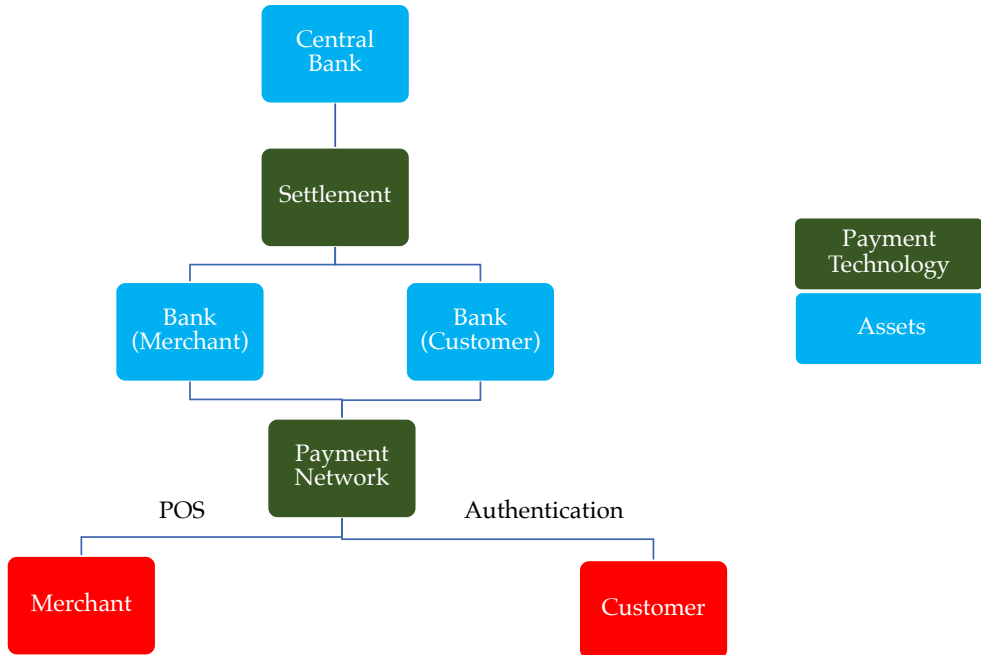
The traditional payment infrastructure consists of digital assets held in traditional bank accounts and a payment technology.⁶ These assets change ownership through settlements via the balance of banks at the central bank (reserve accounts). In the special case where the bank accounts of the payee and the payer are with the same bank, the payments or transfer of value does not require access to the central bank settlement. We will refer to this as a closed-loop network.

The two assets – bank deposits and accounts of commercial banks at the central bank – represent the backbone of modern payment systems.⁷ Banks can be seen as intermediaries in this process by providing access to central bank money to customers. A representation of this infrastructure is summarised in Figure 1.

⁶ In our analysis we typically refer to retail payments, but many of our arguments apply to wholesale payments. Developments in this area are similar to those we have seen in retail payments and they are motivated by, for example, the creation of a faster and more efficient securities settlement (Bech et al. 2020).

⁷ These two assets are the digital component of the monetary base and the money supply.

FIGURE 1 TRADITIONAL PAYMENT INFRASTRUCTURE



To be able to execute a payment, there needs to be a payment technology that connects the two assets and executes the transfer of value. These technologies are complex and typically involve several steps. First, when the customer and merchant interact, there needs to be a process of authentication on both sides that connects them to their assets (bank accounts, in this case). That process has traditionally been run through an infrastructure relying on credit card companies. This is typically a proprietary closed system requiring that both the merchant and the consumer have a technology or device that is part of that infrastructure. In the case of a merchant this is a point-of-sale terminal, and in the case of a consumer a credit or debit card. As the payment goes through, the settlement will need to be executed, via the central bank.

In most countries, banks were not just at the centre of the assets but also in control of the payment technologies. Visa or Mastercard were originally launched by a consortium of banks. And even when they became independent, they have always been close partners of banks. In fact, in many countries credit cards are issued by banks even if they are branded under the name of the credit card company that controls the payment network. In addition, the final settlement takes place via the exclusive access that banks have to central bank accounts. In this environment, competition to banks was very limited.

3.4 Full disruption: Cryptocurrencies

Cryptocurrencies represent a complete challenge to the infrastructure described above. A new technology (Blockchain) has delivered the creation of both a digital asset and a payment technology in an environment that does not require intermediaries but instead runs on a new, decentralised governance structure.

Some of these changes came together for a variety of reasons. First, bypassing banks required the creation of a separate asset. For this asset to serve as a medium of exchange, it needed to be connected to a settlement system. Access to the central bank was out of the question (it would require living with the same constraints as any other bank), so a completely new currency based on a new paradigm needed to be created.

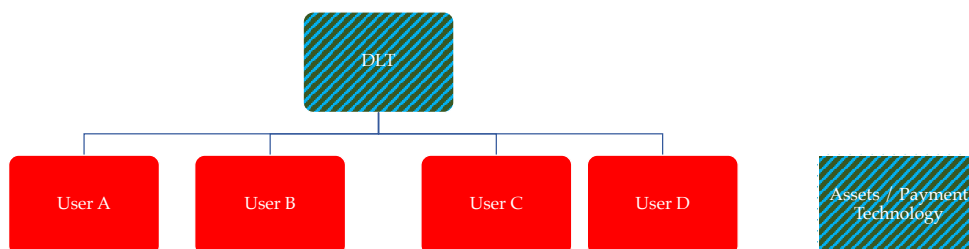
With a separate unit of account, there was a need to decide how the value of the currency would be determined. The historical development of Bitcoin was such that not only was it a challenge to the intermediaries (banks) but also to the central bank. The paper published on 31 October 2008 that served as the white paper for Bitcoin made it very clear that central banks were part of the problem. *“The root problem with conventional currency is all the trust that’s required to make it work. The central bank must be trusted not to debase the currency, but the history of fiat currencies is full of breaches of that trust”* (Nakamoto 2008). What this meant is that the new currency would set a unit of account that would fluctuate according to the “monetary policy” rule stated in the Bitcoin rules. Behind that rule there was a view that a fixed supply, in the long term, would create a very stable store of value.

We will ignore the macroeconomic assumptions behind Bitcoin, but the addition of a new currency and unit of account means that the store of value and the unit of account properties of money are not simply inherited from current forms of digital money. And a parallel unit of account means volatility that could limit its adoption. In a world with a dominant unit of account, assets based on a separate one will not be perceived as good store of value.

An interesting feature of Bitcoin is that it makes the payment technology inseparable from the asset itself, taking us back to a feature of physical money. There is a single database using distributed ledger technology (DLT) of records where the value of balances is kept. Payments require changes in those balances through communication with the database. By eliminating all intermediaries, we have a closed-loop ‘centralised’ system (in some sense, we are all banking with the same bank).⁸ Figure 2 summarises this new technology.

8 In practice, some intermediaries (cryptocurrency exchanges) were created to manage interactions with the ledger. They facilitated the communications and the technology of keeping the asset safe.

FIGURE 2 DLT PAYMENT SOLUTION



Bitcoin was the first currency to use this model, but many other cryptocurrencies that used a similar model soon followed.⁹

In summary, the idea of reducing intermediaries, the notion of an always-on and real-time payment system, was a fundamental driver of this innovation.¹⁰ However, the volatility of the value of the new units of account was too large of a deterrent for the new digital forms of money to be adopted.

3.5 Electronic wallets

A second innovation, also geared towards streamlining the set of intermediaries in the payment infrastructure, is the creation of repositories of value, which we will call electronic wallets (sometimes referred to as e-money).

Electronic wallets can be seen as closed-loop payment systems, and are in that sense similar to Bitcoin. These wallets can be accessed easily and can be used to execute payments or transfers between individuals or companies. The big difference is that they are denominated in the traditional unit of account and have a fixed redemption value.

The classic examples of this development are M-Pesa and similar initiatives in several African countries. Access to banks is limited in these countries while mobile phone contracts reach everyone. The large network created by mobile phones, combined with a technology that can easily handle the payments, makes for an ideal case for the development of these new forms of electronic money.

Mobile payments in China started as a natural extension of the social media networks or ecommerce platforms created by large tech companies. WeChat Pay started as a P2P transfer platform within their network. AliPay started as a payment platform within the ecommerce system of Alibaba. As the payment systems gained acceptance, they

⁹ There are more than 5,500 digital coins that are listed on exchanges, although as of 19 June 2020, only around 40 of them have a daily trading volume of more than \$50 million (source: <https://coinmarketcap.com>).

¹⁰ There are of course some technical limitations, including scalability and the delay in validation so that it is not a true real-time payment system.

migrated to transactions outside of their original platforms. Similarly, Paypal's growth was associated with its acquisition by eBay and later developed on the heels of the growth of ecommerce transactions.

3.6 Stablecoins

A third type of digital money was born out of an attempt to exploit the potential advantages of distributed ledger technologies without the volatility associated with cryptocurrencies such as Bitcoin. From an economic point of view, stablecoins can be redeemed at a fixed value relative to a traditional currency. Conceptually, this fixed-value redemption is no different from that found with electronic wallets or even bank accounts. In all these cases there is an asset that can be exchanged at a rate of 1:1 for a regular currency. One dollar stored in a checking account at Citibank, a dollar in a Paypal account and a dollar in a Stablecoin with a fixed redemption value to the US dollar can all be seen as interchangeable assets. There can, however, be several differentiating elements:

- **The technology being used.** Does the asset rely on traditional storage technologies managed by intermediaries or does it use a decentralised DLT? While this question might be relevant for some important regulatory issues, from an economic point of view there is not much to say about the underlying database technology. What really matters is the risk incorporated into the asset and the possibility of enforcing standard regulations on those assets (including, for example, resolving disputes on payments).¹¹
- **Whether there is a separate unit of account** (at least nominally). Unlike in the case of electronic wallets that rely on the traditional unit of account, stablecoins tend to have their own unit. The newly proposed DiemUSD (previously known as LibraUSD) for retail payments, or the JP Morgan Coin for wholesale payments, come with their own unit of account. But this unit of account has a fixed 1:1 value relative to the US dollar. What is the economic difference? From an economic point of view, what matters is the credibility of the redemption value (more on this below), not the name.
- **The potential use as money** (i.e. its ability to be used as a medium of exchange). The possibility to use stablecoins as a medium of exchange relies on their ability to connect to standard payment networks. Many of these coins are immediately available for P2P payments within their platforms, but executing transfers or

¹¹ In addition, the separation between these technologies has become blurred over time. The definition of what constitutes a 'blockchain', or even a decentralised technology, is a source of endless and not very fruitful debate that we will ignore here.

payments outside of the platform requires a bridge to the existing infrastructure. This restriction is sometimes by design. What these coins represent is an attempt to create a particular exclusive platform where access requires holding the asset.¹²

- **Trust in the redemption mechanism.** This is a key issue for these new assets, although the logic is no different from any other asset. Some of the stablecoins claim to rely on a system that mimics that of a fixed exchange rate commitment of currencies. For example, Tether originally based the logic of its fixed redemption value on 100% backing by US dollar assets, resembling a currency board type of arrangement.¹³ But the parallel is not exact. Fixed exchange rates are abandoned because they are unsustainable from a political point of view, not just for economic reasons (Hanke 2002). There is no obvious parallel to stablecoins here. There is no monetary policy associated with these coins, there is no government in desperate need of seignorage, so the possibility of a 'devaluation' must be associated with a failure of the business model to maintain the value of the assets (or simply fraud). In many ways this resembles more the enforcement of the commitment of any financial institution to honour its liabilities denominated in a traditional currency, in particular those that resemble money. Reneging on a fixed redemption value by a stablecoin can then be seen similar to a bank reneging on the value of the deposits it holds. Addressing this issue requires proper regulation for all these assets that treats the same risks with the same regulatory constraints. We will discuss this later in the chapter.

One final interesting development in the world of stablecoins is the launch of global stablecoins. The original Diem (Libra) proposal was focused on the creation of a global stablecoin whose value was fixed relative to a basket of currencies. From an economic point of view, there are many similarities between a single-currency stablecoin and one based on a basket of currencies. However, there are fundamental differences when it comes to volatility relative to the local currencies. In addition, countries where there are concerns about their currency could see this as a threat because it can create a parallel currency and challenge monetary policy (Fatas and Weder di Mauro 2019).

3.7 FinTech and the plumbing of the payment system

Electronic wallets and stablecoins are new forms of digital money that can be used for payments. But in order to be a medium of exchange, they need to be connected to a payment technology. The payment infrastructure is complex, with multiple parts controlled by different institutions. In this section we explore the payments networks and the processes that link all their parts together. We stress how the success of new forms of money relies on the efficiency and convenience of the payment technology associated

¹² There are some interesting economic considerations about whether launching stablecoins which are restricted to a particular platform can be beneficial to companies (see You and Rogoff 2019 for an analysis of this issue).

¹³ Libra also makes use of the currency board parallel in its white paper.

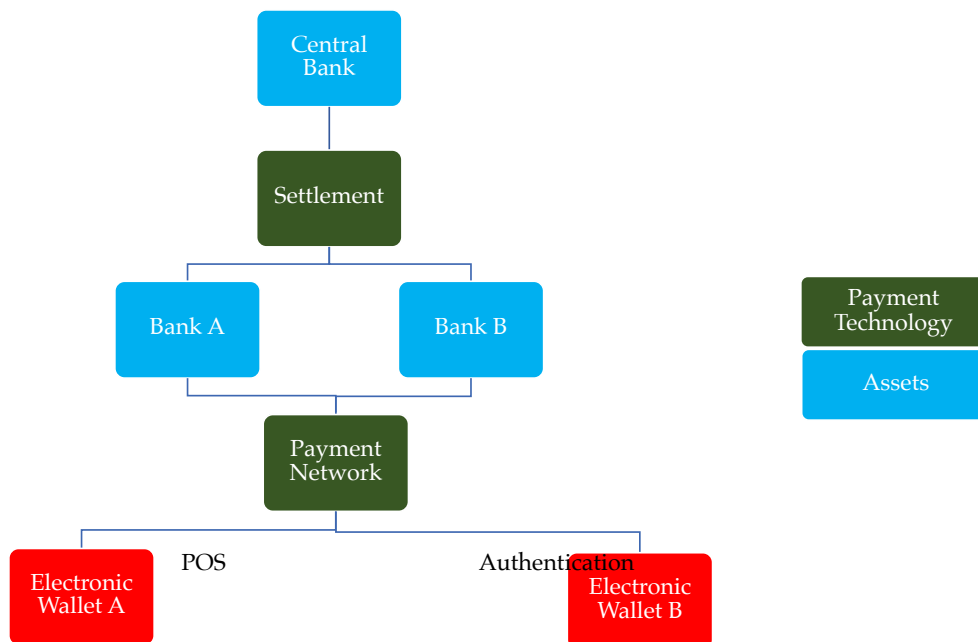
with them. Also, the issue of interoperability between different networks becomes key to define the competitive landscape. An important insight is that market power shifts as innovation transforms some services into commodities while making other parts central to the new technology.

3.7.1 Connecting the networks

An electronic wallet such as the proposed DiemUSD in the US or a WeChat wallet in China can always execute real-time payments within its network and the costs and speed can be fully controlled by the Diem (formerly Libra) association or by WeChat. But when a transfer or a payment is done to a different wallet, it requires a connection to the rest of the system.

Figure 3 schematically represents this interconnected set of networks. Overall, the system has become much more complex, with additional layers of intermediaries for some transactions. Separate networks can connect to each other using banks and the traditional payment infrastructure. Alternatively, if the central bank gives them direct access, settlement can happen at the central bank level without the need for banks to intervene.

FIGURE 3 PAYMENTS WITH MULTIPLE NETWORKS



As the system becomes more complex, the connection of each of these networks raises both technology and competition issues. From a technology point of view, while the redesign of the system is driven by customers' demand for speed, convenience and low cost, the increasing complexity might make that goal more difficult. Of course, the widespread use

of fast Internet connections and newer and faster protocols should facilitate this task. From a competition point of view, each of the players might have incentives to limit these connections to maintain their market power.

As an illustration, we can think about electronic wallets. They could potentially manage payment across networks using the traditional infrastructure of credit card companies. For example, if you wanted to add balance to your PayPal account from your bank account, you could do so using a credit card. But the credit card fee and potentially the speed of the transaction might not be what the customer is expecting and what PayPal ultimately wants to deliver. Similarly, if you want to use an electronic wallet to execute an in-store purchase, you need to be connected to the POS of the merchant, which is likely to be exclusively run by a credit card or debit card company.

This is why innovation by FinTech companies has been redirected to the creation of the new ‘plumbing’ of the payment system. A set of additional ‘pipes’ link networks and help new entrants bypass the market power of incumbents. A good example is the creation of additional channels for bank-to-bank payments. Transfers of value between bank accounts can simplify payments and transfers as they bypass the credit card company infrastructure. Electronic bank-to-bank transfers using online banking have been around for decades, but there were always initiated by the holder of the account and they typically relied on settlement systems that were slow (and potentially costly).

The first necessary innovation was to improve the settlement system, which partially relies on the central bank. In many countries, central banks have responded to the task and quickly launched instant payment systems. In other countries, such as the US, the slow response of the central bank has led to the creation of a parallel real-time settlements network run by banks (via The Clearing House).

The second improvement was to ensure that FinTech players can connect to this settlement system and the pool of assets held at bank accounts. For P2P transfers, the task requires access to bank accounts for executing orders. Some of this involves fast ‘pipes’ between banks (Zelle in the US is a successful example of the creation of these pipes). In other cases, it is about creating an interface that allows FinTech apps or software access to the bank accounts of their customers. This might require regulatory action (such as open banking) or the willingness of banks to collaborate with these new initiatives. Banks might be willing to collaborate in order to maintain their current position in the market as holders of deposits. Unless customers feel that those deposits can be used seamlessly for payments in transactions, they will explore using alternative forms of digital money. As an example of these new processes, many countries have moved quickly into the creation of QR code payment systems. This allows for easy identification of the accounts of merchants (and possibly buyers) that, together with a layer of software, can execute a bank-to-bank transfer as an in-store payment.

An important insight from all these examples is that we are building these new ‘pipes’ by relying on an existing infrastructure – the Internet. All of us have devices connected to the same network (the Internet). We then build a software-based infrastructure of payments to replace the traditional proprietary based point of sale infrastructure. This infrastructure benefits from standardisation of digital IDs, authentication that allows for interoperability. The combination of all of this allows for atomisation of payment services and the co-existence of multiple players.

3.7.2 The nuts and bolts of the payment infrastructure

As the different networks get connected there is an increasing number of parts that play an important role. The importance of each of them can be affected by both technological and regulatory changes. These changes affect the relative power of each of these players and can lead to shifts in market power away from the traditional institutions such as banks.

As an example, connections to the network require a device. On the customer side that device used to be a credit card, but increasingly the device is a smartphone. This can be used for P2P transfers or for in-store payments via contactless payments (QR codes, NFC chips). Smartphones can come with features that are controlled by the company producing the hardware. One of these features is the ability to use biometric authentication. This represents a key piece of the payment process today, but it might become even more relevant in the future as biometric identification becomes required for all forms of financial transactions. As an example, many regulators are already recognising the importance of these authentication methods and allowing a higher payment limit when a biometric technology is being used in the payment.

Samsung, Apple and Google have entered this space by offering their own forms of payment (Samsung Pay, Apple Pay and Google Pay, respectively). Initially, none of these solutions has relied on the creation of separate electronic wallets. The digital asset remains the deposit on the bank account and the payment makes use of the credit card infrastructure. While the disruption is limited, it allows these BigTech companies to control a unique part of the process. If they are successful, it might be natural for them to then develop electronic wallets where the asset is held and potentially disrupt other parts of the financial system (the Apple credit card is an example of this).

A second example is the increasing number of FinTech companies working on connecting different pieces of information via APIs. Some of these are offered as a service to banks, some are used to build consumer-friendly apps. Plaid in the US builds APIs for financial institutions to plug them into a network of partners. Lenders are then able to collect information on the financial history of their applicants to better assess their risk. In Europe, with regulators pushing for open banking, we see the growth of aggregators of bank account information.

4 THE REGULATORY RESPONSE

4.1 The policies

The introduction of new forms of digital money and payments has led to a rethinking of the role of regulators and more generally the role of government intervention. There are several dimensions to consider. First, financial markets are heavily regulated and any new product can alter the competitive landscape and create instability in the financial system. In addition, some of these products can mislead investors due to their novelty. How should the regulatory framework be adapted to deal with these new products and players?

Second, central banks play a central role in digital money and payments. The reference in digital money is the reserves of commercial banks at the central bank. These can be exchanged at parity for physical currency and together they anchor the value of the unit of account. But reserves are not offered directly to individuals and businesses; banks are required as intermediaries. As digital forms of money and payment are becoming more common, should the central bank offer direct access to reserve accounts? This is what is known as central bank digital currency (CBDC). Also, central banks manage the settlements system and can influence the competitive nature of the market through changes in the efficiency of the system or by broadening access to a larger set of financial institutions.

Finally, there are a set of other regulatory issues around the issuance of bank licenses, setting of standards and interoperability that are becoming more relevant as new entrants bring different technology solutions.

4.2 Regulation of assets

When it comes to money and payments, regulation has been designed around the business model of banks. (BIS 2018). A bank holds deposits that can be redeemed by central bank notes at a fixed value of 1:1. Banks are engaged in maturity transformation through lending and purchases of other assets and the liquidity and solvency risks are minimised via regulation and deposit insurance. This strict regulation leads to a perception in most countries of bank deposits as being a digital equivalent of physical money.

There are other assets that are perceived as similar to bank deposits. Money market funds appeared in the 1970s and were immediately seen as a potential threat to bank deposits. Under some conditions they offer similar money properties to bank deposits (access via a debit or credit card) and they offer a higher rate of return with similar risks. The risk involved in maturity transformation and losses on assets held was minimised through

strict regulations, which were strengthened during the global financial crisis.¹⁴ Money market funds do not offer deposit insurance, but they may be perceived as being as safe as bank deposits.

And then there are many other assets that cannot be considered money because they are not as liquid and carry a much higher risk. Mutual funds, exchange-traded funds (ETFs) or any risky security will fall into this category and are subject to very different regulation.

Regulators have typically followed an approach to new forms of digital money that involves trying as much as possible to fit these new assets into the previous boxes. As an example, the guidelines from the Swiss regulator (FINMA) on stablecoins make this principle very clear: “substance over form” and “same risks, same rule”. Other regulators have followed a similar approach.

As an example, let’s think about electronic wallets – an activity that we have seen growing in many countries. Given that they are presented as a form of money and payments, they should receive similar treatment to current forms of money. The simplest approach is to have these new assets inherit the properties of an asset that is already known and regulated. Requiring electronic wallets to keep funds in custody as a deposit in a bank account or as a deposit at a central bank makes that process as transparent as possible and creates the necessary safety for these assets to be used as payments. In January 2019, the People’s Bank of China became the custodian of deposits from payment groups. In many countries (from Colombia to Indonesia), electronic wallet funds need to be backed 100% by bank deposits. In Europe, the funds need to be in custody at bank accounts or safeguarded by private insurance. In other countries (UK, US, Brazil), the assets backing the account balance can also be safe and liquid assets such as government bonds. In all these cases, we are taking a known asset (a bank deposit or a deposit at the central bank) and passing its properties on to the new electronic form of money.

As we move away from electronic wallets, we find a world of many other assets that promise money-type properties (liquidity and safety) and also provide a return based on the assets they hold. But while there may be some interesting innovations in the technology behind these assets, from an economic and financial point of view there is nothing new. The liability side of the balance sheet must inherit the properties of the asset side. If assets are less liquid and riskier, and there is a mismatch in maturity, the safety of the value of the liability being issued would require that these institutions be subject to a regulation similar to banks. At the end of the day, many of these proposals look like securities and they should be regulated as such (FINMA 2019).

There may be some innovations that can potentially offer some additional value, but they are related less to the technology and more to inefficiencies in the current offering of assets. One possibility is that banks still have enough market power to offer too-low

14 In the US, a new regulation (Rule 2a-7) required that money market can no longer have average maturity exceeding 60 days and there were also stringent criteria on ratings.

interest rates on bank accounts. This, of course, only matters in countries where interest rates are positive. As an example, in the period 2016–2019 the US central bank raised interest rates, but banks were slow in passing these higher interest rates on to their customers. If FinTech companies had access to the central bank, they could pass on to customers the properties of that asset (safe and liquid) but also its interest rate (which was higher than what banks were offering). A startup (The Narrow Bank) tried to reproduce this scheme, but the US Federal Reserve did not allow it access to reserves at the central bank. We highlight the role of this decision next.

4.3 The payment infrastructure provided by the central bank

Payments today heavily rely on the infrastructure created by the central bank. Central banks manage the unit of account and provide both a physical form of money and a digital one via the reserves account of banks at the central bank that are redeemable at a 1:1 for physical currency. Access to these accounts represents the backbone of the settlements system, where finality of most payments is reached.

Central banks might also set or regulate standards for different parts of the payment system. Because of the network effects of payments, these standards can be key to improve the competitiveness of the market. For example, standards for QR codes, digital IDs or the protocol for payments can make a large difference when it comes to creating an environment conducive to innovation.

Related to standards is the issue of access and interoperability. For example, providing access for payment service providers to the central bank might weaken the exclusive position banks hold in many jurisdictions. Also, facilitating the conditions under which new players can obtain a bank license can change the competition to banks. For example, in several countries we are seeing the creation of separate virtual or digital bank licenses for institutions operating fully online. Similarly, requiring banks to provide access to their customers' accounts to third parties can weaken the position of banks. Open banking initiatives of this type are in place in many countries and we will discuss them in the next section.

Finally, as BigTech companies enter financial services they raise fundamental issues about enforcing competition. The network effects coming from the dominance of their ecosystems and the regulatory treatment of ownership of data become very important. Some of these issues are new to the regulatory framework of financial markets and will require some rethinking on the side of regulators (Carletti et al. 2020: Chapter 3).

There is a particular part of the infrastructure that has received attention in recent years, namely, the possibility of providing access to all to central bank accounts (i.e. central bank digital currency).¹⁵ There are several arguments made in favour of the creation of

¹⁵ See BIS (2020) for a recent summary of the state of CBDC.

CBDC. Simplifying the payment system in order to remove intermediaries and address the inefficiencies of the traditional payment system is one of them. Related to this, the fact that not every citizen has access to a bank account limits the possibility of moving towards a fully digital payments system. Finally, as physical cash is used less, the payment system falls into the hands of the private sector without a backup provided by the state in the form of bank notes.

While there are good arguments for CBDC, there is an ongoing debate as its creation also comes with costs and risks, among them the possibility of bank deposits shifting to CBDC during times of crisis (Fernández-Villaverde et al. 2020). One of the points made by critics of CBDC is that addressing the shortcomings of the current system does not necessarily require central banks to create CBDC. The current payment system is already becoming more efficient, and regulators could facilitate and speed up these improvements. Also, one could potentially create something very similar to CBDC by using banks as intermediaries ('synthetic CBDC') (Griffoli et al. 2018). Finally, access to central bank balances by electronic wallet providers could in some sense provide the same service. This is a practice that is already in place in China and the UK, where payment providers have access to central bank balances.

Many central banks have started to explore the possibility of CBDC, but as yet no central bank today offers one. The People's Bank of China has launched an actual pilot and seems to be the closest to making that step, but details on how the system would work are not yet fully available.

5 CHANGES IN THE COMPETITIVE LANDSCAPE

5.1. Market structure and regulation as a framework

In this section, we compare the development of FinTech across several regions or countries in order to understand the factors that make its growth and success more likely. As we did in previous sections, we focus on digital money and payments.

Our framework for our cross-country comparison starts by understanding the strong network effects of payments and, as a result, of different forms of money. For money to be used, it has to be an efficient medium of exchange. And in today's world, efficient means always-on access, immediate execution and low cost. These features dominate the traditional 'store of value' property of money (partly because we take that property for granted).

But payments require interconnectivity. Traditionally this was done by a closed proprietary network of banks, credit card companies and the central bank as the ultimate settlement. What technology has done is open up possibilities of creating closed-loop parallel networks or creating 'pipes' that can connect us faster via our traditional bank accounts. Here is where banks are being disrupted via payments.

The creation of additional closed-loop networks such as electronic wallets or even cryptocurrencies was initially the easiest way to create a competing payment infrastructure. But to be successful, these networks must meet three criteria. First, there must be an easy technology for individuals and merchants to connect to these networks. The foundation of this technology was created by the Internet and the spread of mobile telephony. Second, these networks need to reach a critical mass. The value of the network is a function of the number of users. Where is the network coming from? In most cases, from alternative platforms. As our life has become more digital, the Internet, social media platforms and messaging platforms have become the natural networks where payments are developed. Finally, there needs to be an easy way in and out of the network, assuming that the network does not fully dominate the market. Here is where the role of regulation becomes crucial. The ability of new entrants to make use of parts of the existing network will be fundamental for their success. Also, the creation of efficient and widely available standards will be a strong force behind adoption.

As we discuss the role of new entrants (FinTech and BigTech), we also provide insights on the response of banks. How can banks respond to these new competitive threats? Should they try to stay ahead by innovating or by partnering with new entrants? As we discuss below, the answer to these questions will be different across regions and will once again depend on both the competitive and regulatory environments.

5.2 Cross-country comparison

We now provide an analysis of some of the developments observed in different regions around the world through the lens of the framework developed in the previous section.

5.2.1 *The explosion of mobile digital money in Africa*

The first ingredient of this case is an underdeveloped banking system that leaves many individuals out of any form of digital payments. Then mobile phone technology becomes widespread, providing individuals with a device to access an omnipresent network. Mobile phone companies have an easy way to authenticate users and create repositories of value based on the pre-paid balances of their customers (M-Pesa in Kenya was launched by Safaricom and Vodafone). What was needed was simply a process to make use of the device to engage in payments and P2P transfers. One of the pivotal moments of the project was when the balances were allowed to be used to buy minutes of airtime; this increased engagement and use of the wallet. M-Pesa was originally launched in Kenya but it then spread to many other countries in Africa and later to other parts of the world (IMF 2019).

From a regulatory point of view, a central issue is how to protect the value of the funds deposited in these accounts. In every country where mobile digital money has succeeded, regulators have imposed restrictions on the funds held by the companies. Those restrictions require the funds to be kept in a trust account that is separate from the

operational accounts of the business (Reserve Bank of Malawi 2019). These trust accounts can be deposits at banks. This allows the new forms of money to inherit the properties of a bank account.

A second regulatory issue is the need to abide by 'know your customer' regulations. In most cases regulation was lax at the time the projects were being developed, but requirements got tighter as the system became successful. For example, since 2017 M-Pesa has been required to use photo ID to validate the identity of users.¹⁶

From a competition point of view, the small presence of banks and their inability to replicate the technology and networks of the telecom providers means that is very little they can do to stop new entrants. The only options for banks are to develop alternative payment systems for their customers (those who already have bank accounts) or find ways to partner with the new entrants. Some of these partnerships are dominated by the network operator, such as M-Shwari in Kenya, a partnership between Safaricom and CBA that relies on the M-Pesa infrastructure. In other cases the partnership is driven by banks, as with Equitel (a partnership between Equity Bank and Airtel in Kenya). Of course, banks can also improve on the existing infrastructure of payments using mobile phones (banks in South Africa have followed that route).¹⁷

5.2.2 *The dominance of BigTech in China*

The market structure of China, and in particular the role of BigTech, has led to a very different outcome. The developments of new forms of money and payments started via the ecommerce platform of Alibaba (Taobao) in 2003. Platforms dedicated to e-commerce are a natural environment for new forms of payment to develop. By definition, stores and customers are already connected and because the payment has to be facilitated by the platform, there is a need to keep an infrastructure for managing the liquidity. In this particular case, there was the need to build the trust between the buyer and the seller over the execution of the payment. Once those balances were in place, creating a digital wallet was a natural next step. And once critical mass was reached, the use of that wallet was extended to payments outside of its own platform.

Similarly, WeChat Pay is the outcome of a digital platform – in this case, a messaging platform that created a network was used to launch a simple and seamless P2P transfer system based on electronic wallets. As the system grew, as happened with Alipay, it was natural to broaden the reach of the payment system beyond the network.

The growth of these two BigTech companies was partially made possible by a lower penetration of banks and also by the lax regulatory approach by Chinese regulators. Chinese regulators had as a priority to increase financial inclusion since 2005 (Zhou et al. 2018). Digital means of payment or financing was seen as a driver of these goals and

¹⁶ See <https://techweez.com/2017/07/10/m-pesa-new-kyc-photo-id/>

¹⁷ See www.mckinsey.com/industries/financial-services/our-insights/mobile-financial-services-in-africa-winning-the-battle-for-the-customer

the regulator had regularly encouraged these new developments. As time passed and the BigTech giants started to dominate payments and to expand into many other parts of the financial system, regulation tightened. At that point, regulators stressed the need to balance stability and the development of new technologies. For example, since 2015 payment providers face strict constraints on the use of funds collected from customers (to be deposited at the central bank) and they are required to verify users' identities – all of this matching the regulation we see in other countries.

China is a great example of how BigTech firms make use of their ecosystems and platforms to dominate financial transactions. No doubt the initial weaker position of banks helped them gain market share, but now that they have expanded their offerings to a large variety of financial services it is hard to imagine banks or new entrants being able to challenge their dominant position. Payments and its network effects serve as a great point of entry but as critical mass is reached, other aspects of the BigTech ecosystem reinforce their competitive position. In particular, the data they collect from users and transactions can allow them to improve on certain services (lending) and tailor their offerings better to the characteristics of their customers. Finally, their familiarity with technology makes them more likely to be innovative and stay ahead of the game. Because of all these reasons, financial regulation must now operate with a broader perspective that includes issues around competition, technology, the role of network externalities and the ownership of data.

5.2.3 The dominance of 'super apps' in Asia

In several other countries in Asia, we see similarities to what we witnessed in China. Regulators were keen to improve financial inclusion and encouraged the move towards digital payments and finance. Digital platforms were growing based on a host of services that could be ordered or consumed via a smartphone app – from messaging, to food delivery, to car rides or dry cleaning. What we witnessed in these countries is the growth of some large players that became aggregators of these services ('super apps'). The critical mass of these networks, combined with the fact that they needed to manage payments, creates once again an ideal environment to launch a payment system based on the account balance of buyers and sellers (in many ways this is not too different from the story of M-Pesa in Africa or AliPay in China). Internal transfers can be executed seamlessly and at no cost – a technology that is clearly superior to the alternative of using credit card payments that are not only expensive but also not as widespread as in other regions such as Europe. GoJek (Indonesia), Grab (Malaysia and Singapore) or Kakao (Korea) are good examples of these dynamics.

In several of these countries, the internal online payment system also spread to in-store payments through the use of new technologies to identify users (QR codes). In some cases, such as Singapore, regulators created a standard for QR codes that identify the merchant and its bank account. The standard is open for any application to use, facilitating the creation of safe and fast payments. The fact that the central banks also adopted real-time payment facilities was also a key point in the development of these payment technologies.

The experience of India also reinforces this logic. India is a country where banks have limited reach and where the government has encouraged financial inclusion via the use of digital payments. The creation of real-time payment systems with a common standard for payments (a Unified Payments Interface) as well as standardised QR codes (Bharat QR) or digital ID (Aadhaar) has opened the door to the growth of multiple digital payments initiatives. Some of these have taken advantage of multi-service platforms to build a stronger ecosystem.

What has been the response to banks in these countries? The response has varied depending on the country and is very much a function of the initial position of banks and their ability to react. In a country like Singapore, the initial strong position of banks combined with their ability to keep up or even lead innovations means that new entrants have not gained substantial market share. Banks are under pressure to innovate; they might partner with providers of new technologies, but the disruption is limited. There was no obvious BigTech platform that could serve as a disruptor and the entry of SuperApps, while successful, is limited compared to the experience of China. The role of the central bank in providing an infrastructure for real-time payments has allowed banks to compete with the electronic wallet solution proposed by new entrants.

In India the starting position was very different: low penetration of bank accounts and digital forms of payments. The government had as a goal reversing this situation by creating an infrastructure of standards in digital ID but also payments.¹⁸ Today a variety of alternative forms of digital payments coexist and electronic wallets and UPI payments account for around 50% of all digital transactions, a share that is larger than that controlled by debit and credit cards. FinTech entrants such as Paytm have been early leaders in this area but they now face competition from BigTech firms (such as Google, Amazon or even Walmart, through Flipkart).

5.2.4 The dominance of banks in Europe

The competitive framework in Europe was characterised by a strong presence of banks when it came to both deposit taking and provision of loans. In addition, regulation was very much designed around banks and bank stability (Vives 2017). But alongside protection of banks, we also have a strong pro-competitive regulatory stance coming from competition policy (e.g. open banking). Finally, through national initiatives, there was early investment in modern payment systems via the use of PIN-based credit and debit cards, later replaced by contactless systems. Europe was ahead of other countries in the use of debit card-based payments.

¹⁸ By 2017, 80% of the population in India had access to a bank account, up from 35% in 2011 (<https://ftalphaville.ft.com/2019/12/15/1576438221000/India-s-payments-revolution/>).

New entrants had to compete with a well-run infrastructure providing almost-universal access. The only way to enter was to use new technologies that allowed for faster, more convenient payments and were fully integrated into other digital platforms. While the bank infrastructure was functional, it lacked the features that more tech-savvy customers were demanding.

Many of the new entrants followed this path. Monzo started with the launch of prepaid debit cards managed by a smartphone app. Within its network P2P transfers could easily be made via the app. Outside of the network, Monzo relied on the traditional debit card infrastructure. As time passed, Monzo applied for a regular banking license given the limitations it faced. Similarly, Revolut or N26 were new entrants that today operate as 'digital banks' (with banking licenses). They compete with traditional banks on the same level-playing field except that they can be more focused on certain segments and take advantage of the lower costs from the having no physical presence and possibly superior technologies than the legacy systems of banks.

Why didn't these FinTech companies launch parallel payment systems of closed-loop networks, as we saw in other countries? First, the regulation of credit card and debit card fees in Europe has kept interchange fees at very low levels. Instead of the 2–3% seen in other countries, fees can be as low as 0.2%. Given the low cost and the presence of these technologies everywhere, there was no incentive to create a parallel system. In addition, these entrants are not coming from a social media or messaging media platform (as in China). Without critical mass, the idea of creating a separate network is much less attractive.

A significant factor for this development is that central banks made rapid improvements in the existing settlement infrastructure. For example, as of November 2018, a new system was introduced (TIPS) at the European level that can handle real-time gross payments at a negligible cost.¹⁹ Given the efficiency and cost of this infrastructure, the room for disruption was much smaller.

An additional important development in Europe was the open banking initiative aimed at ensuring a competitive environment for banks. As an example, banks are required to provide access to customer's deposits to be used for payments to any application that is granted access by the owner. This has led to an explosion of startups trying to profit from both the information and access to bank accounts. For example, one could imagine a payment-based infrastructure that makes use of the assets stored at banks. Managing payments could be an interesting value proposition as it would not require the regulatory hurdles of the bank and it could provide potential revenues from payment fees but also from the data involved in the transaction.²⁰

19 There were other similar developments in individual countries, sometimes pushed by association of banks. The Vipps payment system in Norway, the payment infrastructure in the Netherlands using Maestro cards or Swish in Sweden are all examples of modern, fast and costless payment systems used by traditional banks.

20 Yapily is one of most advanced entrants offering a variety of services to companies when it comes to access to accounts across multiple banks for information, payments or lending.

In summary, in Europe banks started with a strong dominant position. A friendly regulatory environment combined with the development of a good infrastructure for instant payments allowed them to quickly adapt and compete with new entrants. In the early years these entrants exploited the backwardness of the traditional banking services, but as banks reacted the entrants found themselves broadening their services and transforming themselves into digital banks, competing with banks on the basis of leaner, more modern and more focused business models. Both banks and new entrants rely on the same payment infrastructure that has evolved through a combination of central bank initiatives and projects run by associations of banks. Seamless, always-online access via mobile devices has become the norm in many of these countries as banks had to quickly adapt to a new environment. What about BigTech in Europe? The absence of a pan-European social media or ecommerce platform limited the ability of these players to be a strong disrupting force. This played to the advantage of banks that, as a result, have managed to keep their dominant position in payments, deposits, wealth management and loans. This does not mean that they have not suffered the consequences of the competitive threat through pressure on margins because of reductions in fees and the need to accelerate investments in technology.

5.2.5 The dominance of credit cards in the US

The digital payment infrastructure in the US was, and still is, dominated by credit card companies. This domination comes from their strong partnership with banks, their control of the payment infrastructure and a pricing structure that does not favour competition. Consumers face identical store prices regardless of the method of payment used to purchase goods and services. But many consumers take advantage of different discounts and rewards associated with the use of credit cards. These rewards are funded by very high fees paid by the merchant. In this environment, creating a parallel payment system via the use of electronic wallets or QR codes facilitating bank transfers in the US was unlikely to happen (Klein 2019).

Where competition is possible is in P2P transfers. Credit card companies are not part of that space, so discounts and rewards cannot stop competition. In addition, the payment infrastructure of the US banking system has been lagging relative to other countries. While we had seen an increasing number of central banks adopting wide-reaching real-time payment systems, the US Federal Reserve was not one of them. This means that bank-to-bank transfers remained slow, cumbersome and costly. The use of alternative assets that sit outside of the banking system for those transfers led to companies like Venmo or PayPal becoming some of the most successful FinTech companies in the US.

The slow development of a fast payment system was also behind the creation of a parallel private settlement system driven by banks (the Real Time Payments network hosted by The Clearing House). And also driven by banks, new pipes have been created to facilitate P2P transfers within the bank infrastructure. Zelle is now dominating these transfers.

The success of Zelle reveals how banks can coordinate to compete with the new entrants. Adopting a standard in identifying bank accounts and using that standard to make transfers more convenient is enough to meet a large part of digital consumers' demand.

An interesting development in the US has been the late entry of BigTech firms in payments, in particular those that are behind the social media platforms (such as Facebook). Given the reach of these platforms in the US, we could have imagined a development that was similar to what we have witnessed in China. We already mentioned earlier that the strong role of credit cards was an impediment to the development of any form of electronic wallet. But there is something else. In the US, Facebook was not a dominant messaging platform. Initially SMS and later other proprietary platforms (like iMessage for iPhone users) became the ultimate mobile messaging platforms for many users. The acquisition of WhatsApp by Facebook gave them access to a large messaging network, but mostly outside of the US. This explains why entry into payments was much less obvious for Facebook than for WeChat in China. Facebook has recently launched Facebook Pay, a wallet within the Facebook ecosystem, and has been part of the launch of Diem, a stablecoin to be integrated into a payment infrastructure. But they are late to these developments and the integration with mobile digital life and messaging is still to be defined.²¹

In many ways, the experience of banks in the US resembles that of Europe. When it comes to payments, they have managed to keep their dominance because of their strong initial position. There are, however, some differences. In Europe, innovations in payments spread faster, led by public interventions in the infrastructure and the regulation of credit card fees. This allowed banks to compete with new entrants. In the US, those innovations have been slower but banks have managed to exploit their partnerships with credit cards to protect their business. It was only in the case of P2P transfers where disruption could happen and banks have been forced to partner with technology companies to maintain their competitiveness. Of course, this is just payments. In other financial services new entrants have gained significant market share, for example in residential lending. We discuss these other financial services in the next section.

6 BEYOND PAYMENTS

In the previous sections, we focused on innovations in payments and digital money. In this section, we briefly describe developments in other markets. Our goal is to highlight the role of the initial market structure and the regulatory framework in explaining the outcomes we observe.

²¹ Facebook Pay is being integrated into WhatsApp in countries where WhatsApp is the main messaging platform, such as Brazil. Interestingly the regulator has recently banned the launch (www.reuters.com/article/us-brazil-central-bank-visa-mastercard/brazil-suspends-whatsapps-new-payments-system-idUSKBN23V042).

6.1 Wealth management

The wealth management industry went through a large disruption decades ago with the explosion of online brokers after the adoption of Internet technologies. A combination of much smaller fees, the increase in the ability of investors to acquire information and the ease with which orders could be instructed and executed represented a large deviation from the traditional model.²²

The shift towards a more mobile world has now pushed this model to the next level, as users expect all this information and possibilities in all places at all times. In addition, improvements in the trading and information-processing technologies have resulted in even lower trading fees (in some cases reaching zero for common trades).

But the biggest change we have seen is the use of automatic trading strategies, or ‘robo-advisors’. The idea here is to create algorithms that are tailored to investors’ profiles and that can make trading and rebalancing decisions automatically. This is a technology that relies on the availability of low-cost processing power and the use of artificial intelligence. Whether the technology is truly disruptive or simply part of the regular progress in the wealth management industry is an open question. Clearly, some strong players have become large by using these new technologies (e.g. Betterment), but it is also the case that the traditional players have quickly adopted these new strategies.

From a regulatory point of view, brokerage firms, regardless of the technology used, face the same regulation (Ehrentraud et al. 2020). In comparison to payments, this is an area where there has been much less need to adapt our regulatory framework.

When we look across countries we see cases like the US, where the brokerage sector was already very developed and also competitive. But the entry of new firms pushing fees towards zero or relying on robo-advisor technology has forced traditional players to follow these innovations. In Europe, the sector is much less developed and institutional investors play a stronger role. Relative to the US, fees remain high and while there has also been entry into the sector by similar players, their impact has been much more limited. In the case of Europe, the strong role of banks as the channel for saving limits the scale of disruption. In Asia, we see again the entrance of BigTech into this segment of the financial sector through the creation of a variety of saving instruments that were attractive to small investors, as was the case of Yu’e Bao in China. In other countries in Asia where banks had a stronger presence (e.g. Singapore), there has been much less entry and banks continue to control this market while bringing innovations to their in-house operations.

22 Prior to the Internet, the rise of discount brokers in the 1980s had already been a warning to the traditional players.

6.2 Insurance

When it comes to investment in technology, the insurance sector has typically been behind the banking sector. One potential reason for this is that the move towards digital banking was warranted by the daily interactions individuals have with payments, while in the case of the insurance industry the interactions tend to be much less frequent. But as with the other industries, a more tech-savvy pool of customers has increased demand for similar access to this market. On the supply side, the ability to analyse data became a potential competitive advantage (IAIS 2017).

The developments in this industry have been similar to those in other sectors – from digital platforms to data analytics, automated personalised recommendations, and so on. The technology has also allowed for the development of aggregators or consolidators via those digital platforms. In addition, the nature of the technology has seen the growth of niche players that offer on-demand insurance for particular or time-restricted needs (e.g. Slice), while a few startups have exploited the possibilities of peer-to-peer insurance (e.g. Lemonade).²³

A final innovation in this market is the use of the ‘Internet of Things’ capabilities. The information potentially contained in devices located in your home, in your car or on your wrist could be valuable to insurers to assess risk and tailor their offerings. This is an area under development with questions still many unanswered about its true potential as well as the ethical and privacy issues it might raise.

Overall, the disruption in this industry is a combination of data analytics on the companies’ side and their ability to produce customer-friendly platforms when it comes to access to information plus the flexibility of insurance contracts that fall outside the traditional rigid ones offered by the regular players. Some of these new technologies can be incorporated by the traditional insurers that will make use of their brands and history to retain their comparative advantage.²⁴ An open question is whether the technology fundamentally changes the insurance market towards segmentation and where the incumbent companies might lose the control that they have today.

From a regulatory point of view, there was also much less need to rewrite the existing framework. New entrants are simply made subject to the existing licensing regime and regulatory requirements.

6.3 Lending and fund raising

The lending and fund-raising space is one where we have also seen significant innovations, some of them requiring a significant rethinking of our regulatory framework.

²³ The label of P2P insurance is less clear than in other P2P models like lending. Pooling risks is the way insurance always works. The difference between these new P2P players and traditional insurers is what happens with the residual of the premia being paid.

²⁴ In fact, some of the new FinTech startups are creating tools for incumbents to incorporate these new technologies (e.g. Clientdesk, Snpasheet and Zywave).

The use of data analytics for lending is part of the overall trend for better use of big data in financial decisions. This is not new to lenders, but an increasingly digital life leads to big pools of data that can allow for better models. To take advantage of these models, one needs the know-how but also companies need to have access to data. While banks are used to collecting the usual credit-risk data, new competitors have access to data that are not available to banks. This is particular the case for large technology companies (BigTech) running big social media or e-commerce platforms. The growth of lending by these players in China is an example of the advantage of these organisations.

More fundamentally, we have also witnessed the growth of different forms of peer-to-peer lending and crowdfunding (including ICOs).

P2P lending was created on the premise of eliminating the intermediary to reduce costs. While the idea of eliminating intermediaries in lending was seen by some as challenging, P2P lending took off in some markets and became a FinTech success story. In the US, P2P lending originates more than \$62 billion in consumer loans (LendingClub and Prosper being the market leaders). We have also seen fast growth in other regions, in particular Asia (Lendit in Korea being such an example). While these players position themselves as competitors to banks, in some cases they can be seen as complements as they can provide banks with additional information on credit worthiness (Balyuk 2019). While the growth of these platforms has been impressive, they remain small relative to the overall volume of lending and it is still unclear whether disintermediation can be the model for the future of lending.

Crowdfunding platforms represent a mixture between funding of new business ideas and in-advance ordering. Under certain assumptions, they can be an efficient funding platform because of the commitment of lenders to also being customers of the products.

Finally, ICOs represent an alternative form of funding where the mechanism of funding is through tokens whose valuations is related to the success of the business. ICOs are closely related to crowdfunding platforms because, in both cases, the investment is linked to the use of the company's product in a way that helps companies and markets better gauge the potential demand for the service and also creates a degree of customer commitment (Howell et al. 2018, Cong and He 2018).

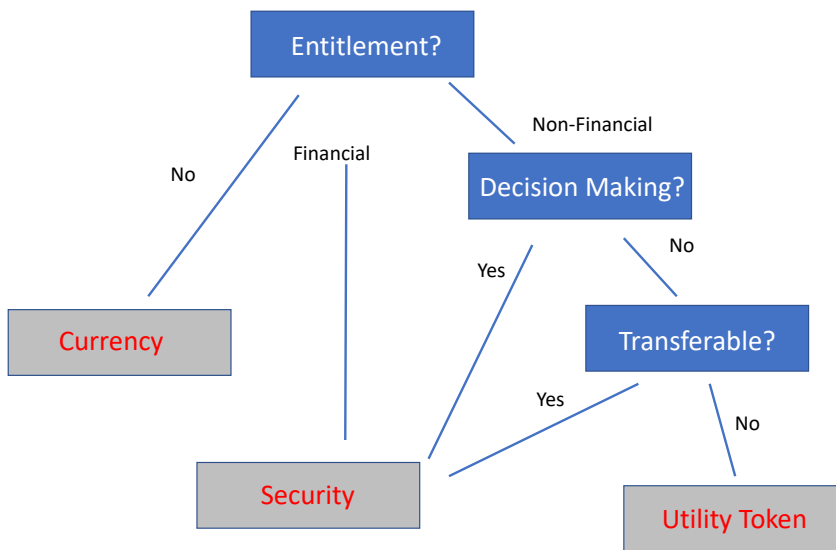
ICOs have faced intense scrutiny from regulators. Issues of investor protection were at the heart of the discussions among regulators.²⁵ Here we have witnessed very different responses depending on the country. Some regulators took a radical view and simply prohibited ICOs and shut down exchanges trading fiat money for cryptocurrencies. A notable example of such radical action was China. Japan started regulating exchange platforms after one of the largest (Mt Gox) suffered a huge theft of bitcoins it was holding

²⁵ Given the small size of the market, financial stability issues are currently not so relevant, but for instance ESMA, the European Market Authority is only concerned about risks of fraud, cyberattacks, money laundering and market manipulation (ESMA 2018).

on behalf of customers and became insolvent. Other regulators, like Switzerland and Singapore who wanted to develop a strong FinTech sector, have tried to balance the risks with the potential benefits of providing some space (sandbox) for ICOs with light regulation.

However, the main question all regulators have is about the right level of investor protection: should ICOs be regulated like securities? There is no simple answer to this question, as ICOs come in different flavours. To summarise the analysis of regulators, we can draw the decision tree of Figure 4.²⁶

FIGURE 4 REGULATORY TREATMENT OF ICOS



The figure shows that there are three types of cryptoassets that should receive different treatment:

- Those whose goal is to be a means of payment. They are not attached to any particular service and are accepted as means of payments to purchase goods and services. They are considered currency, with Bitcoin the perfect example of this.
- Those that are almost identical to a traditional security because they offer a financial entitlement (dividend, expectation of appreciation) and they are tradable (in some rare cases they also offer decision making in the business). In this case, there is unanimity among regulators that they should also be treated like standard securities.

²⁶ This decision tree comes from Allen et al. (2019).

- The third type of token is where the grey area lies. These are tokens that promise access to a service. In principle, these are labelled ‘utility tokens’ and are similar to pre-purchasing a certain amount of goods or services; the reality is less clear-cut. Some of these ICOs were tradable and in addition they were sold under the promise of a return (as the market demand for the service increases). For these reasons, the US regulator, the SEC, moved in the direction of labelling most ICOs as a security. In Europe, there is a variety of views depending on the country, but at the European level (ESMA 2018) there seems to be a consensus to move towards a similar interpretation. This would mean that the regulatory scrutiny of ICOs would increase, but so would investor protection.

Regulation matters for the development of ICOs across markets, but it also matters in other aspects of lending. As an example, residential lending in the US has been shifting away from banks, and shadow banks and FinTech lenders now represent a significant share of such lending. Part of the reason for this growth is the regulatory changes banks faced after 2008 that made lending in these markets more difficult. Interestingly, both shadow banks and FinTech still rely in the government guarantees that are present in this particular market (Buchak et al. 2018).

6.4 The wider universe of FinTech initiatives

FinTech has touched on many other segments of financial markets. For example, the area of regulations such as anti-money laundering (AML) and know your customer (KYC) regulations has received attention from companies that promise to streamline and simplify regulatory compliance (Fenergo being one example). In real estate, in addition to further development of platforms for transactions, we have seen initiatives linking the idea of renting to purchases of real estate assets (Divvy) or fractionalising ownership through the creation of specific assets or tokens. Finally, information gathering and aggregation of either investment positions or banking activity is also a fruitful area of innovation. In some cases, this is partly the result of regulations (such as open banking) that require financial institutions to provide APIs to allow other apps or platforms to access customers’ information.

7 CONCLUDING COMMENTS

In this chapter we have provided an overview of recent technology-related changes in the financial and banking industry. Our focus has been on the area of payments and digital money where developments have been fast and, in some cases, disruptive.

By comparing the experience of different countries, we have highlighted the role of the market structure, the weight of banks and the decisions made by regulators and central banks.

There are several patterns that emerge from this analysis. First, network effects are central to payment systems. Traditional payment systems were dominated by banks, their access to central bank settlements and partnerships with credit card companies. The existence of closed networks and proprietary protocols created inefficiencies. Competing with established payment networks was difficult as entering these networks required cooperation from incumbents. The alternative path followed by many entrants was to create parallel networks. These took the form of electronic wallets managed by FinTech, BigTech or even mobile telecom companies.

The second insight is that for these parallel networks to become successful, they need to attract critical mass – they need to find a way to overcome the switching costs and network externalities of existing systems. The success stories we describe combined an environment characterised by a weaker position of incumbents, a technology that created an alternative platform that provided the critical mass for the new payment systems, and a light regulatory approach to new forms of payments in the early phases of development. In Africa, the fact that not everyone had access to banks made the switch easier. This was combined with the natural network that the mobile telecom companies already have and could exploit.

What lies ahead for banks? FinTech has become a disruptor for banks. In all markets new innovations from FinTech entrants have reduced bank margins and push banks to invest in competing solutions. These dynamics are already visible in the most profitable segments, payments being a good example. Banks can make use of the market power they derive from their deposits and their strong customer relationships (Drechsler et al. 2018). The biggest threat to banks comes from BigTech companies that control ecosystems with network effects and switching costs that are as large as those that the banks are trying to use in their favour. The experience of China shows the risk of BigTech companies dominating financial services. But that experience is unique because of a combination of weak banks, loose regulation and very strong BigTech platforms.

In Europe and the US, banks and credit card companies started from a much stronger position and managed to exploit the strong network effects of widespread networks of payments limiting the entry of new players. FinTech startups relied on their adaptability to new technologies and new consumer habits. As time passed, many of them partnered with banks or became banks themselves, competing head-to-head with the incumbents. Where banks were strong, they reacted to these innovations, in some cases with the help of regulators and central banks that upgraded the payment infrastructure so that it can now compete with the lighter and more consumer-friendly payments promised by FinTech and BigTech.

Where banks quickly adopted new technologies, these allow them to remain competitive. But technology improvements come with a risk to traditional players. As the networks become faster, more open and easier to interconnect, the ability of entrants to disrupt parts of the payment ecosystem increases. For example, as standard QR codes are

established for payments, it makes banks more competitive but it also facilitates the entry of other payment providers. Money can easily move between bank accounts and electronic wallets, to execute a payment from the buyer to the seller. Who captures the value will depend on many factors. And once again, the implications of technology for market power combined with the regulatory response will be key to predict the future landscape. As an example, biometric authentication might become a key piece of the payment system. Today it is controlled by hardware companies producing smartphones. Without regulation that opens up access to those tools, it will be hard for banks or any FinTech entrant to compete with these new technologies. Regulators must ensure that standards remain open and that interoperability is possible so that no single player can become dominant when it comes to payments.

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CHAPTER 4

Cryptocurrency regulation and enforcement in the US and Europe

107

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1 INTRODUCTION

Bitcoin – the first successful application of blockchain technology – has become a household word all over the globe. In light of Bitcoin’s remarkable survival against all odds, companies and governments have been looking at blockchain technology as a secure way to raise funds and facilitate transactions.

Blockchain is a digital ledger of data records secured by cryptography and distributed electronically. To take each word in turn, ‘digital’ means that it is for computer use only and has never existed in physical form; ‘ledger’ refers to a database of issuance and transactions. ‘Data records’ are blocks on the blockchain. ‘Secured by cryptography’ means that data records have been secured using some versions of cryptographic hash functions and encryption protocols. ‘Distributed’ means that copies of the ledger are stored on all computers that belong to the network rather than in a central database. ‘Electronically’ means that there is a communication protocol that enables computers on the network to communicate to each other.

In response to blockchain technology and its applications to cryptocurrencies, regulatory bodies in the US and in Europe have weaved together a patchwork of sometimes contradictory measures (Tu and Meredith 2015). This is in spite of the fact that over the last 30 years, regulators and policymakers in major jurisdictions have become quite proficient, if not sophisticated, in regulating digital transactions recorded in computer databases. After all, that’s how the dominant majority of securities are issued, payments are initiated and finalised, assets are traded and settled, and reports to regulators are submitted. What makes it so difficult to regulate activities and entities involved with the applications of blockchain technology in money, payments and capital formation?

There are two core challenges that prevent regulators from designing an appropriate regime for cryptocurrencies and other applications of blockchain technology. Both challenges are rooted in the technology itself.

First, by design cryptocurrencies are incorporeal rights to a digital object with no intrinsic value. A digital object, in turn, can be commonly defined as a sequence of binary bits, the metadata about the properties of the sequence, and, if applicable, methods and

procedures of performing operations on the data. Regulating digital objects with no intrinsic value is not easy, but it has been done. After all, forex contracts for difference could be thought of in roughly similar terms. What adds to the difficulty, however, are all the separate elements, ranging from specific cryptographic primitives to block structure to consensus mechanisms, each of which may fall under different regulatory mandates.

Second, the distributed network of computers on which a ledger of cryptocurrency transactions (chains of digitally signed incorporeal rights) is stored is not only distributed, but also decentralised – i.e. no single computer can make decisions on what is included or not included in the ledger without a consensus reached electronically with the other computers. A decentralised blockchain does not have a central authority, which could be held liable for its use (Sebastián 2017). Nor does it belong to a specific regulatory jurisdiction (Lazcano 2019).

This chapter contributes to the increasingly important discussion on the growing body of laws and regulations pertaining to cryptocurrencies and blockchain technology in the US and Europe (e.g. Bech et al. 2017). Notably, the US and the UK operate under common law, whereas most of the countries in the EU operate under civil law. The main difference between the two systems is that in common law countries, case law – in the form of published judicial opinions – is of primary importance, whereas in civil law systems codified statutes predominate. So, we should expect to find more court cases in the UK and US and fewer in the EU, and more regulations in the EU and fewer in the UK and US. However, all countries utilise a mixture of both common and civil law. Therefore, this chapter documents all relevant court cases and codified laws available to date.

Although the main issues surrounding cryptocurrencies differ from country to country, there are a few common threads. How cryptocurrencies impact anti-money laundering (AML), know-your-customer (KYC) and securities laws is relevant in most countries. However, each country is handling these challenges in different ways. For example, in the US the main discussion is around the Securities Exchange Commission's Howey Test. However, in Germany, there is no equivalent of the Howey Test nor there is a legal term for "investment contract". Rather, Germany is concerned with the digital ownership of security tokens and questions like, "Is signing a transaction with a private key the same as a legally binding physical signature?" or "Is transferring a security token over a blockchain the same as transferring ownership of the security in the physical world?" Outside of securities laws, Germany and the other EU members states are concerned with how the General Data Protection Regulation (GDPR) is challenged by blockchains. The main argument is that GDPR states that people have the right to be forgotten online, but blockchains do not provide this option. However, the US does not have an equivalent of GDPR, and it is therefore not as relevant for US regulators. Currently, the largest issue that is intergovernmental is the Financial Action Task Force's Travel Rule. This relates to the topic of custody, which is important both in the US and in almost all countries in Europe.

2 AN OVERVIEW OF CRYPTOCURRENCIES AND BLOCKCHAIN TECHNOLOGY

After 20 years of failed attempts at making a private digital currency, Bitcoin emerged somewhat inexplicably out of the global financial crisis of 2008. The creator of Bitcoin, who is still unknown, was determined to provide a decentralised, private and secure means of transferring value online without interference by sovereign entities, central banks or financial intermediaries (Lo and Wang 2014). Cryptocurrencies are being employed in several different applications, including virtual money, identity authentication, security issuance, voting and gambling, amongst other things. These applications are dependent on the system's ability to securely record, transfer and store data on distributed ledgers, referred to as blockchains.¹

Each cryptocurrency has unique features which present unique challenges for regulators (Halaburda and Sarvary 2016). One of the chief legal difficulties with regulating cryptocurrencies is that they are incorporeal in nature. The intangible aspect of virtual currencies presents challenges for due process and comity jurisprudence (Raskin 2015). If cryptocurrencies are assumed to be stored on physical servers throughout the world, and if courts are able to pinpoint bitcoins to a specific physical location, then existing rules of civil procedure are applicable. However, the distributed data structure of blockchain technology makes pinpointing the specific location of any specific piece of data impossible (Kelly 2014).

Furthermore, there is no such thing as a 'bitcoin'. Even digitally, bitcoins do not exist as coins with unique attributes and tracking numbers (Bashir et al. 2016). Instead, each bitcoin represents a sequence of signatures made by cryptographic private keys controlled by Bitcoin users (Narayanan et al. 2016). Bitcoin uses a peer-to-peer (P2P) network to record digital payments. Decentralised cryptocurrencies like Bitcoin allow people to create new units of currency through a process called proof-of-work mining. Once coins have been generated, cryptocurrency users can send and receive payments of digital money while hiding their identities behind a pseudonymous account nomenclature (Nakamoto 2009).

The revolutionary nature of the technology is a major reason why it cannot easily fit into any existing legal frameworks. Brito et al. (2014) note that bitcoin transactions are not facilitated within a consumer protection framework, and measures such as AML or KYC policies are not inherent to the system. Once a transaction is sent, there is no way to perform a charge-back. Furthermore, transactions that are sent to the wrong public address via 'fat-finger' errors are not insured. Therefore, in some ways, 'you get what you pay for' and 'buyer beware' have come to fruition. The North American Securities Administrators Association and the Consumer Financial Protection Bureau have both released advisory warnings that using cryptocurrencies can be dangerous.

¹ Blockchain with upper case 'B' refers to the company (e.g. Blockchain Access UK Ltd.), while blockchain in lower case 'b' refers to the distributed ledger technology (DLT) underlying the Bitcoin network.

3 ELECTRONIC MONEY, VIRTUAL CURRENCIES AND SMART CONTRACTS

3.1 Electronic money

The debate regarding Bitcoin's legal status as money or currency remains open. Bitcoin meets the non-physical part of the definition of electronic money, and the non-denominational and non-centralised part of the definition of virtual currency.

In August of 2013, a Texas US District Court Magistrate Judge referred to Bitcoin as a currency during a case between the Securities Exchange Commission and Trendon T. Shavers. Shavers was the creator of Bitcoin Savings and Trust (BTCST).² During the court proceedings of *US v Anthony Murgio* in September 2016, a federal judge ruled that "bitcoins are funds within the plain meaning of that term."³ Due to the unbacked and digital nature of Bitcoin, some research classifies cryptocurrencies as fiat currencies (Berentsen and Schär 2019).

According to the Monetary Authority of Singapore, electronic money can be defined as "electronically stored monetary value in a payment account that can be used to purchase goods or services, or to transfer funds to another individual" (Mancini Griffoli et al. 2018). Al-Lahman et al. (2009) define electronic money as "... a record of the funds or 'value' available to a consumer stored on an electronic device in his or her possession, either on a prepaid card or on a personal computer for use over a computer network such as the Internet". Digital currency or electronic money includes decentralised virtual currencies, such as Bitcoin, and centralised virtual currencies, such as PokéCoin or Magic the Gathering. Additionally, electronic money can refer to centralised digital payment systems, such as PayPal. Electronic money can also include online bank deposits issued to customers by regulated private banks, such as Wells Fargo or Bank of America. In fact, the majority of fiat money issued by governments is only available electronically as opposed to physically (ECB 2012). Electronic money includes monetary units that are represented as sequences of binary bits of '1' and '0' along with metadata about the properties of these sequences. It has become increasingly common for electronic money to serve as a substitute for cash and checks. The possession of electronic money creates a claim against the electronic money issuer (for example, PayPal or frequent flyer miles issued by Oneworld Airline alliance). The electronic money issuer is subject to special duties of technical security in order to ensure that digital accounts are not hacked or changed, and that counterfeit digital units are not circulating within the network.

The possession of decentralised cryptocurrencies is different because these digital units are not accompanied by a claim against the issuer of the cryptocurrency. Decentralised cryptocurrencies lack a centralised issuer in the sense of the electronic money regulation. According to Article 4A of the Uniform Commercial Code, electronic money in the US is

² *SEC v. Trendon T. Shavers and Bitcoins Savings and Trust*, 416 (E.D. Tex. 2013).

³ *U.S. v. Murgio et al.*, 15-cr-00769 (U.S. District Court, Southern District of New York).

governed by the Electronic Fund Transfer Act (EFTA).⁴ Regulation E of this act states the electronic money issuer's responsibilities and the consumer's liability when using electronic money.⁵ In order to improve consumer confidence in electronic money systems, the US government has made it mandatory for public disclosure of basic information pertaining to the system. Issuers of electronic money must disclose information as outlined in the EFTA, applicable state laws and 12 U.S.C. 1831t.⁶

In 2019, the German Parliament passed a new law regarding the custody of cryptoassets and defined cryptoassets within the law as financial instruments according to the German Banking Act. The law states that cryptoassets are digital representations of an asset which are neither issued nor guaranteed by any central bank or public entity and which do not have the statutory status of a currency or money, but which, based on agreements or actual practice, are accepted by natural or legal persons as means of exchange or payment or serve investment purposes and which can be transferred, stored or traded electronically. The law also states that cryptoassets are not electronic money within the meaning of the German Payment Services Supervisory Act (*Zahlungsdiensteaufsichtsgesetz*) (Byungkwon et al. 2020).

On the other hand, several authors argue that Bitcoin is a type of commodity (e.g. Selgin 2013, Bergstra and Weijland 2014), because Bitcoin is not a liability to any issuer and is sufficiently decentralised. To support this notion, the Commodity Futures Trading Commission (CFTC) stated that Bitcoin and virtual currencies are properly defined as commodities.⁷

In May of 2019, the ECB's Cryptoassets Task Force found that cryptoassets do not fulfil the traditional functions of money and do not represent a significant threat to monetary policy and financial stability (Byungkwon et al. 2020).

3.2 Virtual currencies

The ECB defines virtual money as “electronic money issued and usually controlled by its developers, and used and accepted among the members of a specific community” (ECB 2012). The majority of the legal opinions released by governing bodies state that cryptocurrencies are a form of virtual currency; however, this begs the question of what precisely virtual currencies are. One of the earliest discussions on this definition occurred at the federal level during a US Senate meeting. In November 2013, a committee hearing titled “Beyond Silk Road: Potential Risks, Threats and Promises of Virtual Currencies” was held in order to discuss virtual currencies. Senator Tom Carper organised the hearing and during it, Bitcoin was referred to as a virtual currency and was also deemed a “legal means of exchange” (Kennard and Addison 2015). Furthermore, the hearing discussed

4 www.fdic.gov/news/news/financial/2009/fil09066.pdf.

5 See the appendices to Office of the Comptroller of the Currency (2019) at www.occ.gov/topics/bank-operations/bit/intro-to-electronic-money-issues-appendix.pdf.

6 Ibid.

7 www.cftc.gov/PressRoom/PressReleases/pr7231-15.

that “online payment systems, both centralised and decentralised, offer legitimate financial services” (ibid.). US officials Peter Kadzik and Mythili Raman made these positive statements about the technology, reinforcing its legitimacy (ibid.). However, a precise definition of virtual currencies was not established at the hearing.

Also in November 2013, the US Treasury classified Bitcoin as a convertible decentralised virtual currency.⁸ Brito et al. (2014) argue that cryptocurrencies fit neatly into the definition of a virtual currency because they do not have a physical form and neither are they denominated in fiat currencies. Cryptocurrency transactions that are completed on a distributed ledger such as the Bitcoin network or Ethereum network are not denominated in dollars or any other country’s fiat currency. This is in contrast to PayPal, where fiat currencies are converted into digital bits that PayPal recognises as PayPal accounting units denominated in fiat currencies. Lastra and Allen (2018) have a similar understanding of virtual currencies, defining them as monies that are not issued by a central bank or a licensed intermediary, and that are not denominated in fiat monetary units but rather in novel units (e.g. bitcoins) (Lastra and Allen 2018). However, many ‘stablecoin’ cryptocurrencies are denominated in fiat monetary units and are still considered to be virtual currencies.

From our understanding of the various definitions provided, virtual currencies are a type of digital or electronic currency; however, the converse is not correct. Digital currencies encompass the whole gamut of electronic currencies, from centralised to decentralised currencies. Virtual currencies typically refer to centralised currencies issued by a known entity, and this is why cryptocurrencies could be considered decentralised virtual currencies. This is similar to Bech and Garrat’s (2017) definition because decentralisation means that the system is universally accessible. The authors classify virtual currencies and cryptocurrencies as similar but not synonymous to electronic monies because virtual currencies do not necessarily need to be universally accepted or sent peer-to-peer, as is the case with cryptocurrencies. The authors cite PokéCoin as an example of a virtual currency because it is created by the developers of the game Pokémon Go and is used by the game’s players to purchase in-game goods. The currency is neither universally accessible nor sent peer-to-peer.

3.3 Smart contracts

In March of 2017, the Governor of the State of Nevada in the US signed Bill 2417 into law and provided a definition of blockchain technology and smart contracts.⁹ The bill declares that blockchains can be used to record data and that blockchains are “considered to be in an electronic format and to be an electronic record”. The legislation also defined smart contacts and supported their public use. According to Bill 2417:

8 Statement of Jennifer Shasky Calvery, Director of the Financial Crimes Enforcement Network of the United States Department of the Treasury, before the United States Senate Committee on Banking, Housing, and Urban Affairs Subcommittee on National Security and International Trade and Finance Subcommittee on Economic Policy.

9 Arizona House Bill 2417, 29 March 2017 (<https://legiscan.com/AZ/text/HB2417/2017>).

1. “Blockchain technology” is a distributed ledger technology that uses a distributed, decentralised, shared and replicated ledger, which may be public or private, permissioned or permissionless, and driven by tokenised crypto economics or tokenless. The data on the ledger are protected by cryptography, are immutable and auditable, and provide an uncensored truth.
2. A “smart contract” is an event-driven program, with state, that runs on a distributed, decentralised, shared and replicated ledger and can take custody over and instruct transfer of assets on that ledger.

The bill outlined that businesses and governments, including the State of Nevada, can use this technology. The Nevada House of Representatives unanimously supported the bill from legislators, with only one senator voting against the legislation. In addition to Bill 2417, the Arizona legislatures are also working on another blockchain-related piece of legislation, House Bill 2216, which states that blockchains should not be used as registries for gun ownership.¹⁰

4 UTILITY TOKENS, INITIAL COIN OFFERINGS AND SECURITY TOKENS

Although there is debate regarding Bitcoin’s legal status as either a money or commodity, there is no debate around Bitcoin’s status as a non-security. US SEC Chairman Jay Clayton said Bitcoin cannot be considered a security because it is sufficiently decentralised.¹¹ However, this guidance does not apply to all cryptocurrencies. Former Chairman of the Commodities Future Trading Commission, Gary Gensler, who currently serves as Chairman of the US SEC, has previously stated that he believes the cryptocurrencies XRP and Ethereum may be securities according to the Howey Test. Although Ethereum is not under review as an unregistered security, XRP is facing the third court case in the US regarding its status. According to the US SEC Commissioner Hinman, most initial coin offerings (ICOs) are security offerings, and the SEC does not consider the self-made claims of token issuers that a coin is a ‘utility’ or a ‘payment’ token. Instead, they look at how users of the tokens use the technology.

From a legal perspective, initial coin offerings and security token offerings are similar to crowdfunding and private equity offerings; they are all ways to raise capital for small and medium-size enterprises (SMEs). Crowdfunding typically refers to entrepreneurs raising small amounts of capital from a large pool of investors online.¹² The two main types of crowdfunding are donation-based fundraising and equity crowdfunding. Donation-based equity crowdfunding is where investors give or ‘donate’ capital to a startup in exchange for a future good or service or simply to support the idea. Popular sites for donation-based crowdfunding include Kickstarter, which has raised over \$3.7 billion,

¹⁰ Arizona House Bill 2216, 18 April 2017 (<https://legiscan.com/AZ/bill/HB2216/2017>).

¹¹ www.sec.gov/news/public-statement/statement-clayton-2017-12-11

¹² See www.merriam-webster.com/dictionary/crowdfunding.

and Indiegogo, which has raised over \$1 billion. Equity crowdfunding, on the other hand, refers to the crowd-sale of securities such as equity, debt, membership units or convertible units. Equity crowdfunding has raised approximately \$500 million since its inception in the US in 2015 (Marks 2018).

Many countries have relaxed their security offering regulations for crowdfunding campaigns, and some companies in the cryptocurrency space have used security exemption laws to raise capital under less onerous compliance requirements. Registration and prospectus requirements carry heavy compliance costs that hinder a small company's ability to access regulated capital markets. Bagley and Dauchy (2003) estimate compliance costs for initial public offerings (IPOs) to be above \$1 million due to legal, underwriter and SEC filing fees, state securities filing fees, stock exchange or OTC registration fees, accounting fees and an increased D&O insurance premium. In contrast, Darren Westlake has estimated that crowdfunding prospectus approvals cost between £20,000 and £100,000 in the UK (Collins and Pierrakis 2012). Fees on crowdfunding platforms are approximately 5% of the sale proceeds;¹³ this is in addition to a small filing fee of \$1,500 with the SEC.

The 2012 Jobs Act in the US enabled non-accredited investors to invest in equity and bonds that are exempt from normal security regulations.¹⁴ In 2015, Austria reformed the *Alternativfinanzierungsgesetz* (AltFG) to allow a maximum funding of €5 million without a prospectus, and Germany's *Kleinanlegerschutzgesetz* increased the maximum to €2.5 million without a prospectus (Hornuf and Schwienbacher 2017). The various exemptions to security laws were harmonised in the EU under Directive 2010/73/EU.¹⁵ Laws are expected to be relaxed even further in the coming years.

Prior to 2012, accredited investors such as 'angels' and venture capitalists (VCs) dominated the capital market for startups. In the US, accredited investors are individuals with a net worth of over \$1 million (excluding primary residence) or an annual income of \$200,000 for the past two years.¹⁶ Switzerland has a similar concept in the form of 'qualified investors'. According to Art. 10 Para. 3 of the Swiss Federal Collective Investment Schemes Act (CISA), a qualified investor must be an individual with net assets of at least 2 million Swiss francs (excluding real estate).¹⁷ In both countries, regulated financial intermediaries such as banks, securities dealers and fund managers are considered accredited investors, as well as insurance companies, public entities, pension funds and companies with professional treasury departments.

13 Information retrieved from www.kickstarter.com/help/fees.

14 www.govinfo.gov/content/pkg/PLAW-112publ106/pdf/PLAW-112publ106.pdf

15 Directive 2010/73/EU of the European Parliament and of the Council of November 2010, Official Journal of the European Union L 327/12, November 2010 (<https://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:327:0001:0012:EN:PDF>).

16 Title 17: Commodity and Securities Exchanges Part 230. General Rules and Regulations, Securities Act of 1933, Electronic Code of Federal Regulations (www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title17/17cfr230_main_02.tpl).

17 SFBC Circular 03/1 "Public advertising within the context of the Investment Funds Act" (www.swissfunddata.ch/sfdpub/en/group/info).

TABLE 1 OVERVIEW OF ICOS, CROWDFUNDING, STOS AND IPOs

	ICO	Donation crowdfunding	Equity crowdfunding	STO	IPO
Investment requirements	Anyone with Internet and smartphone or computer	Over 18 years old; must have bank account; in the US, unaccredited investors with less than \$100,000 per year can only invest \$2,000 or 5% of their annual income	Over 18 years old; must have bank account; in the US, unaccredited investors with less than \$100,000 per year can only invest \$2,000 or 5% of their annual income	Accredited investor	Accredited investor
Issuance criteria	Anyone with Internet, smartphone or computer	Over 18 years old, permanent resident of an eligible country, bank account, government issued ID, major credit or debit card	Disclosure regulations: Form C submitted to the SEC along with the company's finances; after the sale, Form C-AR must be posted on the company's website within 120 days of the end of next fiscal year	Register, streamlined prospectus approval	Register, prospectus approval, underwriters, stock exchange registration, directors and officer's liability insurance
Advantages	Pseudonymity, no barriers to entry, network effects	Network effect, lower barriers to entry than a security offering	Conveys ownership; low legal costs; \$1,500 to file Form C with the SEC and \$1,500 for an escrow account, a requirement to host a campaign	Conveys ownership	Conveys ownership
Disadvantages	Does not convey ownership often	Does not convey ownership; funding platforms charge around 5% of the equity crowdfunding raise as fees	Funding platforms charge between 7% and 15% of the equity crowdfunding raise as fees	Barriers to entry, legal and regulatory costs, nowhere to trade STOs yet	Barriers to entry, legal and regulatory costs
Example	Bancor, Bitshares	Star Citizen	Geostellar, Napa Valley Distillery	Hydrominer	Facebook
Platform	Ethereum, EOS, TRON	Kickstarter, Indiegogo, TILT	Republic, First Democracy VC	tZERO, Harbor, Swiss Digital Exchange	NASDAQ, NYSE, SIX, DAX

Table 1 provides an overview of the main types of capital-raising vehicles, including ICOs, donation crowdfunding, equity crowdfunding, security token offerings (STOs) and IPOs. Based on the landscape of existing ways to raise capital, we find that the cost and regulatory requirements of raising capital is leaving an entire market of supply and demand unrepresented. Specifically, retail investors are not able to easily invest in the private equity of companies that are too small to go to IPO. The unexpected popularity of ICOs and STOs may be partially due to retail investors gaining access to this asset class for the first time. However, as we have pointed out, retail investors could invest up to certain amounts in the equity of small companies via equity crowdfunding and securities law exemptions. Therefore, opening up this asset class to retail investors cannot fully explain the hype surrounding the ICO bubble. An additional reason that ICOs may have become popular is that they are 'bearer' instruments. One of the main attractions of cryptocurrencies is that they are bearer financial instruments similar to physical cash and gold. The holder of the asset is the owner, and transference of ownership does not need to be registered with any issuer in order to be legally binding. Originally, stocks and bonds were bearer shares in the sense that the issuing firm neither registered the owner of the stock nor tracked transfers of ownership, and any investor could collect dividends by tearing off a perforated coupon from the physical document and mailing it to the issuer. The return to bearer investments may explain part of the 2017 cryptocurrency bubble, and the removal of this bearer feature may explain why STOs have not been as popular.

4.1 Utility tokens

An important distinction regarding ICOs is that they are not synonymous with utility tokens. According to the Merriam-Webster dictionary, 'utility coin' is a noun describing a distinct type of cryptoasset:

"A digital token of cryptocurrency that is issued in order to fund development of the cryptocurrency and that can be later used to purchase a good or service offered by the issuer of the cryptocurrency."

However, this definition conflates two different concepts. The definition of utility coin does not have anything to do with how the capital to build the coin was raised (either by ICO, IPO, self-funding, etc.). Instead, the Swiss regulator FINMA has a better definition of utility tokens:

"Utility tokens are tokens which are intended to provide digital access to an application or service."

For example, the native Ethereum blockchain coin, ether (ETH), is considered a utility token. Utility tokens are supposed to be tender for goods and services; however, a medium of exchange is typically thought of as stable, not volatile. Speculation on the price of a utility token is not beneficial to holders of the utility token if they are actually expecting utility rather than speculating on price fluctuations. If they expect to actually use the token as a medium of exchange to buy a good or service, then volatility actually

decreases the utility of the token. The appreciation in price that utility token investors seek is precisely what makes the utility token unable to achieve the network adoption that could actually lead to a price increase. Instead, the stablecoin model based on the concept of stable purchasing power over time is more aptly suited for tokens that are used to buy goods and services combined with an STO token that gives investors ownership in the company.

4.2 Initial coin offerings

Nicknamed a ‘token generation event’ (TGE) by the Swiss law group, MME, the process of creating tokens and distributing them to users in return for a network’s digital token is called an initial coin offering. According to a September 2017 statement by the Gibraltar Financial Services Commission (GFSC), “ICOs are an unregulated means of raising finance in a venture or project, usually at an early-stage and often one whose products and services have not yet been significantly designed, built or tested, yet alone made operational or generating revenue.”¹⁸ Catalini and Gans (2018) explain that an ICO token transitions into a medium of exchange once the code is programmed and people are using the DLT-based network:

“...through an ICO, a venture offers a stock of specialized crypto tokens for sale with the promise that those tokens will operate as the medium of exchange when accessing services on a digital platform developed by the venture.”

Although, the most comprehensive and appropriate definition up to date could be the one of Adhami et al. (2018):

“Initial Coin Offerings (ICOs) can be defined as open calls for funding promoted by organizations, companies, and entrepreneurs to raise money through cryptocurrencies, in exchange for a token that can be sold on the Internet or used in the future to obtain products or services and, at times, profit.”

ICOs can be seen as an evolution of the crowdfunding model because, similar to donation-based crowdfunding, ICOs should not provide ownership shares in a company or a revenue or profit-sharing agreement, and nor should they be a type of debt investment. A non-security ICO is designed to enable anyone, anywhere (except the US, China, Bangladesh, Nepal, Macedonia, Bolivia, Ecuador, Pakistan, Algeria, and Morocco), to raise capital on a donation basis without lawyers and investment banks (Reese 2018). The original concept of ICOs was to allow entrepreneurs to access financing for ideas without incurring costs for registering their business, opening a bank account or paying underwriter fees. Retail investors were able to invest in ICOs without having a bank account or complying with KYC and AML regulations. Furthermore, the transaction fees for buying tokens can

18 See www.gfsc.gi/news/statement-on-initial-coin-offerings-250.

be less than for buying stocks. For example, investors can currently purchase ERC-20 tokens for a fraction of the cost of buying a stock from a licensed broker dealer because transaction fees on the Ethereum network are low.

ICOs that are not securities represent a public sale of cryptosets that do not resemble investment contracts or securities. This includes utility coins or payment coins. Once the cryptoasset begins to resemble a security, this capital-raising method becomes a security token offering. Many ICO tokens have no direct link to the financial success of the issuing company. ICOs that actually offer investment contracts but do not comply with security regulations, such as having their prospectus approved by financial market authorities or filing for an exemption, are actually illegal security offerings. This can be seen with the SEC fine of EOS of \$24 million for raising \$4 billion in an unregistered security offering during 2018, and the shutdown of Telegram's gram launch that was expected to occur in 2020.

One trend for software development teams that are launching ICOs are 'white papers'. White papers, terms of conditions (ToCs) and 'light papers' are similar to legal disclaimers that state where the company is registered and what laws the company perceives itself to be regulated by. For example, in Liechtenstein and Malta, companies that want to launch an ICO must register their prospectus with the financial market authorities prior to commencing the sale.

ICOs are not synonymous with utility tokens, even though many firms doing ICOs claim their tokens are utility tokens and not securities. One reason they may make this claim is so that they can circumvent security regulations. However, utility tokens may also be considered securities in the US following the criteria of the Howey Test. Subsequently, many regulators have deemed ICOs to be unregistered security offerings because they serve the purpose of an investment contract (Clayton 2018). In addition to potentially being unregistered securities, critics have claimed that between 78% and 95% of all ICOs are doomed to fail or are scams (Dowlat 2018, Patel 2018). To complicate matters further, if ICOs and some cryptocurrencies are unregistered securities, then that means that exchanges offering them are violating securities law because exchanges must be licensed to list and store securities with a broker-dealer license, an alternative trading system license or an exchange license. Firms such as Facebook's Libra Association and Ethereum have engaged in regulatory arbitrage, moving their headquarters out of the US in search of lighter regulation jurisdictions. From a regulatory perspective, the main options in Europe are Malta, Gibraltar, Estonia, Liechtenstein and Switzerland.

4.3 Security token offerings

Over the past two years, the cryptoasset market has gradually moved away from ICOs because of the problems outlined in the previous section. The market is currently moving towards regulated security token offerings (STOs), also referred to as digital security offering (DSOs) by the Swiss law group, FRORIEP. TokenMarket's Jay Pazos defines a security token as:

"...digital representations of company shares, and their holders are collectively the owners of the company."

However, Pazos' definition of an STO may be too narrow. An STO could represent a multitude of different investment contracts, including equity (ETO), debt (DTO), revenue-sharing and voting rights. From traditional finance valuation, an asset can provide two main types of financial return: annual yield in the form of dividends (stocks), interest payments (bonds) or rent (real estate); or capital gains from the asset increasing in value over time. Smart contracts enable many different agreements to be programmed into the token. For example, La Pradera is a Swiss-compliant, asset-backed, revenue-sharing security token that entitles investors to a portion of the annual revenue from an organic cattle farm in Bolivia. However, each token does not offer ownership of the farm. In contrast, the Swiss cryptobank startup, Mt Pelerin, issues tokens that actual offer equity ownership in the company. Other token arrangements include voting rights, as in the case of MakerDao's MKR token. It is very important to consider that an STO could also be a type of cryptobond. The global bond market is approximately double the size of the global equity market, and firms in the US such as Overstock.com have already experimented with issuing bonds using blockchain technology. Issuance of tokens that represent bonds can be referred to as a debt token offering (DTO). Instead, the term that best fits Pazos' definition is equity token offering (ETO).

Similar to ICOs, ETOs are not revolutionary. Rather, they are an evolution of the IPO model applied to startups and growth companies. Cited benefits include fractionalisation of asset ownership, increased liquidity and lower issuance fees. ETOs are meant to be cheaper and faster IPOs. The tokenisation of shares can be thought of as levelling the playing field for small and medium-sized businesses on the capital market. Similar to the benefits of forming a corporation, anyone can be a token holder – they do not need to have knowledge of the business or management. The idea of an ETO would be to lower the cost and time required for a firm to make a public offering of ownership shares so that firms with lower valuations can also access the capital market.

Two benefits of blockchain-based stock exchanges are purported to be instant settlement and transparency, which would potentially reduce the prevalence of naked short selling and rehypothecation. However, there are currently many obstacles that hinder stock trading from transitioning entirely to public permissionless blockchains.

- First, there are currently no licensed exchanges that can legally trade ETOs. In the US, STOs that file for exemption from security regulation with a Regulation S or Regulation D lose their exemption if they are traded on an unregistered alternative trading system, such as an unlicensed crypto exchange. Until shareholders can trade ETO tokens on an exchange, they are effectively the same as illiquid venture capital investments.
- Second, natively issued stocks on a blockchain could allow traders to circumvent KYC/AML regulations.
- Third, many large institutions legally cannot or do not want to be responsible for secure custodianship of cryptocurrencies. If stocks were traded on a public permissionless blockchain, then investors would have to protect the private keys that control the digital cryptoassets that are proxies for the stocks. For example, an investor could lose his investment in Visa stock if their private key were successfully hacked.
- Fourth, it is not clear that the current legal structure enables a digital token to represent ownership of a company. The December 2018 DLT report by the Swiss Federal Council is quite clear that linking a token to a physical good or a claim is possible. In Switzerland, there is a distinction between tokens that represent physical goods (such as a Rolex) and tokens that represent claims (such as debt or a non-physical share certificate). Regarding the question of transferability of claims via tokens, the Swiss Bundesrat is cautious to make a ruling regarding the ability for investors to transfer ownership using a digital token without a physical signature. In Germany, regulators are drafting a new law that will address electronic and dematerialised securities; however, the law will be initially limited to electronic bonds (Schuldverschreibungen) (Byungkwon et al. 2020). Currently, securities cannot be issued on a blockchain under German law, because German law states that securities must be represented by physical certificates. Overall, more clarity is needed on the legal status of transferring ownership rights of assets using a DLT coin or token, such as real estate-backed tokens actually representing ownership of tangible real estate. Additional clarity is needed on whether signing a DLT transaction with a private key is recognised as a legally binding signature similar to a notarised physical signature.

5 REGULATION AND ENFORCEMENT ON CRYPTOCURRENCIES AND DISTRIBUTED LEDGER TECHNOLOGY

There are two levels of regulation in the US – state and federal. The federal level includes the Department of Justice, the Inland Revenue Service (IRS), the Financial Crimes Enforcement Network (FinCEN), the Financial Industry Regulatory Authority (FINRA), the Commodity Futures Trading Commission (CFTC) and the SEC, amongst others. At

the state level, 'blue sky' laws and unique money transmission laws weave an incongruent quilt of regulations. In Europe, laws and enforcement actions vary across the European Union, the European Economic Area, the UK and the EU member states. The main topics that are relevant across the US and Europe include AML/KYC, securities violations and custody.

5.1 Anti-money laundering and know-your-customer

5.1.1 Intergovernmental

The farthest-reaching set of regulations pertaining to anti-money laundering and know your customer is the Financial Action Task Force (FATF) Travel Rule. The FATF released guidance in 2020 that, like traditional financial institutions, crypto exchanges and virtual asset service providers (VASPs) must comply with the Travel Rule. The rule states that originators of virtual asset transfers must submit the following information to beneficiaries:

1. Originator name
2. Account number (where this is being used to process the transaction)
3. Physical address
4. National identity number, customer identification number or other unique identity number
5. Date of birth and place of birth
6. Beneficiaries of the cryptoasset transaction must submit the following information to originators:
 7. Beneficiary name
 8. Account number or virtual wallet number (where this is necessary to process the transaction)

This guidance has received critical responses pertaining to how decentralised and deregulated exchanges will address this, and that not all countries have put their own regulations in place.

5.1.2 US federal level

At the federal level in the US, the FinCEN, the Department of Justice (DoJ), the Department of Homeland Security (DHS) and the Office of the Comptroller of Currency (OCC) have been very active in regulating cryptoassets that they refer to as virtual currencies in regard to KYC and AML policies.

FinCEN has released several administrative rulings on virtual currency cases online.¹⁹ In general, any firm that transfers funds from one person to another typically requires a money transmitter license.²⁰ Since cryptocurrency networks enable users to transfer funds from one person to another, companies that facilitate these transactions require a money transmitter license. Money service business (MSB) regulation requires each cryptocurrency firm to have a compliance officer, to do AML procedures and to perform an independent Bank Secrecy Act (BSA)/AML audit. Several of the earliest legal cases pertaining to cryptoassets in the US involved companies or persons that failed to acquire a money transmitter license prior to facilitating cryptocurrency transactions.

On March 18 of 2013, FinCEN announced that the Bank Secrecy Act applies to consumers and businesses engaged in the cryptocurrency ecosystem.²¹ This opinion means that exchangers and administrators of cryptocurrencies are expected to register with FinCEN as an MSB and that any firm working with cryptocurrencies are expected to comply with AML and KYC regulations. Exchanges such as Coinbase and Gemini that receive large sums of money from users in suspicious patterns are expected to file suspicious activity reports (SARs) on customer transactions that are over \$2,000. These exchanges can also freeze accounts during investigations. In accordance with FinCEN regulations on MSBs, cryptocurrency exchanges must allow the federal government access to business records in a transparent manner. Also, the cryptocurrency firm is responsible for reporting to FinCEN on a regular basis, and FinCEN can perform random audits on the firm. This guidance provided by FinCEN specifically stated that consumers of cryptocurrencies are not considered to be MSBs, and therefore the regulations do not specifically apply to individuals. In January of 2014, FinCEN issued guidance for miners and further clarification of the 2013 virtual currency guidance. According to FinCEN, miners or individuals that perform transaction validation in a decentralised proof-of-work consensus network are not required to register as an MSB in most cases.²² Furthermore, companies that develop software that enable users to trade cryptocurrencies are also not subject to registering as a MSB with FinCEN.²³

Two years later, on 5 May 2015, FinCEN and the US Attorney's Office (USAO) for the Northern District of California initiated the first civil monetary penalty action against a cryptocurrency and a cryptocurrency exchange. Ripple Labs, Inc. and its subsidiary,

19 "Application of FinCEN's Regulations to Virtual Currency Mining Operations", 30 January 2014 (www.fincen.gov/resources/statutes-regulations/administrative-rulings/application-fincens-regulations-virtual-0); "Application of FinCEN's Regulations to Virtual Currency Software Development and Certain Investment Activity", 30 January 2014 (www.fincen.gov/resources/statutes-regulations/administrative-rulings/application-fincens-regulations-virtual).

20 Hearing on the Regulation of Non-bank Money Transmitter—Money Services Businesses: Hearing Before the Subcommittee on Financial Institutions and Consumer Credit of the House Committee on Financial Services, 112th Congress (2012) (testimony of Ezra C. Levine) (<http://financialservices.house.gov/uploadedfiles/hhrg-112-bat15-wstate-elevine-20120621.pdf>).

21 "Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies", 18 March 2013 (www.fincen.gov/resources/statutes-regulations/guidance/application-fincens-regulations-personsadministering).

22 "Application of FinCEN's Regulations to Virtual Currency Mining Operations", 30 January 2014 (www.fincen.gov/sites/default/files/administrative_ruling/FIN-2014-R001.pdf).

23 "Application of FinCEN's Regulations to Virtual Currency Software Development and Certain Investment Activity", 30 January 2014 (www.fincen.gov/sites/default/files/administrative_ruling/FIN-2014-R002.pdf).

XRP II, LLC, were charged with failing to comply with the BSA. Ripple Labs received a fine of \$700,000 for failing to register with FinCEN as an MSB. FinCEN also accused Ripple of failing to implement and maintain proper AML and KYC protocols. Founded in 2012, Ripple and its cryptocurrency, XRP, gained a lot of interest with major banks all across the globe. Ripple is an example of a cryptocurrency that relies on a closed blockchain where transactions can only be validated by the company Ripple rather than by a decentralised network of peers. Similar to other cryptocurrencies, Ripple allows its users to send cross-border payments without delays and high fees.

According to FinCEN, Ripple's lack of adherence to FinCEN regulation enabled money launders and terrorists to use the cryptocurrency to finance criminal activity.²⁴ In addition to the \$700,000, Ripple Labs made a settlement agreement with the USAO for \$450,000 to account for criminal or civil activity that occurred because of Ripple's actions. Also, Ripple agreed to fully comply with US government agencies during the investigation.

During the investigation, Ripple was found guilty of operating without an MSB license. In the Statement of Facts and Violations, Ripple admitted to failing to adhere to AML regulations on several occasions.²⁵ One incident occurred in September of 2013, when Ripple's subsidiary, XRP II, sold \$250,000 worth of cryptocurrency to a customer without requiring the customer to provide identification. A second offence occurred in November of 2013, when XRP II failed to file suspicious activity report after rejecting a customer's transaction because the legitimacy of the source of funds was put into question during the transaction. Although XRP II was registered with FinCEN, the subsidiary failed to report suspicious activities to the government. However, Ripple's reputation has recovered since the investigation. As of May of 2020, Ripple is the fourth largest cryptocurrency with a market capitalisation of approximately \$9 billion.²⁶

In 2016, FinCEN released further guidance on how cryptocurrencies can be used to facilitate terrorism and cyber-enabled crimes. In May of 2016, the Director of FinCEN, Jennifer Shasky Calvery, stated that FinCEN's regulation of virtual currency is trying to balance the interests of preventing terrorism while supporting innovation in financial technology.²⁷ In October of 2016, FinCEN stated that in order to prevent virtual currencies from becoming a conduit for crime, businesses and government agencies must share information about suspicious activity involving this new payment system.²⁸

24 "FinCEN Fines Ripple Labs Inc. in First Civil Enforcement Action Against a Virtual Currency Exchanger", 5 May 2015 (www.fincen.gov/sites/default/files/2016-08/20150505.pdf).

25 "FinCEN Fines Ripple Labs Inc. in First Civil Enforcement Action Against a Virtual Currency Exchanger. Attachment A: Statement of Facts and Violations" (www.fincen.gov/sites/default/files/shared/Ripple_Facts.pdf).

26 Source: <https://coinmarketcap.com/currencies/>.

27 Testimony of Jennifer Shasky Calvery, Director Financial Crimes Enforcement Network, United States Department of the Treasury, "Stopping Terror Finance: A Coordinated Government Effort", FinCEN, 24 May 2016 (www.fincen.gov/news/testimony/testimonyjennifer-shasky-calvery-director-financial-crimes-enforcement-network).

28 "Advisory to Financial Institutions on Cyber-Events and Cyber-Enabled Crime", FinCEN, 25 October 2016 (www.fincen.gov/resources/advisories/fincen-advisory-fin-2016-a005).

Regulators are concerned about the ability to use cryptoassets for money laundering, financing terrorism and buying illegal goods and services such as drugs because there have already been cases where non-law-abiding people have used cryptocurrencies to facilitate their activities. The largest and most famous Bitcoin-related court case arose from the Department of Justice's prosecution of Ross Ulbricht, an operator of the online drug trafficking website, Silk Road. The DOJ seized 600,000 bitcoins from Silk Road's wallet and subsequently auctioned them off. Ross Ulbricht was sentenced to three life sentences in jail.²⁹ Prior to shutting down Silk Road, which had been operated by Ross Ulbricht for a period of time, the DOJ also shut down the virtual currency Liberty Reserve in 2013. The creator of Liberty Reserve was sentenced to 20 years in jail and fined \$500,000 for money laundering.³⁰ In an affidavit by the DOJ in March of 2015, an undercover agent of the Homeland Security Investigations team averred:

*"I [Matthew Larsen] am part of a digital currency task force focused on identifying the use of digital currency to launder the proceeds of criminal activity. As part of this task force, I have been involved in several investigations into unlicensed digital currency exchangers and narcotics distributors on the dark web who use digital currency to receive payment for the sale of narcotics. These investigations have brought my attention to numerous individuals who have been cycling through large amounts of Bitcoin."*³¹

The DOJ has since indicted several narcotics traffickers, including David Ryan Burchard, who primarily used bitcoin to facilitate transactions.³²

In addition to federal authorities, state authorities in the US have also been active in fighting money laundering with cryptoassets. In 2016, the United States Attorney for the Southern District of New York convicted Anthony R. Murgio for conspiring to obstructing an examination of a credit union by the National Credit Union Administration (NCUA). He was also convicted along, with two other individuals, in a case involving a multimillion-dollar money laundering business called Coin.mx. According to US Attorney Preet Bharara,

"Anthony Murgio took a new age approach to an age-old crime of fraud. As he admitted in his guilty plea today, Murgio used Coin.mx, an Internet-based Bitcoin exchange, to process over \$10 million in Bitcoin transactions in violation of federal anti-money laundering laws, and then obstructed a regulatory examination to hide his scheme."

29 "At an Auction of Bitcoins Seized From Silk Road, One Exchange Wins Big", *New York Times*, 10 December 2014.

30 "Liberty Reserve Founder Sentenced to 20 Years for Laundering Hundreds of Millions of Dollars", Department of Justice, 6 May 2016 (www.justice.gov/opa/pr/liberty-reserve-founder-sentenced-20-years-laundering-hundreds-millions-dollars).

31 *United States of America v. David Ryan Burchard*, March 2015 (www.justice.gov/usao-edca/file/836576/download).

32 *ibid.*

During the court proceedings overseen by US District Judge Alison J. Nathan, Murgio plead guilty to processing over \$10 million in illegal Bitcoin transactions. He also plead guilty to attempted bribery. First, the accused did not follow federal AML and KYC regulations. Second, Coin.mx failed to acquire the state- or federal-level licensing required of MSBs by the US Treasury department. The founders of Coin.mx used a fake company referred to as the ‘Collectables Club’, which gave the business the appearance of a members-only club that bought and sold collectible memorabilia. Then, Murgio and his partners miscoded customers’ credit and debit transactions, in violation of banking and credit card regulations. In 2014, Murgio acquired a federal credit union called HOPE FCU in New Jersey. Murgio admitted to paying over \$150,000 in bribes in order to acquire the credit union. Then, Murgio rerouted all customer transactions through HOPE FCU in order to reduce scrutiny from customers’ banks. In October 2015, the NCUA forced HOPE FCU into bankruptcy.³³

5.1.3 US state level

A topic related to AML and KYC policies is custody. Custodians of assets – whether banks or cryptoasset exchanges – are able to collect data on users as entry and exit points, thereby being conduits for enforcement of AML and KYC regulation. In the US, several state authorities have been active in discussions pertaining to custody. At the state level, New York, California, Washington State, Florida, Hawaii and Wyoming have made or proposed laws.

In 2015, New York released the BitLicense, which is required by any virtual currency company serving New York residents or business owners that commute into New York.³⁴ The New York State Department of Financial Services (NYDFS) established the BitLicense in order to provide “guardrails that protect consumers and root out illicit activity – without stifling beneficial innovation.”³⁵ According to the legislation, anyone involved in any of the following activities in the State of New York is required to obtain a BitLicense:³⁶

1. Virtual currency transmission
2. Storing, holding, or maintaining custody or control of virtual currency on behalf of others
3. Buying and selling virtual currency as a customer business

33 “Operator of Unlawful Bitcoin Exchange Pleads Guilty in Multimillion-Dollar Money Laundering and Fraud Scheme”, US Attorney’s Office, Southern District of New York, 9 January 2017 (www.justice.gov/usao-sdny/pr/operatorunlawful-bitcoin-exchange-pleads-guilty-multimillion-dollar-money-laundering).

34 “New York Resident means any Person that resides, is located, has a place of business, or is conducting business in New York,” New York Codes, Rules and Regulations, Title 23, Chapter I – Regulations of the Superintendent of Financial Services, Part 200 – Virtual Currencies, NYDFS, June 2015.

35 Benjamin Lawsky, “Remarks by the New York State Department of Financial Services”, BITS Emerging Payments Forum, 3 June 2015.

36 New York Codes, Rules and Regulations, Title 23, Chapter I – Regulations of the Superintendent of Financial Services, Part 200 – Virtual Currencies.

4. Performing exchange services as a customer business
5. Controlling, administering, or issuing a virtual currency.

Out of 22 applications over the past two years, only three firms are legally authorised to engage in virtual currency business activities pursuant to New York's BitLicense: Coinbase, Ripple and Circle.³⁷ Coinbase is a virtual currency exchange headquartered in San Francisco, California. The company allows users to buy and sell virtual currencies against fiat currencies including euros and US dollars. Coinbase has served over five million unique customers across the world³⁸ and is licensed to engage in money transmission in 38 jurisdictions in the US, including New York.³⁹ Although the Winklevoss' cryptocurrency exchange, Gemini, has not received a BitLicense, the NYDFS has granted the firm a banking charter.⁴⁰ The only other virtual currency exchange to receive a banking charter from the NYDFS is the itBit Trust Company.⁴¹

In California, Assemblyman Roger Dickinson, sponsored a proposed legislation bill that would legalise all cryptocurrencies. Assembly Bill 129 was sent forth in June of 2014,⁴² but it was not met with an enthusiastic response. Instead, the California Legislature is working on a new set of rules specifically designed for virtual currencies and inspired by New York's BitLicense. The Virtual Currency Act was a bill proposed to the California Legislature on 17 February 2017.⁴³ The predecessor to this proposal, the Assembly Bill (A.B.) 1123, was released by the Legislature in August of 2016. This bill, submitted by Democrat Matthew DeBabneh,⁴⁴ was designed to set forth a licensing scheme for virtual currency companies in California. Similar to the New York BitLicense, already established banks would not be required to apply for the California Virtual Currency License if they wish to engage in cryptocurrency business activities. However, the licence would be required for any new businesses that do not have a bank charter. As stated in A.B. 1123:⁴⁵

"The bill would prohibit a person from engaging in any virtual currency business, as defined, in this state unless the person is licensed by the Commissioner of Business Oversight or is exempt from the licensure requirement, as provided. The bill would require applicants for licensure, including an applicant for licensure and approval to acquire control of a licensee, to pay the commissioner a specified non-refundable

37 "NYDFS Grants Charter to "Gemini" Bitcoin Exchange Founded by Cameron and Tyler Winklevoss", NYDFS press release, 5 October 2015 (www.dfs.ny.gov/reports_and_publications/press_releases/pr1510051).

38 Mike Lempres and Juan Suarez, "Coinbase Second Comment Letter, Regulation of Virtual Currency Businesses Act", Uniform Law Commission Drafting Committee on Regulation of Virtual Currency Businesses, 4 May 2017 (www.uniformlaws.org/shared/docs/regulation%20of%20virtual%20currencies/2017may2_RVCBA_Coinbase_Comments.pdf).

39 <https://support.coinbase.com/customer/portal/articles/1826671-what-countries-us-states-are-supported-for-coinbase-exchange->.

40 "NYDFS Grants Charter to "Gemini" Bitcoin Exchange Founded by Cameron and Tyler Winklevoss", NYDFS press release, 5 October 2015 (www.dfs.ny.gov/reports_and_publications/press_releases/pr1510051).

41 "NYDFS Grants First Charter to a New York Virtual Currency Company", NYDFS press release, 7 May 2015 (www.dfs.ny.gov/about/press/pr1505071.htm).

42 Bill Text - AB-129 Lawful money, California Legislative Information (<https://leginfo.ca.gov>).

43 Assembly Bill No. 1123. California Legislature - 2017 - 2018 Regular Session (Bill Text), California Legislative Information, 17 February 2017 (https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB1123).

44 *ibid.*

45 *ibid.*

application fee and complete an application form required to include, among other things, information about the applicant, prior virtual currency services provided by the applicant, a sample form of receipt for transactions involving the business of virtual currency, and specified financial statements. The bill would make these licenses subject to annual renewal and would require a renewal fee paid to the commissioner in a specified amount. The bill would require licensees to annually pay the commissioner a specified amount for each licensee branch office. The bill would require applicants and licensees to pay the commissioner a specified hourly amount for the commissioner's examination costs, as provided. The bill would also require the commissioner to levy an assessment each fiscal year, on a pro rata basis, on licensees in an amount sufficient to meet the commissioner's expenses in administering these provisions and to provide a reasonable reserve for contingencies..."

Regulation of this nature enacted in California would impact the cryptocurrency economy because several of the largest cryptocurrency companies are headquartered in the state, including Coinbase, Kraken, Blockstream and Pantera Capital.

In December of 2014, the Department of Financial Institutions (DFI) in Washington State outlined an "Emerging Payments Task Force" during the Annual Conference of State Bank Supervisors (CSBS). By September of 2015, the CSBS released a model regulatory framework for virtual currencies.⁴⁶ The guideline states that:

"After engagement with industry participants, state and federal regulators, and other stakeholders, CSBS concluded that activities involving third party control of virtual currency, including for the purposes of transmitting, exchanging, holding, or otherwise controlling virtual currency, should be subject to state licensure and supervision."⁴⁷

According to the government of Washington State, virtual currency, "also known as digital currency or crypto-currency, is a medium of exchange not authorized or adopted by a government."⁴⁸ Despite not being an official medium of exchange in Washington State, virtual currencies such as Bitcoin were added to the definition of "money transmission" in December of 2014. All currencies and virtual currencies in the state of Washington are subject to the Uniform Money Services Act (UMSA), Chapter 19.230 RCW.⁴⁹ Similar to California and New York laws, governments, banks and credit unions are not subject to the act.

In May 2017, Florida House Bill 1379 was passed, which defined virtual currency as a "means a medium of exchange in electronic or digital format that is not a coin or currency of the United States or any other country". Furthermore, the act prohibits its use in

⁴⁶ www.csbs.org/regulatory/ep/Pages/framework.aspx.

⁴⁷ *ibid.*

⁴⁸ www.dfi.wa.gov/documents/moneytransmitters/virtual-currency-regulation.pdf.

⁴⁹ Uniform Money Services Act, Chapter 19.230 RCW, December 2014 (<http://app.leg.wa.gov/rcw/default.aspx?Cite=19.230>).

laundering criminal proceeds.⁵⁰ The bill adds the term “virtual currency” to the definition of “monetary instruments” under Florida’s Money Laundering Act. The State Governor is currently deciding on the legislation. In the state of Florida, criminals that use Bitcoin will now be charged with money laundering in addition to the underlying criminal activity. According to Democratic House Representative Jose Felix Diaz, “cyber criminals have taken advantage of our antiquated laws for too long”.⁵¹ Diaz, the sponsor of the bill, also stated that “Bitcoin bypasses the traditional banking system, and our state’s laws simply had not caught up to the upsurge in criminality in the world of cybercurrency”.⁵²

Florida has a long-running history of rulings regarding Bitcoin and cryptocurrencies. The case of *State of Florida v. Michell Espinoza* lasted three years. After being arrested for selling bitcoins to an undercover agent in Miami in 2013, Espinoza was accused of money laundering \$31,000 worth of bitcoin. A similar case was made by the Miami Police Department against another bitcoin seller a few days after the original arrest of Espinoza. In an undercover sting operation, police officers contacted Pascal Reid, a seller who advertised on the peer-to-peer bitcoin exchange LocalBitcoins.com. Localbitcoins.com is a Finland-based exchange that is regulated and fully cooperates with law enforcement agencies. Espinoza and Reid pleaded guilty to “acting as an unlicensed money broker.” However, at the hearing in May of 2016, Miami-Dade Circuit Judge Teresa Mary Pooler dismissed all charges against Espinoza. In the proceedings, the judge stated that “[t]his court is unwilling to punish a man for selling his property to another, when his actions fall under a statute that is so vaguely written that even legal professionals have difficulty finding a singular meaning”.⁵³ Reid agreed to a plea deal of probation and no jail time. Part of the deal involved teaching the Miami Police Department about Bitcoin and cryptocurrencies.

Hawaii’s Division of Financial Institutions (DFI) stated in September of 2016 that digital currency exchanges and custodians, or wallet providers, must hold cash reserves that equal the value of the cryptocurrency in US dollars that the business holds for clients (Suarez 2017). Coinbase, the largest cryptocurrency exchange in the world, is complying with the DFI’s policy by withdrawing services to Hawaiian customers. In a press release, Coinbase stated:

*“This policy is obviously untenable. No digital currency business – and frankly, no commercially viable business anywhere – has the capital to supplement every customer bitcoin with redundant dollar collateral.”*⁵⁴

50 Florida House of Representatives Bill 1379, 2017 (www.flsenate.gov/Session/Bill/2017/1379/BillText/er/PDF).

51 “Florida criminals who use bitcoins could now face money-laundering charges”, Miami Herald, 6 May 2017 (www.miamiherald.com/news/local/crime/article149028844.html).

52 *ibid.*

53 *State of Florida v Michell Espinoza*, Miami Herald, 16 Jun 2016 (www.miamiherald.com/news/local/crime/article91785802.ece/BINARY/Read\%20the\%20ruling\%20\%28.PDF\%29\#storylink=related_inline).

54 *ibid.*

Coinbase claims that the DFI's regulation is impossible to comply with, although it stated that it is happy to serve Hawaiian customers again if a revision of the policy is made. This unexpected news came after a particularly friendly cryptocurrency bill was proposed in Hawaii in January of 2017. House Bill 1481 was filed in order to develop a digital currency working group.⁵⁵ The goal of the group would be to explore the uses of blockchain technology by governments and businesses. According to the proponents of the bill, Democratic Reps Chris Lee and Mark Nakashima, the technology may help bolster Hawaii's tourism and technology adoption:

"The legislative finds that leading industries and governments are quickly adopting innovative technology to defend against cyberattacks and revolutionize products and services for the twenty-first century."

"Digital currencies such as bitcoin have broad benefits for Hawaii. A large portion of Hawaii's tourism market comes from Asia where the use of bitcoin as a virtual currency is expanding. Hawaii has the unique opportunity to explore the use of blockchain technology to make it easier for visitors to consume local goods and services and to drive the tourism economy."⁵⁶

In 2017, the Office of the Comptroller of Currency (OCC) announced plans to issue a special charter for financial technology (FinTech) companies that offer services similar to traditional banks.⁵⁷ In March of 2017, the OCC announced that FinTech companies can apply to be special national bank charters (SPNBs).⁵⁸ This will help ensure that cryptocurrency firms are subject to government oversight and work under the consumer protection framework. A federal-level licence system should help financial technology firms to operate in the different states without having to apply for permission to operate in each state. However, federal regulation that enables banks across the US to be custodians without applying for a license in each state has yet not arrived. Wyoming has created its own banking licence for firms wishing to offer bank-like services to cryptocurrency businesses and users. The Wyoming Division of Banking is already in the process of approving the first two applications for Wyoming's new type of bank, called Special Purpose Depository Institutions (SPDI) or 'speedy banks'.

A corollary of AML, KYC and custody is the ability to give donations in cryptoassets. In 2013, the Federal Election Commission (FEC) deadlocked on the legality of politicians accepting bitcoin contributions to support campaigns financially.⁵⁹ Several politicians

⁵⁵ Hawaii House Bill 1481, 24 March 2017 (<https://legiscan.com/HI/bill/HB1481/2017>).

⁵⁶ Ibid.

⁵⁷ "OCC Summary of Comments and Explanatory Statement: Special Purpose National Bank Charters for Financial Technology Companies", Office of the Comptroller of the Currency, Washington DC, 17 March 2017 (www.occ.gov/topics/responsibleinnovation/summary-explanatory-statement-fintech-charters.pdf).

⁵⁸ Comptroller's Licensing Manual Draft Supplement. Evaluating Charter Applications from Financial Technology Companies, Office of the Comptroller of the Currency, Washington DC, 17 March 2017 (www.occ.treas.gov/publications/publications-bytype/licensing-manuals/file-pub-lm-fintech-licensing-manual-supplement.pdf).

⁵⁹ "Federal Election Commission approves bitcoin donations to political committees", *The Washington Post*, 8 May 2014 (www.washingtonpost.com/news/post-politics/wp/2014/05/08/federal-election-commission-approves-bitcoin-donations-to-political-committees/?utm_term=.40337af53191).

do accept bitcoin donations, including New Hampshire House member Mark Warden,⁶⁰ Southern California politician Michael B. Glenn⁶¹ and Kentucky senator and former presidential candidate, Rand Paul.⁶² Due to the popularity of Bitcoin campaign donations, the FEC issued guidance pertaining to such donations in May 2014. In the draft guidance, the exact definition of Bitcoin or virtual currencies was neglected. Instead, the document states that Bitcoin fits into its “anything of value” definition.⁶³

5.1.4 Europe

In 2019, France enacted the Plan d’Action pour la Croissance et la Transformation des Entreprises, commonly referred to as the ‘Pacte Law’. The law states that French companies that provide services of digital asset custody and/or buying or selling digital assets for legal tender in France must have a license (Byungkwon et al. 2020). Existing companies that offer these services have one year to file an application with the Autorité des Marchés Financiers (AMF). The AMF only awards licenses to firms that comply with AML regulations, and a list of all firms that have this license is provided on the AMF’s website to help consumers distinguish between regulated and unregulated custodians and exchanges.

In 2019, the German Parliament passed a new law regarding the custody of cryptoassets. This law was designed to implement the EU’s 5th AML Directive and the Financial Action Task Force’s virtual asset travel rule discussed in the beginning of this section. The law states that crypto custody providers require licenses in accordance with the German Banking Act (Gesetz über das Kreditwesen).

5.2 Securities laws and violations

In addition to anti-money laundering and custody regulation, the largest area of regulation pertaining to cryptoassets is securities laws.

5.2.1 US federal level

In the US, the SEC began investigating cryptocurrencies and blockchain technology as early as January 2014.⁶⁴ First, the agency investigated two gambling sites: SatoshiDice and FeedZeBirds.⁶⁵ The SEC suspected that bitcoin-denominated securities were being offered on these sites. Specifically, the SEC stated that unregistered stock exchanges were illegal even if they were only issuing bitcoin-denominated securities. After investigating the two companies, the SEC charged the former owner of SatoshiDice and FeedZeBirds

60 www.markwarden.com/page/contributecampaign.

61 “Bitcoin donations welcome, Newport Beach City Council candidate says”, Los Angeles Times, 20 December 2013 (www.latimes.com/local/lanow/la-me-ln-bitcoin-accepted-newport-city-council-race-20131220story.html).

62 “In Accepting Bitcoin, Rand Paul Raises Money and Questions”, The New York Times, 9 April 2015 (www.nytimes.com/2015/04/10/us/politics/in-accepting-bitcoin-rand-paul-raises-money-and-questions.html?_r=0).

63 “What the FEC’s Bitcoin ruling means”, Center for Public Integrity, 8 May 2014 (<https://publicintegrity.org/politics/what-the-fecs-bitcoin-ruling-means/>).

64 “Gambling Website’s Bitcoin-Denominated Stock Draws SEC Inquiry”, Bloomberg, 20 March 2014 (www.bloomberg.com/news/articles/2014-03-19/gambling-website-s-bitcoin-denominated-stock-draws-sec-inquiry).

65 *ibid.*

with selling unregistered securities. In an interesting twist, a few months later, in October of 2014, former SEC Chair Arthur Levitt joined BitPay. BitPay is the largest bitcoin payment processor and works with over 125,000 merchants worldwide.⁶⁶ Also that year, the SEC released an advisory warning that “both fraudsters and promoters of high-risk investment schemes may target bitcoin users.”⁶⁷ On 10 March 2017, the SEC prevented the Bats BZX Exchange from listing trust shares of the Winklevoss Bitcoin Trust.⁶⁸ According to the decision,

“The Commission believes that, in order to meet this standard, an exchange that lists and trades shares of commodity-trust exchange-traded products (“ETPs”) must, in addition to other applicable requirements, satisfy two requirements that are dispositive in this matter. First, the exchange must have surveillance-sharing agreements with significant markets for trading the underlying commodity or derivatives on that commodity. And second, those markets must be regulated. Based on the record before it, the Commission believes that the significant markets for bitcoin are unregulated. Therefore, as the Exchange has not entered into, and would currently be unable to enter into, the type of surveillance-sharing agreement that has been in place with respect to all previously approved commodity-trust ETPs—agreements that help address concerns about the potential for fraudulent or manipulative acts and practices in this market—the Commission does not find the proposed rule change to be consistent with the Exchange Act.”⁶⁹

Later that month, the SEC rejected a second application to list a financial Bitcoin product regarding the SolidX Bitcoin Trust and the Intercontinental Exchange’s applications. On 29 March 2017, the SEC found that Bitcoin markets are unregulated, which does not allow for investment vehicles with underlying bitcoin assets to be listed on the CBOE or any other exchange.⁷⁰ No ETFs have been approved to date.

In 2017, the SEC issued a report stating that the tokens offered by the original decentralised autonomous organisation (DAO) developed on Ethereum by the Germany company Slock.it are securities, “regardless of whether those securities are purchased with virtual currencies or distributed with blockchain technology”. The DAO used blockchain to offer and sell tokens to raise capital. In 2017, the SEC shut down the offering of Munchee, Inc. and ordered it to return resources to investors. Munchee was a smartphone app that allowed people to leave reviews of restaurants. The SEC issued the company with a cease-and-desist order. In 2018, the SEC issued a “Statement on Potentially Unlawful Online Platforms for Trading Digital Assets” that investors should be careful when

66 “Ex-SEC Chairman Levitt to Advise Two Bitcoin Companies”, The Wall Street Journal, 28 October 2014 (www.wsj.com/articles/ex-sec-chairman-levitt-to-advise-two-bitcoin-companies-1414468861).

67 “Investor Alert: Bitcoin and Other Virtual Currency-Related Investments”, US Securities and Exchange Commission, 7 May 2014 (https://www.sec.gov/oiea/investor-alerts-bulletins/investoralertsia_bitcoin.html).

68 Release No. 34-80206; File No. SR-BatsBZX-2016-30, Securities Exchange Commission, 10 March 2017 (www.sec.gov/rules/sro/batsbx/2017/34-80206.pdf).

69 *ibid.*

70 Release No. 34-80319; File No. SR-NYSEArca-2016-101, Securities and Exchange Commission, 28 March 2017 (www.sec.gov/rules/sro/nysearca/2017/34-80319.pdf).

trading cryptoassets. Also in 2018, SEC Chairman Jay Clayton stated that many ICOs were unregistered securities during an interview with CNBC, and the SEC fined Zachary Coburn, the founder of Ether Delta, \$400,000 for operating an unregistered national securities exchange. Ether Delta was allowed to stay in operation, but was forced to register and file periodic reports with the SEC. In 2019, the SEC issued its first 'no-action' letter to TurnKey Jet, Inc. stating that the SEC does not consider the company's token offering to be a security. TurnKey Jet is a business that allows people to book flights on private jets with tokens. In 2019, the SEC also fined the company that developed EOS, Block.one, \$24 million for selling unregistered securities and raising \$4 billion from retail investors in the US. In 2020, the SEC completely shut down the distribution of Telegram's gram tokens and demanded money be sent back to investors due to the company failing to register its ICO with the SEC and selling unregistered securities to retail investors. The SEC's approach to Telegram was similar to its approach to Munchee, Inc. in that it shut down both projects and demanded funds to be returned to investors.

5.2.2 Europe

In Europe, the main countries that issued guidance and regulations pertaining to the securitisation of cryptoassets are Liechtenstein, Malta, Gibraltar, Estonia, Germany and the UK.

The German Federal Financial Supervisory Authority (*Bundesanstalt für Finanzdienstleistungsaufsicht*, or BaFin) issued a second advisory letter on prospectus and authorisation requirements regarding cryptoassets in 2019 (Byungkwon et al. 2020). Prior to launching an ICO, BaFin requires documentation on the sale. Upon reception of the documentation, BaFin determines if the sale meets the definition of a security under the prospectus regulations according to the German Banking Act (*Kreditwesengesetz*, or KWG), the Payment Services Supervision Act (*Zahlungsdienstleistungsaufsichtsgesetz*, or ZAG) or the Investment Code (*Kapitalanlagegesetzbuch*, or KAGB).

Malta's Virtual Financial Assets Bill came into effect on 1 November 2018.⁷¹ The Virtual Financial Assets Act (VFSA) defines an ICO as "a method of raising funds whereby an issuer is issuing virtual financial assets and is offering them in exchange for funds."⁷² The VFSA also documents what an ICO white paper must contain in order for it to be filed with the Malta Financial Services Authority.⁷³

In order to determine whether a specific company is regulated by the VFSA or other applicable laws, the Maltese legislator developed the Financial Instruments Test. This test groups all DLT assets into three broad categories: virtual tokens, financial instruments, and virtual financial assets. The first part of the test determines whether or not the DLT asset is a virtual token. According to regulators, a virtual token is a token that does not have any value outside of its platform and thus cannot be traded or exchanged outside

71 See www.mfsa.com.mt/fintech/virtual-financial-assets/.

72 See www.mfsa.com.mt/wp-content/uploads/2018/12/fintech-main-legislation.pdf.

73 *ibid.*

of the platform. A 'utility token', for example, would be considered a virtual token. The VFSA does not govern virtual tokens, although other laws may. The second step of the Financial Instrument Test checks whether the DLT asset is covered under MiFID and the Maltese Investment Services Act. A security token would fall under these regulations. Finally, if the asset is neither a virtual token nor a financial instrument regulated by MiFID and the Maltese Investment Security Act, then the VFSA becomes applicable.

The Gibraltar Financial Services Commission (GFSC) also began working on the objectives of a framework for virtual currencies in 2016, and published a consultation document, "Proposals for a DLT regulatory framework", in May of 2017. The laws were introduced on 12 October 2017 as amendments to regulations under the Financial Services (Investment and Fiduciary Services) Act 1989 (the '1989 Act') by Gibraltar's parliament. In December of 2017, a discussion paper was published containing the proposed laws. On 1 January 2018, Gibraltar approved the Digital Ledger Technology (DLT) Regulatory Framework bill that outlines consumers' rights regarding transactions with cryptocurrency businesses. According to the bill, companies that work with cryptocurrencies will need to be registered with Gibraltar's Financial Services Commission (GFSC). Supported by the Minister for Commerce, Albert Isola, further guidelines were published by the GFSC in March of 2018 (Gibraltar Finance 2018). Notably, the guidelines state that "in many cases, [tokens] represent the advance sale of products that entitle holders to access future networks or consume future services", and are therefore not considered securities under Gibraltar or EU law.

According to Gibraltar's Token Regulation, companies launching ICOs must have sponsors that supervise the sale and ensure that it complies with local regulations. This regulation applies to any business that stores or transmits cryptocurrency or uses distributed ledger technology, including exchanges wallets. Investment advice is also regulated. There are nine pillars of the regulation, and each application must address each of these nine principles.

1. A DLT firm must conduct its business with honesty and integrity.
2. A DLT firm must pay due regard to the interests and needs of each and all of its customers and must communicate with its customers in a way which is fair, clear and not misleading.
3. DLT firms will need to ensure that they have risk-assessed their businesses and mitigated any risks posed to consumers, name appropriate disclosure of risks to customers, and have an adequate complaints process in place.
4. A DLT firm must maintain adequate financial and non-financial resources.
5. DLT firms must manage and control their business effectively and conduct their business with due skill, care and diligence, including having proper regard to risks to their business and customers.

6. They must have effective arrangements in place for the protection of customer assets and money when they are responsible for them.
7. They must have effective corporate governance arrangements.
8. They must ensure that all of their systems and security access protocols are maintained to appropriate high standards.
9. They must have systems in place to prevent, detect and disclose financial crime risks, such as money laundering and terrorist financing.
10. They must be resilient and have contingency arrangements for the orderly and solvent wind down of its business.

As a British Overseas Territory, passporting Gibraltar licenses to the EU was automatic as long as the UK was in the EU. However, since the UK left the EU in 2019, Gibraltar's passporting rights to the EU will be removed.

5.3 Cryptocurrency derivatives

In addition to the two main categories of regulation pertaining to cryptoassets, including anti-money laundering and securities laws, the topic of cryptoasset derivatives has also been prevalent in the discourse. This is mostly the case for federal authorities in the US. The Commodity Futures Trading Commission (CFTC) has been active in enforcing its regulations on exchanges that offer cryptoasset-based trading products. Several sites offer leveraged trading, and a few offer futures contracts on Bitcoin. However, US retail investors that use these websites may be in contravention of CFTC regulations. The CFTC states that American retail investors can buy leveraged or margined derivative products on a regulated exchange but not outside of an exchange.⁷⁴ If this CFTC regulation applies to Bitcoin derivatives, then off-exchange margined trades would be illegal. There are only two situations where US retail investors can invest in off-exchange derivative products. The first is when a retail foreign exchange dealer (RFED) that is registered with the National Futures Association (NFA) facilitates the trade. The second is when the trade is facilitated with a bank registered with a regulatory body. However, these exceptions only apply to foreign exchange (forex) derivative products. The CFTC announced that Bitcoin and virtual currencies are not foreign currencies. Therefore, these technologies do not neatly fall under the CFTC's regulations for forex derivative trading. Instead of being considered a foreign currency, the CFTC stated in September of 2015 that Bitcoin

⁷⁴ Commodity Exchange Act (www.cftc.gov/LawRegulation/CommodityExchangeAct/index.htm).

and virtual currencies are a type of commodity.⁷⁵ According to Section 1a(9) of the Commodity Exchange Act (CEA), a commodity is defined as “all services, rights, and interests in which contracts for future delivery are presently or in the future dealt in”.⁷⁶

The CFTC’s involvement in cryptocurrency regulation began after an exchange called TeraExchange, LLC, announced plans to issue a swap product based on bitcoin. TeraExchange’s product is based on an index of the price of bitcoin that is derived from six different bitcoin exchanges.⁷⁷ The swap product locked in a dollar-to-bitcoin exchange rate. In 2014, the CFTC gave TeraExchange a temporary approval and in May of 2016, the SEC approved TeraExchange’s registration, which made the derivative offering official.⁷⁸ However, in 2015, the CFTC issued a cease-and-desist letter to TeraExchange on the grounds that its swap market had prearranged ‘wash’ trades that inaccurately portrayed the liquidity of the exchange.⁷⁹ Although TeraExchange was a registered swap exchange facility (SEF) with the CFTC, it misrepresented the volume of transactions occurring on its exchange.⁸⁰ Another SEF registered with the CFTC, the North American Derivatives Exchange, Inc., offered margined binary contracts until December of 2016. Nadex decided to remove the offering and filed a self-certification to delist their binary contracts on Bitcoin.⁸¹ A third company, Ledger X, is planning to offer bitcoin derivatives and has applied to be a bitcoin derivative clearinghouse.⁸² However, LedgerX is not officially launching the exchange until permanent licensure has been granted.

The CFTC has also taken action against unregistered companies. On 17 September 2015, it charged Coinflip, Inc. with conducting commodity option transactions that did not comply with the CEA. Specifically, the CEO, Francisco Riordan, allowed buyers and sellers to engage in bitcoin option contracts via his platform, Derivabit.⁸³ The order requires a cease and desist of the online offering. The CFTC’s Director of Enforcement, Aitan Goelman, noted:

75 “CFTC Orders Bitcoin Options Trading Platform Operator and its CEO to Cease Illegally Offering Bitcoin Options and to Cease Operating a Facility for Trading or Processing of Swaps without Registering”, Release No pr7231-15, Commodity Trading and Futures Commission, 17 September 2015 (www.cftc.gov/PressRoom/PressReleases/pr7231-15).

76 Order Instituting Proceedings Exchange Act, Making Findings and Imposing Remedial Sanctions 6(c) and 6(d) of the Commodity Exchange Act, Making Findings and Imposing Remedial Sanctions, United States of America Before the Commodity Futures Trading Commission, 17 September 2015 (www.cftc.gov/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfcoinfliporder09172015.pdf).

77 TeraExchange, LLC Swap Execution Facility Rulebook Version 1.89, Commodity Trading Futures Commission, 15 April 2016 (www.cftc.gov/filings/orgrules/rule041816teraexcsef002.pdf).

78 “CFTC Grants Registration to 3 Swap Execution Facilities”, Commodity Trading Futures Commission, 26 May 2016 (www.cftc.gov/PressRoom/PressReleases/pr7375-16).

79 CFTC Docket No. 15-33 In the Matter of: Order Instituting Proceedings Pursuant To TeraExchange LLC, Sections 6(c) and 6(d) of the Commodity Exchange Act Respondent. Making Findings and Imposing Remedial Sanctions, 24 September 2015 (www.cftc.gov/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfteraexchangeorder92415.pdf).

80 “CFTC Settles with TeraExchange LLC, a Swap Execution Facility, for Failing to Enforce Prohibitions on Wash Trading and Prearranged Trading in Bitcoin Swap”, Commodity Futures Trading Commission, 24 September 2015 (www.cftc.gov/PressRoom/PressReleases/pr7240-15).

81 “Nadex Self-Certification to Delist Bitcoin”, Nadex, 16 December 2016 (www.nadex.com/notices/2016/nadex-selfcertification-delist-bitcoin).

82 LedgerX LLC - Exhibit A-1 General Information/Compliance, Commodity Futures Trading Commission, (www.cftc.gov/idc/groups/public/@otherif/documents/ifdocs/ledgerxdocappexa-1.pdf).

83 Order Instituting Proceedings Pursuant to Sections 6(c) and 6(d) of the Commodity Exchange Act, Making Findings and Imposing Remedial Sanctions, 17 September 2015 (www.cftc.gov/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfcoinfliporder09172015.pdf).

“While there is a lot of excitement surrounding Bitcoin and other virtual currencies, innovation does not excuse those acting in this space from following the same rules applicable to all participants in the commodity derivatives markets.”⁸⁴

The CFTC followed up on their charges against Derivabit with charges against one of the largest bitcoin exchanges, Bitfinex. In June of 2016, the CFTC stated that Bitfinex and its predecessor iFinex violated Sections 4(a) and 4d of the Commodity Exchange Act (“the Act”), 7 U.S.C. §§ 6(a) and 6d (2012). According to the CFTC:

“Bitfinex was not registered with the Commission. During the Relevant Period, Bitfinex did not actually deliver bitcoins purchased on a leveraged, margined, or financed basis to the traders who purchased them within the meaning of Section 2(c)(2)(D)(ii)(III)(aa) of the Act. Instead, Bitfinex held the purchased bitcoins in bitcoin deposit wallets that it owned and controlled. Therefore, Bitfinex engaged in illegal, off-exchange commodity transactions and failed to register as a futures commission merchant, in violation of Sections 4(a) and 4d of the Act, 7 U.S.C. §§ 6(a) and 6d.”⁸⁵

Effectively, the main charge against Bitfinex was that it did not register with the CFTC despite allowing customers to trade bitcoins. Bitfinex immediately agreed to a settlement with the CFTC. However, exchanges are claiming that CFTC regulation does not apply to bitcoin transactions because traders are “making and taking delivery” when the trader transfers the bitcoin into their personal bitcoin wallets. According to CFTC regulations, the CFTC’s jurisdiction only applies when private trades involve deliveries with 28 days or more. However, the CFTC answered these criticisms by pointing out that exchanges such as Bitfinex did not make full delivery to traders because of the technological specifications of the bitcoin wallets. Specifically, Bitfinex controlled the private keys of the bitcoin wallet, and therefore had not fully delivered control of the coins to traders. Also, the CFTC states that any “financed retail transaction” is grounds for CFTC supervision. Therefore, any margined or leveraged spot trades can be held accountable according to CFTC law.

5.4 Taxation

According to the US Internal Revenue Service, gains from virtual currency investments are subject to capital gains tax. On 25 March 2014, the IRS issued a guidance document, IR-2014-36, that states, “an individual who ‘mines’ virtual currency as a trade or business [is] subject to self-employment tax”.⁸⁶ However, the government states, “virtual currency is not classified as currency that could generate foreign currency gain or loss for US federal tax purposes”.⁸⁷ In this document, the IRS states that cryptocurrencies will be classified

84 “CFTC Orders Bitcoin Options Trading Platform Operator and its CEO to Cease Illegally Offering Bitcoin Options and to Cease Operating a Facility for Trading or Processing of Swaps without Registering”, Release No. 7231-15, Commodity Futures Trading Commission, September 2015 (www.cftc.gov/PressRoom/PressReleases/pr7231-15).

85 In the Matter of: BFXNA INC. d/b/a BITFINEX, Respondent. CFTC Docket No. 16-19. Order Instituting Proceedings Pursuant to Sections 6(c) and 6(d) of the Commodity Exchange Act, as Amended, Making Findings and Imposing Remedial Sanctions, 2 June 2016 (www.cftc.gov/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfbfxnaorder060216.pdf).

86 IRS Virtual Currency Guidance, IRS, 15 March 2014 (www.irs.gov/newsroom/irs-virtual-currency-guidance).

87 Notice 2014-21, IRS, 2014 (www.irs.gov/pub/irs-drop/n-14-21.pdf).

as property for federal taxation purposes.⁸⁸ This guidance established that general tax principles that apply to regular property transaction also apply to virtual currency transactions. Therefore, businesses that accept bitcoin and other cryptocurrencies for goods and services must pay income taxes on payments. When cryptocurrencies are used to make payments, IRS policies concerning information reporting on property transactions are applicable.⁸⁹ Businesses that pay employee wages in bitcoin are taxable to the employee and must be reported by the employer on the Form W-2.⁹⁰ Furthermore, payroll and federal income taxes are applicable for wages paid in cryptocurrencies. Employers that hire freelancers or independent contractors and self-employed workers are required to file a Form 1099 to declare their income in cryptocurrency. In order to determine what value should be paid on bitcoin income, the IRS states that taxpayers must estimate the fair market value of the bitcoin at the time of receiving the payment.

“For US tax purposes, transactions using virtual currency must be reported in US dollars. Therefore, taxpayers will be required to determine the fair market value of virtual currency in US dollars as of the date of payment or receipt. If a virtual currency is listed on an exchange and the exchange rate is established by market supply and demand, the fair market value of the virtual currency is determined by converting the virtual currency into US dollars (or into another real currency which in turn can be converted into US dollars) at the exchange rate, in a reasonable manner that is consistently applied.”⁹¹

The DOJ is helping the IRS track down cryptocurrency users that do not pay income on cryptocurrency gains. It is estimated that over \$25 billion in taxes have been unpaid by US cryptocurrency investors. In November of 2016, the DOJ requested a ‘John Doe’ summons to be issued to Coinbase, Inc. Coinbase was founded in 2012 and is the largest cryptocurrency exchange company in the world. The company is headquartered in San Francisco, so therefore the DOJ filed the summons in the United States District Court for the Northern District of California. The DOJ demanded a list of all US persons who conducted transactions in a “convertible virtual currency” between 1 January 2013 and 31 December 2015.⁹² Specifically, the DOJ wanted a list of all individuals that bought and sold bitcoin during that two-year time period. According to the government:

“Since 2009, the use of virtual currency has increased exponentially. Some users value the relatively high degree of anonymity associated with virtual currency transactions because only a transaction in virtual currency, such as buying goods or services, is public and not the identities of the parties to the transaction. Because

88 IRS Virtual Currency Guidance: Virtual Currency Is Treated as Property for U.S. Federal Tax Purposes; General Rules for Property Transactions Apply, IRS, 25 March 2014 (www.irs.gov/uac/Newsroom/IRS-Virtual-Currency-Guidance).

89 *ibid.*

90 *ibid.*

91 Notice 2014-21, IRS, 2014 (www.irs.gov/pub/irs-drop/n-14-21.pdf).

92 In the Matter of the Tax Liabilities of John Does, No. 3:16-cv-06658, USDC Northern California.

141 *ibid.*

of that, virtual currency transactions are subject to fewer third-party reporting requirements than transactions in conventional forms of payment. However, due to this anonymity and lack of third-party reporting, the IRS is concerned that US taxpayers are underreporting taxable income from transactions in virtual currencies. Further, because the IRS considers virtual currencies to be property, United States taxpayers can realize a taxable gain from buying, selling, or trading in virtual currencies. There is a likelihood that United States taxpayers are failing to properly determine and report any taxable gain from such transactions.”¹⁴¹

The government states their request is in line with IRC §7609(f), which grants authority to the government to request a ‘John Doe’ summons. Coinbase eventually provided the information, and thousands of letters were sent out to Coinbase users in 2019. The letters came in three varieties and requested Coinbase users to ensure they paid sufficient taxes on their cryptocurrency transactions.

6 CONCLUSION

The use of distributed ledger technology in money, payments and capital formation poses challenges for regulators worldwide. The two main areas that regulators are focusing on are anti-money laundering and securities violations. Regulations that protect against anti-money laundering and know-your-customer are mostly targeted towards companies that offer cryptocurrency custody services, such as exchanges and wallets. In contrast, enforcement of securities violations is mostly targeted towards firms that are raising capital. From a legal perspective, initial coin offerings and security token offerings are similar to crowdfunding and private equity offerings in that they are all ways to provide capital to small and medium-sized enterprises. However, ICO investors often have not received a legally enforceable security in return for their investment, and several ICOs were found to be in violation of securities laws. The initial hype surrounding ICOs may be partially explained by the lack of investor protection regulations and the return to bearer financial instruments. Security token offerings reinstall retail and professional investor distinctions and AML policies that remove their natural nature as bearer instruments.

Even if security token offerings do gain momentum, many questions still remain surrounding the topic of smart contracts, owner transference and signature validity. More legal clarity on the ability for a digital token to represent ownership in a company is needed, as well as more legal clarity on the functional equivalence of signing a transaction with a private key and signing with a physical signature.

Although some cryptocurrency firms are still engaging in regulatory arbitrage on a global scale, the days of unregulated cryptocurrency custodians, ICOs and unregulated security token offerings appear to be over. Federal and state agencies in the US and Europe are closely monitoring token issuers and taking action where necessary against crimes involving money laundering, fraudulent activity and failure to register with authorities. Individual states require additional legal hurdles and licensing before being

allowed to operate legally within each state. Several regulatory sandboxes exist that allow entrepreneurs to work alongside regulators while developing their business case, including in Hawaii in the US and Liechtenstein in Europe.

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CHAPTER 5

Fostering FinTech for financial transformation: The case of South Korea

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European University Institute and CEPR; Korea Institute of Finance; Financial Supervisory Service; Korea University

1 INTRODUCTION

Korea has been at the top of the list of the countries that are leading in the development of information and communications technology (ICT) infrastructure. But this prowess has not been of much help in promoting technological innovation in its financial system, with the country towards the back of the pack in digital innovation in finance. After years of latency, Korea's financial industries are now on the move to catch up with more digitally advanced countries by embracing and investing heavily in new technologies. Digitalisation is expected to improve financial institutions' and markets' efficiency and produce various new products and services tailored to savers' and investors' needs, but it could also change the financial landscape by pitting incumbent banks and nonbank financial institutions (NBFIs) against FinTech and BigTech companies. This change requires regulatory reforms to safeguard financial stability while ensuring competition for consumers' benefits.

In this chapter, we document the digital transformation in legacy financial institutions and the growth and diversification of the FinTech industry since the early 2000s. We then discuss a strategy for advancing financial digitalisation and fostering competitive and complementary relations between traditional financial firms on the one hand, and FinTech firms on the other. The scheme includes creating a new financial regulatory framework that could enrich benefits while minimising the cost and stability risks of financial digitalisation.

At the outset, it should be noted that the history of FinTech development in Korea is relatively short – less than a decade and a half for all practical purposes. Not surprisingly, the availability of information and data on the structure and growth of the FinTech industry is limited, precluding a rigorous empirical study of the effect of FinTech on the growth and stability of both financial and real sectors of the economy. There is also considerable confusion regarding the meaning of FinTech and financial digitalisation.

In this chapter, digital transformation refers to the use of electronic technologies (computers, the Internet, WiFi, Bluetooth, etc.) in place of paper (cash, cheques, share certificates, and even receipts and account books). By extension, it includes Big Data, the Internet of things (IoT), cloud computing, blockchain, and artificial intelligence (AI). It relates to “new business models and product designs, competition, operational efficiencies, intermediation, accessibility, consumer engagement, speed, automation, analytics, privacy and transparency, and digital security risk” (OECD 2018).

As there is no official definition of FinTech, we define it rather narrowly to mean digitally enabled financial innovation.¹ A FinTech firm is any business that applies emerging digital technologies for the provision or distribution of financial services and products.² The FinTech industry is then an amalgam of different types of FinTech firms. It fosters the growth and diversification of the financial system by substituting for and complementing incumbent financial institutions’ and markets’ traditional functions.

Our analysis shows that ever since the digital evolution took off in the early 2000s, financial subsidiaries of BigTechs and a couple of large FinTech firms have dominated the FinTech industry development as providers of easy payment and remittance services, creating an oligopolistic feature of the industry. In recent years, they have started producing and marketing various fee-based financial services, and they now aim to enter the intermediation business by acquiring Internet-only bank licenses.

These developments have important implications for regulatory reform in the FinTech space. To build a level playing field for fair competition, the regulatory authorities have lowered the wall separating incumbent financial and FinTech firms so that banks can offer all financial services FinTech firms have provided. While Korea’s financial regulators do not see the merits of creating an independent regulatory system for FinTech firms, there is no clear integration between the bank and FinTech regulatory frameworks so far. We make several specific recommendations for regulatory reforms.

The remainder of this chapter is structured as follows. Section 2 describes the oligopolistic structure of Korean banking. Section 3 shows why the rapid digitalisation of the Korean economy did not include banking, and Section 4 analyses the emergence of a vibrant FinTech sector. Section 5 examines the role of big techs, the financial platform business, peer-to-peer (P2P) lending, and Internet banks. Section 6 discusses the regulatory framework for FinTech and BigTech companies and possible reforms, and Section 7 concludes.

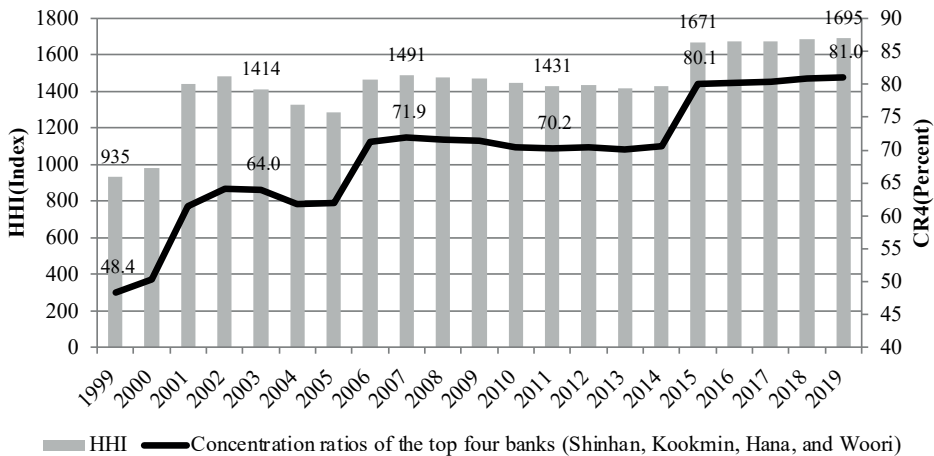
1 For an implicit definition of FinTech, see the chapter by Cecchetti and Schoenholtz in this book.

2 As discussed in Section 3, there are many new financial technologies available for application. Incumbent institutions including banks in Korea have taken advantage of only a few of these technologies.

2 THE KOREAN BANKING SYSTEM

Korean banks paid a high price for their excessive lending to highly leveraged industrial conglomerates prior to the 1997–98 financial crisis. The bulk of these loans became non-performing, setting off a liquidity drought to trigger the crisis. Unable to bring the crisis under control, Korea had to approach the IMF for rescue financing conditional on undertaking financial reform to resolve its overdue external debt. The IMF liquidated 16 commercial banks and merged many insolvent banks with healthier ones as part of financial restructuring. The result was that the number of commercial banks had fallen to eight nationwide and six regional commercial banks by the end of 2020. Over a decade after the crisis, the four largest commercial banks have transformed Korea's banking system into an oligopolistic structure as they continue to add to their combined market share of total commercial bank assets. The proportion jumped to 71.7% at the end of 2007 from 50.8% in 1999. It then surged again, reaching 81.0% by 2019 (Figure 1).

FIGURE 1 MARKET CONCENTRATION RATIOS AND HERFINDAHL-HIRSCHMAN INDEX (HHI) OF THE FOUR LARGEST COMMERCIAL BANKS



Source: Financial Supervisory Service (FSS), Financial Statistics Information System (FISIS).³

The trend towards higher banking concentration has been mirrored in the insurance sector but less so in the securities industry. There were 29 life insurance firms in 1999, but the top three (Samsung, Daehan, and Kyobo) had a combined market share of close to 80%. The top five of the 78 securities firms controlled 60.7% of the market in the same year. At the end of 2019, there were 25 life insurance and 55 securities firms, and the shares of

3 <http://efisis.fss.or.kr/fss/fsiview/indexw.html>

the top five in the two industries were 67.5% and 52.7%, respectively. Not surprisingly, in 2019, the Herfindahl-Hirschman Index (HHI) was the lowest for the securities business at 742, compared to 1,695 for banking and 1,443 for insurance.

Commercial banks suffered from more financial turbulence during the 2008 Global Financial Crisis (GFC). Once again, this setback underscored the importance of prudence in managing loan portfolio risks, making the banks as guarded as before in deflecting adverse external shocks and any internal disruptions that could undermine the stability of their balance sheets. Notwithstanding its efficiency benefits, digitalisation was perceived as a disruption posing the risk of endangering information protection and cybersecurity during much of the post-GFC period. If financial innovation was looked on as a potential source of disruption of the age-old banking practice of lending with collateral funded by deposit money without any clear prospect of future gains, few top executives were willing to venture into innovation.

Similarly, following the 1997 crisis, the government has never regarded finance as a new source of growth, making it reticent to foster digitalisation in finance. Despite its liberal stance on financial sector policy, it was not receptive to the idea of relaxing some of the restrictions on entry to the banking sector until 2017, when it licensed two Internet-only banks. The entry restrictions left the four large commercial banks dominating the sector and allowed them to stay nestled in a cozy, non-competitive environment with little internal or external pressure for innovation.

This oligopoly also prevented efficiency gains in Korean banking over the past decades. Since 2015, there had been little appreciable changes in net interest margins before dropping marginally in the following year at the four largest banks in Korea (see Table 1). The persistence of the low interest rate has undoubtedly contributed to the stability and lower margins but, more than anything else, the oligopolistic market structure, not financial innovation, has been the main factor behind the similarity and steadiness of net interest margins (NIMs).

On the other hand, and due mostly to the contraction in the employment share, labour productivity in the financial sector (measured in nominal value-added per person) has increased rapidly. By 2019, productivity had risen to nearly 140 million won (\$127,272.7) per person, which was almost five times the level in the early 1990s (see Figure 2). In 2017, value-added amounted to 46.5% of GDP in Korea, which was lower than the US (58.8%) and the EU (56.6%).⁴

4 Source: OECD "Value-added in financial corporations" indicator (accessed 18 May 2021).

Finally, as shown in Figure 3, the unit cost in terms of stocks of intermediated assets was stable until 1995 but fell since then, going below 1% in the 2000s.⁵ Compared to other countries, it appears that the cost of financial intermediation has not been excessive in Korea.⁶

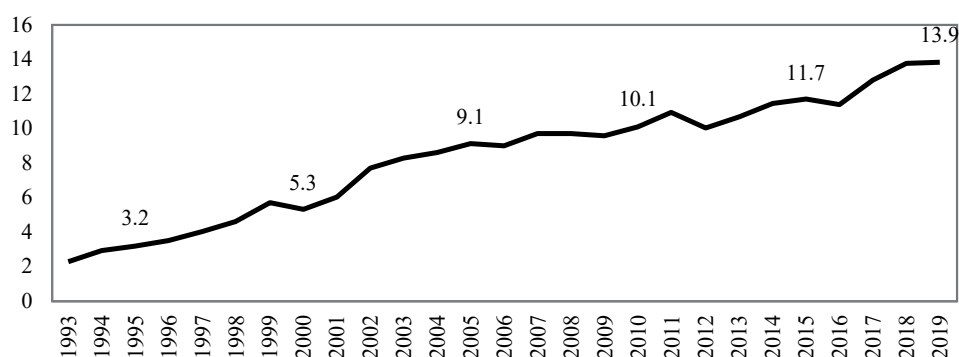
TABLE 1 NET INTEREST MARGINS OF MAJOR BANKS (%)

Year	Kookmin Bank	Shinhan Bank	Woori Bank	Hana Bank	K Bank ^c	Kakao Bank ^c
2015 ^a	1.66	1.54	1.43	1.43		
2016	1.57	1.49	1.42	1.40		
2017	1.69	1.55	1.46	1.47	1.92	1.58
2018	1.71	1.62	1.51	1.57	1.99	2.06
2019	1.69	1.58	1.48	1.53	1.54	1.55
March 2020 ^b	1.56	1.41	1.38	1.39	1.63	1.53
June 2020 ^b	1.52	1.40	1.36	1.38	1.72	1.60

Source: FSS, FISIS “Key Management Indices: Profitability” (<http://efisis.fss.or.kr/fss/fsview/indexw.html>).

Notes: a) Quarterly average from 2015 to 2019. b) Daily average from March and June 2020. c) Internet-only banks.

FIGURE 2 SHARES IN LABOUR PRODUCTIVITY OF THE FINANCE AND INSURANCE (IN TENS OF MILLION WON PER PERSON)

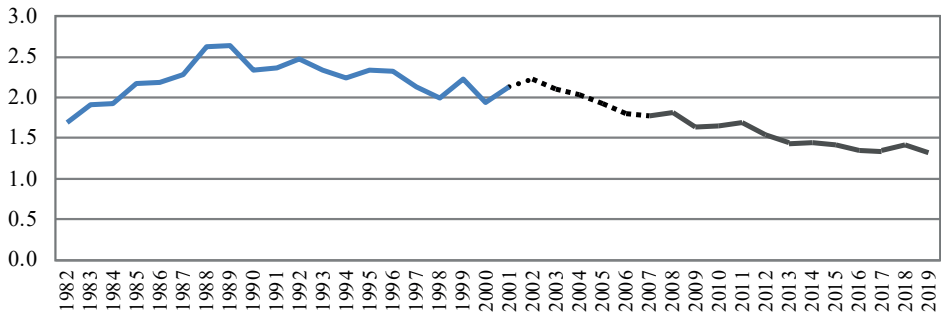


Source: Bank of Korea, Economic Statistics System (ECOS) (<http://ecos.bok.or.kr/>).

Note: Labour productivity is measured as value-added per worker.

⁵ Philippon (2015) measures the unit cost of financial intermediation as the ratio of the income (value-added) of the financial sector to the quantity of intermediated assets.

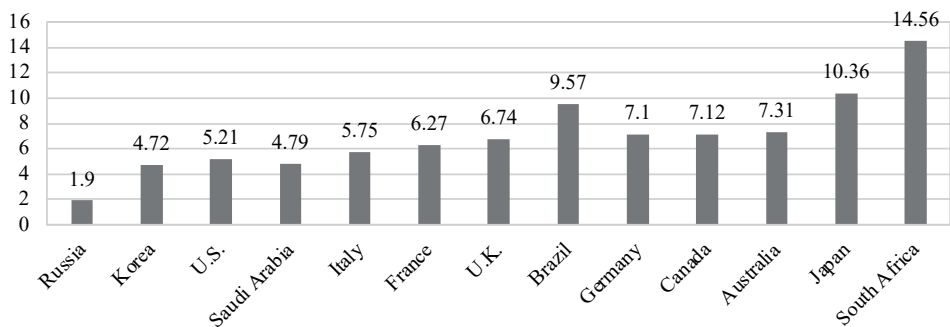
⁶ For example, in the United States, the unit cost of financial intermediation has fluctuated between 1.3% and 2.3% since 1880.

FIGURE 3 UNIT COST OF INTERMEDIATION (%)

Source: Author's calculation.

Notes: There have been a series of changes in the SNA: 1968 SNA (1982-2001), 1993 SNA (2002-2007), and 2008 SNA (2008-2019).

In the FinTech industry, the easy remittance market has shown the importance of allowing competition. Korea now has the second-lowest cost of sending money to other G20 countries in the world (Figure 4) after legislation of the small-amount foreign remittance act (\$5,000 for a maximum per transaction) in 2017 set off explosive growth in the remittance market. It opened the market closed to non-bank institutions for a long time to Internet banks, and many other NBFIs and FinTech firms and dramatically cut down the remittance fee. One FinTech firm charged one-tenth of what commercial banks used to ask for, setting off a cascade of fee reductions, with the result that every financial institution had to charge the same fee.

FIGURE 4 AVERAGE COST OF REMITTANCE FROM G20 COUNTRIES (%)

Source: World Bank (2020).

3 ICT DEVELOPMENT AND THE REACTION OF THE BANKING SYSTEM

3.1 Growth of the ICT industry and mobile banking

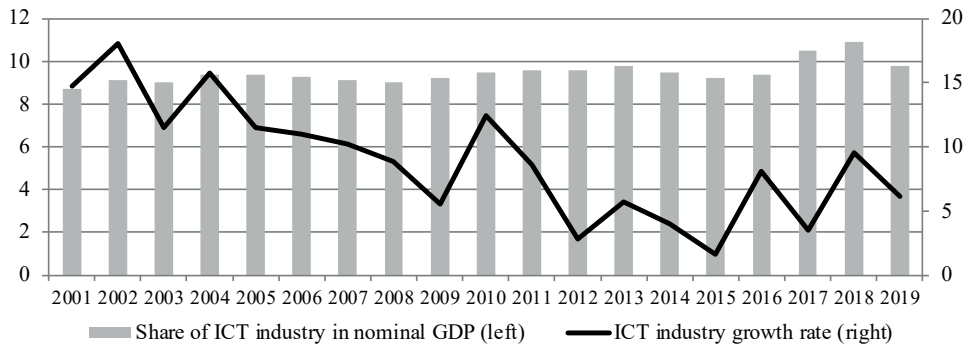
Korea has been recognised as a leader in developing ICT infrastructure, ranking in the top three of the indices published by the International Telecommunication Union (ITU), the Economist Intelligence Unit (EIU) and Bloomberg. It has one of the world's highest Internet penetration rates (Table 2). The ICT industry's share in Korea's GDP has exceeded 10% since 2017 (Figure 5). In 2017 and 2018, 94% of the total population used smartphones.

TABLE 2 KOREA'S ICT INFRASTRUCTURE DEVELOPMENT

Indices of ICT infrastructure development	Rank
ICT Development Index 2017 (ITU, November 2017)	2
2018 Automation Intelligence Unit (EIU, April 2018)	1
2018 Bloomberg Innovation Index (Bloomberg, January 2018)	1
2017 Government AI Readiness Index (Oxford Insights, December 2017)	4
2017 Digital Evolution Index (Tufts University, July 2017)	7

Source: Samjong KPMG (2019).

FIGURE 5 GROWTH OF THE ICT INDUSTRY IN KOREA (%)



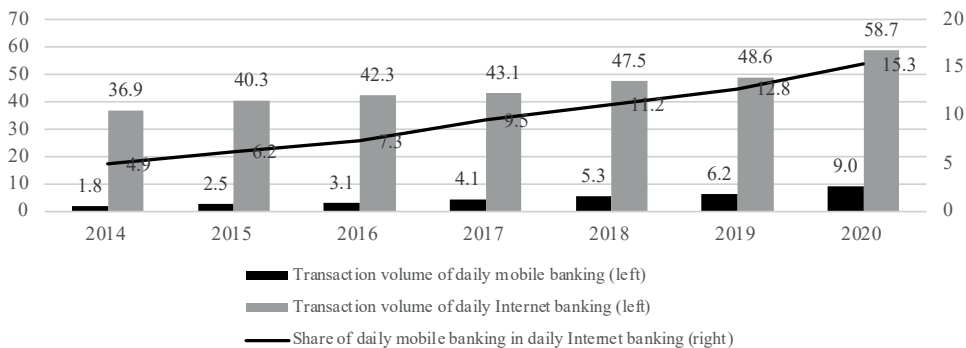
Source: Bank of Korea, ECOS.

Over the past two decades, with the development and expansion of the ICT infrastructure, the number of Internet users has increased substantially, setting in motion the digitalisation of Korea's financial industries. This increase in Internet use first paved the way for the creation and expansion of e-commerce, which in turn generated the demand for simple and secure digital payment services beyond traditional credit cards. The technological advances embodied in Apple's iPhone unveiled in 2007 cleared the way for cellular communication and financial transactions, leading to modest growth in Internet

and mobile transactions at banks (Figure 6). Somewhat belatedly, a new era of e-finance arrived in Korea with “the provision of financial services and markets using electronic communication and computation” (Allen et al. 2002).

One of the electronic services created was an easy payment and remittance solution, which made on/offline and mobile transactions easier and faster than similar services at banks, as users store credit card or bank account information on mobile phones to execute instant payments with a simple PIN or card scan. As shown in the next section, since their inception the easy payment and remittance markets, which FinTech firms have dominated, have recorded spectacular growth, eclipsing the role of banks in electronic payment services.

FIGURE 6 VOLUMES OF INTERNET AND MOBILE BANKING (TRILLION WON)



Source: Bank of Korea (2021a).

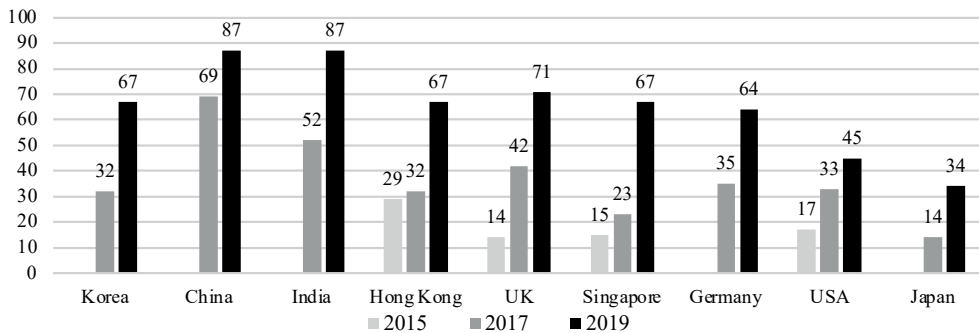
Note: Figures for 18 banks include six commercial banks; six regional banks; four specialised banks; two Internet banks; as well as postal savings and insurance.

The success in building a highly sophisticated tech economy may give the impression that Korea has been equally successful in the digital transformation of its financial industries. Contrary to expectations, however, except for Internet and mobile banking, Korea’s incumbent financial firms have been relatively slow in adopting many of the core technologies of automation such as artificial intelligence (AI), Blockchain, cloud computing and Big Data, falling behind the degree of utilisation in the United States and other advanced countries in Europe. At present they offer mostly chatbot and robo-adviser services (digital platforms that offer algorithm-driven financial advice based on client data and preferences), the underlying technologies for which are, among others, AI and machine learning.

Although legacy financial institutions all claim to have developed sophisticated digitalisation plans and implemented them to improve their operational efficiency, they have been slower in adopting new technologies than in many other countries. And this slowness is borne out by the low degree of the usage of digital technologies, raising doubt as to whether the plans have been carried out and, if they have, how successful they have

been.⁷ For example, the rate at which FinTech users used two or more FinTech services in the last six months surged from 32% in 2017 to 67% in 2019 in Korea, according to Global FinTech Adoption Index 2019 compiled by Ernst & Young (see Figure 7). The doubling of the rate has not improved Korea's rating: it remains far below China and India's, though ahead of the US and Japan. According to the Global FinTech Index 2020, which measures the quality of the FinTech ecosystem and FinTech companies, Korea ranks 18th after India and Estonia (Findexable Limited 2019).⁸

FIGURE 7 FINTECH ADOPTION TRENDS (%)



Source: Ernst & Young (2019).

3.2 Inertia in digitalisation of banking services

While FinTech firms were spearheading the rapid growth of the easy payment market, legacy banks and other financial institutions were left behind in competition as they continued to require a cumbersome process of identity checks of usernames, passwords and online digital certificates in their Internet-based payment system. They often required text messages and phone call confirmations for every online transaction. Not surprisingly, a growing number of bank customers began opting for the easier payment and remittance services provided by FinTech firms.

In an effort to compete against FinTech firms, 18 banks and the Korea Financial Telecommunications and Clearings Institute (KFTC) joined forces to create a new mobile service known as the 'bank wallet' in 2013 to prevent their customers deserting. A year later, the bank-KFTC joint venture teamed up with an Internet portal, Kakao, known

⁷ Banks claim to have begun offering mobile payments and remittances and asset management, and using chatbot and robo-advisors for marketing and internal operations. Life insurance companies have created a Big Data platform for chatbot services to streamline and automate insurance consultations, subscriptions, and claim processing by using AI and big data. They have also introduced InsurTech in cooperation with FinTech firms. Securities companies and other financial investment services providers use biometric authentication for account access. They rely more than before on robo-advisors for a financial consultation. Algorithms are also used to guide customers in investing in bonds and equities and rebalancing portfolios based on their asset preferences and trade tendencies (Kim 2019).

⁸ The country ranking is calculated from a total score measuring (i) the quantity of FinTech ecosystem and supporting infrastructure, (ii) the quality of performance of the FinTech industry, and (iii) the regulatory environment. There are other global FinTech indices, but in none of these does Korea make the top five or ten.

for its sprawling messenger service, to upgrade its technology and expand its bank wallet network. Two years later in 2016, however, Kakao left the joint venture to develop its own mobile payment service.

After Kakao's departure, the bank wallet suffered a large shrinkage of its franchise network, and many banks embarked on offering their own mobile payment services. But with few of these succeeding, banks have retreated to expanding their Internet and mobile banking and credit card services, which do not require the application of new financial technology. The joint venture closed the bank wallet service in 2020.

In what follows, we investigate some of the structural factors in the banking industry that may reveal clues for the lack of progress in digitalisation over the past decade, and which may also apply to the insurance and securities industries. The examination finds five causes.

First, except for the P2P lending platforms, FinTech firms, including those owned by BigTechs and financial platform companies, are not engaged in financial intermediation, and hence they have not posed any threat to banks' role as the nation's dominant lenders to households and businesses. Total P2P lending has been so minuscule that banks could afford to ignore the existence of P2P platform operators as potential competitors. Understandably, banks have not had any strong incentives to invest in acquiring new financial technologies to compete against FinTech firms.

Second, FinTech firms earn practically all of their income from offering fee-based financial services such as easy payment. In contrast, banks rely largely on interest income. For example, at the end of 2019, the share of interest income at commercial and state-owned banks was more than 86%. Until recently, banks have not had any incentives to develop fee-based financial services to bolster their non-interest income as a major source of earnings. Despite the rapid growth of FinTech services, banks have continued to depend on interest income by expanding loans for households and small and medium-sized firms, collateralised by housing and other types of real estate. At the end of 2019, loans at commercial and state-owned specialised banks accounted for almost 60% of total assets

As for the reasons for a relatively smaller share of non-interest income at banks, a recent paper by the staff of the Bank of Korea (BOK) points to tighter regulations on service fees and the lack of staffing specialized in managing fee business (Kim et al. 2020). But there is another explanation for the lack of interest in developing fee business in the face of the rapid growth of FinTech firms.

Commercial and state-owned banks benefit from exclusive access to the central bank fund settlement system (BOK-Wire+) and the payment settlement network of the KFTC. This advantage has created a new source of non-interest income for banks, as they earn fees for acting as agents for clearing and settling the transactions of easy payment and

remittance service providers who do not have access to the BOK and KFTC networks.⁹ Banks also earn an income from fees for issuing virtual bank accounts to FinTech firms' customers using an easy payment service to facilitate the deposit and withdrawal of funds (Financial Services Commission 2019). These fee-based income sources have compensated for the potential income losses stemming from their disregard of easy payment services and dissuaded banks from investing in FinTech services.

Third, the prevalence of short-termism in banking, which prioritises short-term over long-term performance, has also stood in the way of financial digitalisation. On average, the tenure of Korean bank CEOs has been less than two years and that of other senior managers about three years. Many argue this is a legacy of financial repression of the past, when the government took tight control over the management of financial institutions. Given such a short-term tenure, senior executives have little choice but to concentrate on meeting key performance indicators they are valued against ahead of any other managerial goals if they want to hold on to their jobs.¹⁰

Fourth, banks and other financial institutions have faced considerable difficulty in recruiting or training FinTech engineers and designers. These specialists are not financiers and do not belong to the mainstream of asset-liability management, and hence mostly play a supporting role. Understandably, their career prospects in the incumbent financial institutions are somewhat limited and they know they would have better opportunities at newer FinTech firms than at incumbent firms burdened with large investments in older technologies.

The convergence of finance and new technology, together with banks' apathy towards digitalisation, created opportunities for many non-financial firms to enter the easy payment service market. These new firms include Internet portals, telecommunications companies, mobile device manufacturers, IT-related technology firms and a growing number of FinTech startups. The expansion of the payment service market eventually called for the construction of a new legal basis for their conduct and regulation of electronic finance business, leading to the Electronic Financial Transactions Act (EFTA) legislation in 2006. The Act had been amended 13 times through 2020.

Over the past 14 years since the EFTA legislation, the development and spread of new financial technologies have brought into the FinTech industry many new firms other than easy payment service providers. These include companies specialised in P2P lending, crowdfunding, wealth management, blockchain applications and other FinTech solutions. By 2019, it was evident that the EFTA as a regulatory system for the FinTech industry was

9 Following the reform of EFTA, some of the large FinTech firms are likely to obtain a license as one-stop payment service providers with access to the settlement network.

10 Kang and Bae (2018) show that the longer the median term of executive officers' tenure, the higher the bank's productivity. They argue that this short tenure could be the main reason for the widespread short-termism in the Korean banking industry.

grossly outdated and was in need of an extensive overhaul to keep it abreast of the rapid evolution of financial technologies. The EFTA's reform proposed in 2020 ushered in a new phase of the Korean FinTech industry's growth and diversification.¹¹

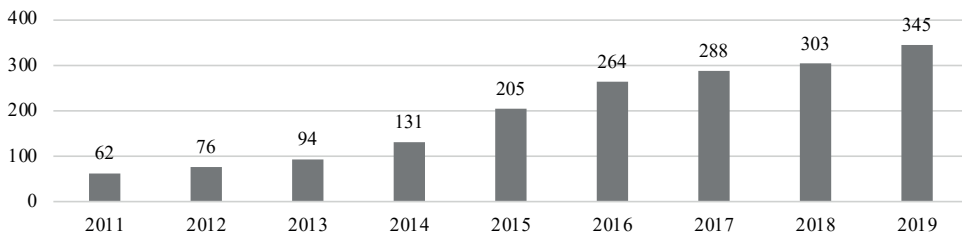
4 THE FINTECH INDUSTRY

A FinTech firm is defined as a business entity engaged in applying digital technologies to provide and distribute financial services and products. The FinTech industry is an amalgam of different FinTech companies that include financial platforms and FinTech startups specialised in delivering a limited number of financial services such as easy payments and remittances in Korea.

4.1 Number and business classification of FinTech firms

The Korea Internet and Security Agency (KISA) estimates that there were 580 FinTech firms in 2019. Of these, only 345 companies responded to the agency's annual survey (Figure 8). The survey shows that most FinTech firms are small – more than 60% of the responding firms had capital of less than one billion won (\$909,000), and more than 45% employed fewer than ten people (Table 3). Those firms with capital over 3 billion won (\$2,727,300) include one unicorn and FinTech affiliates of two tech giants, Naver and Kakao.¹²

FIGURE 8 NUMBER OF FINTECH COMPANIES



Source: KISA (2020) and Samjong KPMG (2020).

¹¹ See FSC (2020) for the proposal for the amendment to the EFTA.

¹² Naver and Kakao are two of Korea's large industrial groups. According to the Fair Trade Commission (2020), as of 1 May 2020, Kakao was the 23rd largest out of the 64 industrial groups the commission designated for public disclosure with 97 subsidiaries and 14.2 trillion won (\$12.9 billion) in assets. Naver was smaller, ranking 41st with 43 subsidiaries and assets valued at 9.5 trillion won (\$8.6 billion).

TABLE 3 CAPITAL, EMPLOYMENT AND YEARS IN SERVICE OF FINTECH FIRMS

Capital (billion won)	Number of employees	Number of years in business
≥ 3 (16.7%)	≥ 30 (26.4%)	≥ 8 (18.6%)
1 ~ 3 (18.3%)	10 ~ 29 (28.1%)	4 ~ 7 (37.1%)
< 1 (65.1%)	< 10 (45.5%)	≤ 3 (44.3%)

Source: KISA (2020).

Note: Figures in parentheses are the shares of 345 firms that responded to the KISA survey on domestic FinTech-related companies, associations, financial companies and relevant institutions in 2019.

An informal classification by the Financial Supervisory Service (FSS) divides FinTech firms into ten different sub-sectors based on their specialisation, as shown in Table 4. The KISA also classifies them into ten different categories, as shown in Table A.1 in the Appendix.¹³ The table shows that most FinTech firms belong to the payment and remittance business.

Most of the FinTech firms covered in the Table 4 are not financial intermediaries because, unlike banks, they do not “incur liabilities on their account on financial markets by borrowing funds which they lend on different terms and conditions to other institutional units” (OECD 2004). P2P and crowdfunding platforms can be classified as financial intermediaries, but as shown in Section 5, there are few P2Ps left after the introduction of tighter regulation of these lending platforms and the crowdfunding businesses, though growing rapidly, are still too small to be a significant source of finance.

Some of the large FinTech firms provide, in addition to easy payments and remittances, a multitude of other financial services, including supply of liquidity, lending and advertising of various financial products and services produced by incumbent financial institutions. They also recommend some of these products for investment to their customers, doing so in alliance with the traditional financial institutions unless they own an Internet bank. Through these cooperative arrangements, FinTech firms serve both as complements and substitutes for the services and products of the existing financial institutions and, as such, are under the supervision and regulations of several regulatory authorities (see Table 4).

¹³ This study does not use either the number or classification of the Korea Internet & Security Agency (KISA). The agency's numbers, which are underestimated, are reported simply to gauge the relative shares of different categories of firms in the FinTech industry.

TABLE 4 CLASSIFICATION OF FINTECH SERVICES

Function/Activity	Examples (Overseas)	Examples (Korea)	Registration Agencies: FSC, FSS, and MOEF (Ministry of Economy and Finance)	Laws and regulations
Payments/remittances	Waymo, Stripe, Ripple, Square, Transferwise, Alipay, WeChat, M-pesa	Kakaopay, Naverpay, Payco, Viva Republica (Toss)	Financial Services Commission	The Electronic Financial Transactions Act
Crowd funding/P2P finance	WeBank, MYbank, XW Bank, Affirm, Prosper, Lending Club, Kabbage, Sofi	Peoplefund, 8 Percent, Lendit, KROSS Inc. (Korea bill brokerage)	Financial Services Commission	The Act on the Online Investment-linked Financial Business and Protection of its Users (Date August 27, 2020)
Crowd funding	Kickstarter, AngelList, CrowdBnk	Wadiz, CrowdY, OHMYCOMPANY	For securities type: Financial Services Commission	For securities type: The Financial Investment Services and Capital Markets Act
Asset management (Robo-advising)	Betterment, Wealthsimple, Acorns, Sofi	Fount, Doomoolmori, Quarterback Investments, AIM	For authorization or registration: Financial Services Commission ¹⁴	For authorization or registration: The Financial Investment Services and Capital Markets Act
InsurTech	Lemonade, Oscar Health	Rich&co., BOMAPP, Life Semantics	For insurance agency: Financial Services Commission	For insurance agency: The Insurance Business Act
Financial investment and advisory services	Robinhood, IEX, Sofi	Kakaopay Securities, Kasa Korea	For securities companies: Financial Services Commission	For securities companies: The Financial Investment Services and Capital Markets Act

14. No authorisation or registration is required when a fund or property entrusted by an asset management company and others is managed by robo-advisor services.

Function/Activity	Examples (Overseas)	Examples (Korea)	Registration Agencies: FSC, Laws and regulations FSS, and MOEF (Ministry of Economy and Finance)
Overseas remittance	Transferwise	Sentbe, E9pay	Ministry of Economy and Finance The Foreign Exchange Transactions Act
Security/authentication	Trustonic	Voim Technologies, ATON, CROSSCERT (Korea Electronic Certification Authority)	-
Fintech system integration (SI)	-	MARINESOFT Co., Ltd, for solution development and, hardware for big data analytics ¹⁵	-
Cryptocurrency	Bitfury	Coinplug, Coinone	-
Others	-	-	-

Source: Financial Supervisory Services.

15 Marine Soft is an Internet company offering customised mobile and web application development for diverse business industries and categories on various operating systems.

Among the ten types of FinTech firms in Table 4, this study leaves out those engaged in security/authentication, tech solution provision (SI) and cryptocurrency as they are not financial institutions. This exclusion of non-financial FinTech firms leaves payment, financial platform, P2P, crowdfunding intermediation, Insurtech, foreign exchange remittance and Internet banks for analysis. In the remainder of this study, 'FinTech firm' is used to refer to a financial FinTech firm .

Of the remaining seven FinTech businesses, this study first reviews FinTech firms playing a major role in electronic payment and remittance markets before turning to cover other FinTech institutions. We start with the payment and remittance markets, as (i) these firms have been able to carve out a larger share of the market, powering the e-finance industry's strong growth; (ii) driven by their growth, they have ventured into delivering other financial services, elevating themselves as financial platforms and competitors and collaborators vis-a-vis incumbent financial institutions; and (iii) this diversification of FinTech financial services has raised a host of regulatory issues related to deregulation of the FinTech industry and creating a level playing field for incumbents and FinTech firms.

4.2 Growth and investment in the FinTech industry

There are no official or reliable statistics that measure the FinTech industry's growth. The evidence put together below suggests that the FinTech industry's growth over the past decade has been impressive: Between 2016 and 2019, the easy payment market, where FinTech firms are dominant players, increased almost seven-fold, and the easy remittance market more than 35-fold. Crowdfunding for securities' investments rose to 27.9 billion won (\$25.4 million) in 2020 from 16.6 billion won (\$15.1 million) in 2016.¹⁶ Between the fourth quarter of 2017 – when small-amount foreign exchange remittances were allowed for the first time – and the following year, remittances increased from \$14 million to \$394 million (FSS 2019).

According to the Korea Institute of Science and Technology Information, the robo-advisor market size was estimated to be about 201.7 billion won (\$183.4 million) in 2016; four years later, the market had soared to 12 trillion won (\$10.9 billion) 2021.¹⁷ Finally, the growth of the big data market has been equally remarkable. The volume of transactions in big data shot up to 720.7 billion won (\$655.2 million) in 2019 from 201.3 billion (\$183 million) five years earlier (Ministry of Science and ICT 2019).

Reflecting the FinTech industry's rapid growth, the number of investments in FinTech companies by venture capital and private equity firms and through mergers and acquisitions (M&A) jumped from 7 in 2013 to 52 in 2016 before leveling off after that (Figure 9). However, since many FinTech firms are relatively small startups, the FinTech industry's total investment had been insignificant until 2018. For example, the volume ran

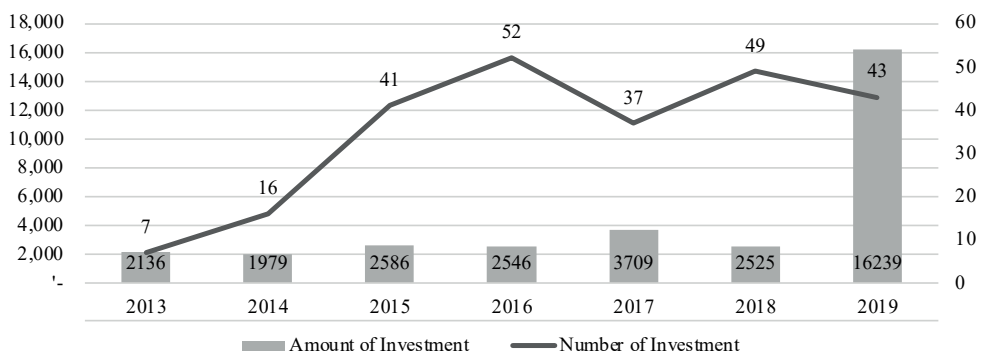
¹⁶ https://www.crowdnet.or.kr/statistics/issued_outline.jsp (accessed on 26 January 2021).

¹⁷ <https://chart-studio.plotly.com/~Parkhyosinfan/13.embed> (accessed on 16 January 2021).

to 3,709 million won (\$3.4 million) in 2017 – a good year for investment. The following year, it skyrocketed when the technology giant Naver Corp launched a financial subsidiary, Naver Financial, by spinning off its Naver Pay. Naver Financial attracted the largest investment amount in Korea's FinTech history (799.2 billion won, or \$726.5 million) from the Mirae Asset Financial Group.

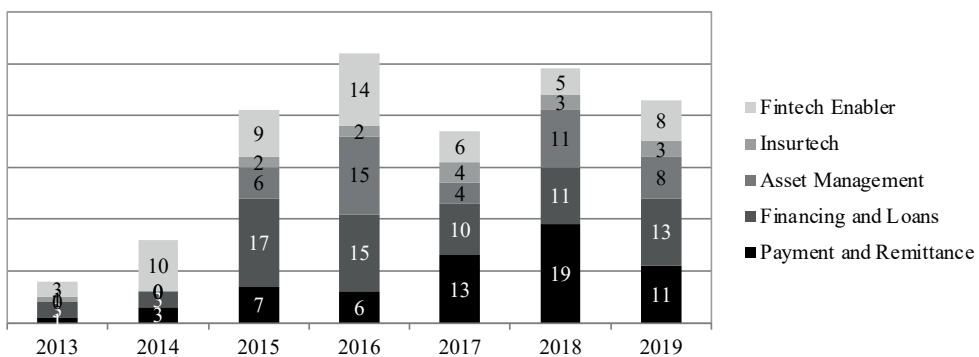
As for the sectoral distribution of investment financing (Figure 10), reflecting their dense population, the easy payment and remittance and lending service providers (mostly P2Ps before their demise in 2020) have accounted for a large share of equity funding in the FinTech industry.

FIGURE 9 INVESTMENT IN FINTECH COMPANIES (MILLION WON)



Source: Samjong KPMG (2020).

FIGURE 10 NUMBER OF EQUITY INVESTMENTS IN FINTECH FIRMS BY SECTOR



Source: Samjong KPMG (2020).

The prevalence of small startups suggests that M&A are likely to help create larger and more efficient firms with scale economies, making the FinTech industry more efficient and resilient to cyclical fluctuations and external shocks. Yet, over the 2016-18 period for which data are available, there were only nine M&As. In 2019, the Financial Services

Commission (FSC) lifted regulations that had restricted incumbent financial firms from equity investment in FinTech firms. It is too early to tell, but so far traditional financial firms have been reluctant to make risky acquisitions as most FinTech firms have yet to prove their long-term viability. As long as they maintain a strong preference for companies with new technologies or at mature development stages with a tested and proven profit model, acquisitions of FinTech companies are not likely to occur as frequently as expected.

Webcash, a small FinTech firm, was the first to list on Korean Securities Dealers Automated Quotations (KOSDAQ) in early 2019. Since then (through May 2021), three other companies have made plans to list. Kakao Pay (a FinTech subsidiary of Internet giant Kakao) and Finger (an IT service management service company) announced their intention to list in 2021. Viva Republica (the corporate name of a mobile financial service platform, Toss), another of the largest FinTech firms, has indicated it may go public in 2022 or 2023. At this stage of development, active initial public offerings (IPOs) of domestic FinTech firms are unlikely to increase due to growing competition and declining profitability in the FinTech industry. The absence of a business ecosystem needed to create a virtuous cycle of investment, exit, and reinvestment appears to be the main reason for an inactive IPO market.

4.3 The role of FinTech firms in the electronic payment industry

E-finance, or electronic payment services, refers to an automated and computerised payment system operated by financial institutions, FinTech firms and non-financial institutions.¹⁸ Electronic financial businesses must register with the FSC and are subject to the EFTA regulations.

E-finance providers comprise a large group of heterogeneous financial and non-financial firms. Only 21 firms registered when the EFTA was enacted in 2007. Since 2015 the growth of electronic financial businesses has accelerated and the number of businesses reached 157 by the end of 2020.¹⁹ Many smaller ones are set up by firms in manufacturing, retail business and distribution to offer an easy payment service to their customers using their shopping platforms or distribution networks. These easy payment providers are required to register with the FSS.

Estimates published by the Economic Statistics System of the BOK show a remarkable increase in usage of various electronic payment services. For example, the number of Payment Gateway (PG) users soared 12-fold between 2008 and 2020. As a share of GDP, the volume of electronic payment services rose to more than 25% in 2020 from less than

¹⁸ E-finance is the terminology used by the Financial Supervisory Service, whereas the Bank of Korea refers to electronic payment services. Methods of e-payment service include electronic prepayment and debit payment, payment gateway (PG), escrow payment, and electronic bill presentment and payment (EBPP) services (Bank of Korea 2021b).

¹⁹ The number of electronic payment service providers estimated by the Bank of Korea is different: as of the end of 2020, there were 166 electronic payment service providers consisting of 144 electronic financial businesses and 23 banks and other financial institutions.

2% in 2008 (Table 5). The PG accounted for the largest market share, close to 70% until 2017, before dropping to 53% in 2020. The main cause of this large increase was the rapid growth of easy payment, which uses PG, since 2008.

TABLE 5 AMOUNTS OF ELECTRONIC PAYMENT SERVICES PROVIDED BY ELECTRONIC FINANCIAL BUSINESSES AND FINANCIAL INSTITUTIONS^a

Services	2008	2012	2015	2019	2020
Payment Gateway (PG)	16,154 (73.1)	40,672 (64.8)	65,397 (71.0)	194,064 (55.7)	258,215 (53.1)
Escrow	1,659 (7.5)	12,174 (19.4)	16,653 (18.1)	35,456 (10.2)	44,041 (9.1)
Electronic Pre-paid Payment Instruments	4,144 (18.7)	6,125 (9.8)	7,524 (8.2)	107,069 (30.8)	171,135 (35.2)
Amount (billion won)					
Electronic Bill Presentment and Payment (EBPP)	157 (0.7)	3,800 (6.1)	2,519 (2.7)	11,575 (3.3)	12,727 (2.6)
Electronic Debit Payment Instruments	- (-)	- (-)	17.2 (0.019)	10.5 (0.003)	17.1 (0.004)
Total	22,113	62,771	92,111	348,175	486,135
Easy payment services ^b	-	-	-	43,764 (12.6)	74,913 (15.4)
Share of PG in nominal GDP (%)	1.40	2.82	3.94	10.11	13.42
Share of total electronic payment services in nominal GDP (%)	1.92	4.36	5.56	18.14	25.26

Source: Bank of Korea, ECOS.

Note: a) Figures in the parentheses are the shares of different instruments in total electronic payment services. b) Figure in the chevron is the share of easy payment services provided by FinTech firms (electronic financial businesses) in total electronic payment services.

The construction of the IT infrastructure discussed in Section 3 laid the foundations for computerising the entire payment and remittance process between buyers and sellers in the markets for goods and services in the early 2000s. Computerisation and the advent of smartphones have, in turn, paved the way for faster, easier and more accurate financial transactions by developing various PG, debit and prepaid electronic payment facilities and fostering mobile payment services.

Realising the potential of the mobile payment market to fundamentally change the mode of financial transactions, in 2014 Kakao, a major Internet portal established in 2010, introduced Kakao Pay, an easy payment provider. A year later, Naver Corp, Korea's largest web portal founded in 1999, launched a similar service, Naver Pay. Smartphone manufacturer Samsung Electronics began popularising the offline mobile payment model

with Samsung Pay's opening in 2015. Following the successful launch of Kakao Pay and Naver Pay, many small FinTech startups began to emerge to produce the same payment services to create a FinTech industry that dominates the easy payment and remittance markets. The subsequent expansion of the FinTech industry has heralded a new era of the e-payment system as the new services were tailored to consumers accustomed to electronic communication and widely used in Korea.

Between 2016 and 2019, the share of easy payment in total e-finance more than doubled, from 7.4% in 2016 to 18% in 2020. Spurred by this rapid growth, the share of FinTech firms in easy payments rose from 63% in January 2019 to 69% on average in the early months of 2020, due in part to the COVID-19 lockdowns that have increased retail e-commerce sales (Bank of Korea 2020). The growth of the easy remittance market has been even more spectacular. The share of easy remittances surged from a minuscule level of 0.14% in 2016 to 4.5% of GDP five years later.

The easy payment market has evolved into an oligopoly controlled by the three large FinTech firms: Naver Financial and Kakao Pay (subsidiaries of the BigTechs Naver and Kakao, respectively) and Payco (owned by a payment gateway NHN). According to Samjong KPMG (2018), when Samsung Pay and SK Pay, in-house companies of Korea's two large conglomerates created for free for their customers, are excluded, the three FinTech companies accounted for more than 80% of easy mobile payment and 100% of online/offline easy payment services in the first quarter of 2018. The concentration of the easy remittance market is even more pronounced: a duopoly ruled over by two FinTech firms, Kakao Pay and Toss, a unicorn operated by Viva Republica Co Ltd, with a 97 percent market share between them.

As discussed earlier, due largely to the short history of the financial platform sector, the easy payment and remittance account for practically all of the total sales of FinTech firms providing financial services, including Naver Financial and Kakao Pay. This lopsided dependence means that the easy payment and remittance service has been synonymous with the FinTech industry for all practical purposes and will remain so for some time to come.

5 GROWTH OF BIGTECHS, FINANCIAL PLATFORMS, P2P INTERMEDIATION AND INTERNET BANKS

5.1 BigTechs and financial platform operators

BigTechs refers to large globally active technology firms or platforms that usually provide web services such as search engines, content provision, social networks and e-commerce to end-users over the Internet. In recent years, BigTechs worldwide have sought to enter financial business by taking advantage of their scale, big data and vast networks of e-consumers of many goods and services. They have been the driving force behind the expansion and diversification of the financial platform business in many advanced and

emerging countries.²⁰ In Korea, there is no official or generally accepted definition of BigTech, although the amendment of the EFTA plans to introduce rules and regulations governing the conduct of these firms.

The four ICT corporations, including a telecom company (KT), two Internet portals (Naver and Kakao), and possibly Viva Republica,²¹ fit the BigTech picture described above.²² However, many other large industrial groups (*chaebols*) – including Samsung, LG and SK – own ICT companies and non-bank financial institutions as subsidiaries. They are likely to establish FinTech firms in the future if they have not done so already. This may indicate that these industrial groups can also be classified as BigTechs from the perspective of this study. Thus, when analysing the role and regulation of the FinTech industry, it is important to make a clear distinction between the non-financial businesses of BigTechs on the one hand, and the financial firms (including FinTech companies) that the BigTechs own or control on the other hand. Section 6 proposes building a wall between the financial and non-financial businesses of BigTechs in Korea. This separation would mean that the non-financial activities of BigTechs are beyond the direct responsibility of Korea's financial regulatory authorities.

The two Internet portals, registered as electronic financial service providers under the EFTA, initially created in-house unlisted FinTech firms – Kakao Pay and Naver Pay – to meet the payment service needs of their customers of e-commerce, content and other non-financial services. By expanding their FinTech subsidiaries, the two portals have taken the lead in developing the easy payment and remittance markets.

Over time, the emergence of the new digital technologies – IoT, sensing, cloud computing, and big data processing – has enabled the two BigTechs to collect and analyse much more customer data from their non-financial business sources than was previously possible. The new technologies, ample data and network externalities of the non-financial platform services have combined to lay the ground for providing various new digital services, mostly in consumer finance. To facilitate the build-up of financial platform operations, the two portals separated their FinTech subsidiaries as independent corporate entities known as Kakao Pay (in 2017) and Naver Financial (in 2019).²³

20 See BIS (2019) on the comparative advantage of BigTechs.

21 All four are classified as ICT firms in Korea. KT has a controlling interest in an Internet bank (K Bank), a credit company and five other financial firms. Viva Republica is the corporate name of Toss, which started as a FinTech firm specialised in easy payment services and still is, although it qualified as an ICT firm when applied for a license for an Internet bank (see chapter 4).

22 As of 3 March 2021, the market capitalisation of Naver was 64.3 trillion won (\$58.5 billion), which is much more than that of the largest four commercial banks combined. Kakao's market capitalization, at 42.8 trillion won (\$38.9 billion), was much lower than that of Naver but higher than the market capitalisation of Korea's largest Kookmin bank (18.9 trillion won, or \$17.2 billion). There are many smaller ones, but their combined market share is too small to have any significant effect on the market. For profiles of these financial platform operators, see Appendix A2.

23 In spinning off their subsidiaries, Kakao retained the name of its affiliate, Kakao Pay, for the new corporation, whereas Naver changed Naver Pay into Naver Financial. Naver has a stake of over 90% in Naver Financial and Kakao has a 56% stake in Kakao Pay. Table A.1 in the Appendix presents the services and products of these four financial platforms - Naver Financial, Kakao Pay, Toss, and Bank Salad - as well as Payco, a large FinTech firm that is not included in the FSC's classification of a financial platform company.

The platform's growth has triggered calls to establish a legal basis for the financial platform business. In particular, the plan to introduce new programmes as part of the EFTA reform in 2020 – such as the My Payment (Payment Initiation Service provider licensing), which opens the door to the provision of many variegated financial services, and a one-stop payment service provider that could allow access to the payment settlement system of the banking sector – has inspired FinTech firms to set off a flurry of development and marketing of new online financial services. These include lending, management of customer accounts at various financial institutions, investment in securities, insurance and other financial advisory services. Most of these services have been delivered in alliance with incumbent banks and other NBFIs as partners.²⁴

Since being incorporated, Naver Financial and Kakao Pay have been looking beyond payment services to expand the scope of the financial platform business. This shift in their strategic focus has prompted other large FinTech firms, including Toss and Payco, to make a similar move. As noted earlier, most FinTech firms started as providers of easy payment remittance services, but there was an exception. Bank Salad, an online financial service application operated by the private company Rainist, has offered financial solutions tailored to end-users by analysing customers' financial data since its inception in 2012.²⁵

Unlike Naver Financial and Kakao Pay, Toss and Bank Salad are independent FinTech firms with no ties with BigTechs. Toss is considered Korea's FinTech success story. It began as a FinTech startup delivering easy remittance services. The firm has been so successful in capturing a large share of the market that it became Korea's first – and only – unicorn. It has obtained an Internet bank license for opening in 2021, solidifying its role as a financial intermediary.

The shares of financial services other than easy payment and remittance provided by the FinTech subsidiaries of the two BigTechs (Naver and Kakao) and Toss are still too small to qualify them as full-fledged financial platform companies. And except for Rainist, their main line of business will continue to be easy payment and remittance services for the foreseeable future. Measured by capital, assets and market valuation, all three FinTech firms are no larger than relatively small traditional financial institutions. For instance, Naver Financial and Kakao Pay are smaller than the top 18 of 79 savings banks with assets greater than one trillion won (\$909 million) (see Table A.2). Therefore, it might

²⁴ See Section 5 for the details of these programmes.

²⁵ In terms of capital and market value, Rainist is a relatively small FinTech firm, but according to a recent estimate it manages more than 405 trillion won (\$368.2 billion) of customers' financial assets through its Bank Salad app. KT, a major telecom company, is expected to take over the firm by paying 33% of its current market value (\$272 million). KT plans to merge the company with its K Internet bank to expand the bank's financial platform business. See *Chosun Ilbo* (16 April 2021) for details.

be more appropriate to refer to them as ‘big FinTech firms’ (BFFs) rather than financial platforms, but we will refer to them as either BFFs or financial platforms in the remainder of this analysis.²⁶

There is little information available on the business profiles and performance of other small-sized financial platforms. As noted in Section 4.1, the KISA estimates the number of FinTech startups at more than 200.²⁷ Many of these are likely to be small platforms. A winning strategy for these small FinTech firms may call for ‘select and concentrate’ targeting of a few non-intermediation financial services. However, a recent trend in the FinTech industry suggests that even small FinTech firms may need to re-bundle their services because their main clients – legacy financial institutions and consumers – prefer to deal with those firms offering a variety of financial services (Lazarow 2019).

Among the BFFs, Naver Financial and Kakao Pay are certain to prevail in capturing a large share of the financial platform business as they did in the easy payment and remittance markets. This is because they can exploit oligopolistic market power stemming from their subsidiary relationship with the BigTechs with a multi-sided business platform. This relationship allows access to a vast amount of data on customers of their parent companies. This access, in turn, helps them benefit from economies of scale and scope. At the same time, their direct interactions with two or more distinct types of other customers in different businesses across the BigTech organisations they belong to create a positive feedback loop that furnishes each other with network benefits. These network advantages will help the two big techs turn the financial platform market into another oligopoly as the leading players.

Since their inception, the three BFFs or financial platforms (Naver Financial, Kakao Pay, and Toss) and Bank Salad have recorded spectacular growth in sales revenues. Between 2016 and 2019, Toss’s sales revenue increased 35-fold and that of Bank Salad 20-fold. The other two platforms have not done as well. Naver Financial managed to double its revenue, while Kakao Pay recorded a 13-fold increase between 2017 and 2019. However, all four have piled up huge operating losses (see the FSS’s Data Analysis, Retrieval and Transfer System (DART)).²⁸

In the case of Toss and Bank Salad, operating losses grew larger than sales revenue between 2016 and 2019, suggesting that they have yet to reach a break-even point. In 2020, the massive increase in the use of easy payment services and the introduction of the open banking system, which lowered the fee they pay to banks for the settlement service, helped Naver Financial and Kakao Pay to post profits, but whether the improvement will continue once Covid-19 is brought under control remains uncertain.

26 They are also comparatively small subsidiaries from their parents’ managerial perspective. Their places in the organisational hierarchy of Naver and Kakao, as measured by the shares in their parent companies’ total sales and operating profits, are insignificant.

27 The number corresponds to 60% of the 345 firms that responded to the KISA survey.

28 <http://dart.fss.or.kr/>

The 2020 EFTA reform established the legal base of the financial platform operation at FinTech firms. However, after the FSC announcement of the reform plan, banks and other legacy financial companies took issue with the reform that, in their view, tilted the playing field against them as it contradicts the rule of imposing the same regulations on the same financial activities. Their concern has led to the reform proposal being amended to level up the EFTA regulations among legacy financial firms and FinTech companies. This regulatory adjustment has allowed incumbent banks to enter the financial platform business and also introduced new regulations to prevent the financial platform business being monopolised by BFFs.

BFFs have begun to offer a large assortment of new financial services – aside from opening deposit accounts and lending – to broaden their business lines and customer bases.²⁹ But if the 2020 EFTA reform slated for creating a level playing field for legacy financial institutions and FinTech firms is carried out, many FinTech firms – both large and small – may lose out in competition against banks and other incumbent financial institutions in the financial platform business because they have yet to achieve scale economies. This competitive weakness means that the reform will worsen the outlook of their future growth, squeezing further the share of FinTech firms share – and particularly of BFFs – in revenues and profits from their financial platform operations. This expectation of deterioration is likely to necessitate a reassessment of their business strategies to determine whether they should remain as non-intermediated financial services providers (fee business only) as before, or diversify into financial intermediation services.

Kakao has already built an in-house online FinTech financial holding company that owns or controls subsidiaries such as an Internet bank and a big FinTech firm, Kakao Pay, which has established its securities company and a non-life insurance firm. Toss will also develop into a similar holding company as it established Toss Insurance, a general agent, in 2018 and will open an Internet bank and a securities firm in 2021. By owning or controlling an Internet bank, Kakao and Toss have both become financial intermediaries.

So far, Naver Financial, Bank Salad and most FinTech startups appear to be following the non-intermediation path of growth, but it is unclear whether they can remain financial supermarkets for non-intermediated financial services, and if so, for how long. This section argues that they are likely to emulate Kakao's and Toss's strategy and evolve into financial intermediaries. One reason for this is that banks and other incumbent financial institutions are bound to exhaust the room for further expansion of the easy payment and remittance markets. Unless they diversify into investment banking, insurance, sales of equity fund products and brokerage services, FinTech firms' financial platform operations are not likely to increase operating profits and revenues, much of which come from their service charges.

²⁹ After the 2020 EFTA reform, which plans to introduce the system of one-stop payment service providers, customers can open payment accounts at the platforms that can be used for payroll transfers and payments for a credit card, insurance premium, utilities and others. Many detractors believe that the payment account is the first step towards allowing large FinTech firms to take deposits, although at present they cannot use deposit proceeds for lending.

Another reason is that they see the rapid growth and profitability of the Kakao Bank and the void of online lending due to the collapse of P2P platforms. These divergent developments provide the opportunity for creating new online markets for financial intermediation to induce them to obtain licenses for Internet banks and online lending firms such as P2P platforms, venture capital firms, or other credit-specialised financial institutions. If their efforts to enter these markets are frustrated, they may demand regulatory relaxation that allows FinTech firms to take deposits and invest the proceeds in specific short-term securities such as treasury bills by way of expanding the scope of the one-stop payment service.

The relationship between FinTech and traditional financial institutions has so far been complementary rather than competitive. The preceding discussion suggests that they will become more competitive than before, although it is expected that for the time being at least, Naver Financial, Rainist and many smaller FinTech firms will maintain a cooperative relationship with incumbent financial institutions by staying with the current model of partnerships with these institutions. Kakao Pay and Toss, on the other hand, are likely to forge ahead with an increasingly competitive relationship with traditional financial firms as they branch into banking and other intermediation activities.

5.2 The rise and fall of the P2P lending business

The P2P lending business was first introduced in 2006 and the first platform, Popfunding, opened its services in August of that year. For the next 14 years until its reorganisation in 2020, the volume of P2P lending grew in leaps and bounds. P2P operators were initially required to register with local governments rather than the FSC. They were subject to supervision under the Money Lending Business Act (MLBA), which provides a framework for registering private money lenders, controlling money lending transactions and prohibiting the charging of excessive interest rates.

Since they registered with city and provincial governments as entities engaged in money lending with a nationwide business domain, the regulatory authorities could not acquire information on their lending activities or place them under formal supervision and regulation to protect investors and borrowers. The regulatory authorities were also apprehensive about the possibility of holding back the growth of this new financial industry by imposing entry and other lending restrictions. As a result, P2P platforms had been free of any supervision, remaining outside the purview of the FSC until a tougher P2P law was enacted to restructure the industry in 2020.

Most P2P operators were informal money lenders. They converted themselves into P2P lenders with the expectation that such an about-face would enhance their legitimacy and credibility as financiers. The new P2P online service title also gave an aura of reliability as a financial intermediary and attracted many ill-informed investors and borrowers.

The borrowers on P2P platforms were SMEs and households that had limited access to the bank loan market. Commercial banks usually do not lend to customers with credit ratings lower than BBB. As shown in Table 6, at the end of June 2018, those with credit ratings lower than BBB accounted for 65% of total P2P lending. The interest rates they paid ranged from 15% to 26.3% per year, much higher than lending rates at commercial banks, which ranged from 3% to 4%.³⁰

TABLE 6 P2P LOAN INTEREST RATE BY CREDIT RATING AT THE END OF JUNE 2018 (%)

	AAA-A	BBB	BB	CCC	CC-D	Average
Loan interest rate (share)	10.4 (19.9)	12.9 (15.4)	15.1 (24.5)	17.4 (25.6)	26.3 (14.6)	14.6

Source: FSS (2020).

Note: P2P loan interest rates by credit rating are based on the survey results of P2P loans at the end of June 2018.

Peer-to-peer lending platforms offer match-making online services between borrowers and lenders and borrowers credit checking for a fee (see Table 7). From the beginning, however, P2P operators failed to gain credibility as reliable intermediaries as they could not forsake their old underground market lending practices.

TABLE 7 P2P LENDING INTEREST RATE AND FEES FOR BORROWERS AND INVESTORS (%)

Lending	Credit loans		Lending with collateral			Total
	Individual	Corporation	Project financing	Real estate	Others	
Range of lending rates	1.0~27.9	2.0~19.9	8.0~25.0	3.1~27.9	4.4~25.0	1.0~27.9
Average interest rate	12.5	12.9	16.3	14.9	14.7	14.9
Average fees for borrowers (average)	2.6	2.8	4.7	2.8	3.0	3.6
Average fees for investors	1.1	0.7	0.4	0.5	0.5	0.4

Source: FSS (2020).

Note: P2P lending rates and fees for borrowers and investors are based on the survey results of P2P loans at the end of June 2018.

30 This raises an interesting question as to why so many creditworthy borrowers (23% with a rating above BBB) sought P2P financing. Many of the P2P borrowers who could qualify for low-cost bank loans chose to obtain financing from a P2P platform because of the speedier processing of loans with relatively loose collateral requirements. They may have been denied bank credit because of the riskiness of the investments they were trying to finance.

At the end of 2015, there were 27 P2P platforms and the total amount of their lending amounted to 37.3 billion won (\$33.9 million). Two years later, the number had jumped to 187 and the volume of lending to 800 billion won (\$727.3 million). Alarmed by the growing number of P2P loans in default and investor losses, the FSS issued P2P lending guidelines in 2017 for investor protection. These guidelines called for improved information disclosure, specialisation in loan intermediation, the separation of investors' funds from the proprietary assets of the P2P business, and caps on the amount of an individual investors' lending to a single borrower at 5 million won (\$4,545.5) and on cumulative lending at 10 million won (\$9,090.9).³¹

However, the guidelines were ineffective in curbing fraudulent or illegal lending practices as they were not legally binding. Realising the guideline's limitations, the FSS inspected the entire P2P platform business in 2018 as part of its preparation for legislating a stricter law to restore the P2P service's credibility. The inspection results published in March 2020 showed how severe the disarray and irregularities of the P2P intermediation had become, with the delinquency rate having tripled to almost 16%.

Before promulgating the Act on Online Investment-linked Financing, or 'P2P law', which took effect on 27 August 2020, the FSC required all P2P lending platforms to file audit reports between 7 July and 2 August. Only 78 out of a total of 237 P2P platforms filed proper audit reports on time to be eligible for business registration under the new P2P lending act; it was expected that only 10 out of 78 firms would qualify for a P2P license. For all practical purposes, the P2P industry had been regulated out. As of February 2021, three platforms had applied for a license. The saga of the P2P fiasco provides a microscopic piece of evidence on the perils of the pall-mall approach of laissez-faire finance.

5.3 Internet banks

On 3 April 2017, K Bank, the first Internet-only bank, began its operations with Korea Telecom as its principal and largest shareholder. The second Internet-only bank, Kakao Bank, launched on 27 June 2017. Toss obtained the third online bank license, and will open its doors in 2021. The creation of Internet-only banks somewhat resembles the push for challenger banks in the UK. These banks are expected to have a considerable impact on the existing banking market's conservative operating environment, though it is too early to tell.

The Act on Special Cases Concerning Establishment and Operation of Internet-only Banks³² stipulates that: (i) only an ICT corporation designated as a non-financial business operator may own up to a maximum of 34% of the voting shares in an Internet-only

31 The P2P Loan Guidelines did not set a lending limit for P2P lenders classified as either corporate or individual expert investors

32 See National Law Information Center (2020) (enforced on 19 May 2020).

bank; (ii) Internet banks can only lend to households and SMEs; (iii) Internet banks are prohibited from the acquisition of equity securities issued by their large shareholders; and (iv) they are subject to Basel III for minimum capital.

Since their inception, the two banks have carved out a sizeable market share of customers by marketing loans with low-lending rates and bank deposits with favourable interest rates. Kakao Bank, which began its service almost three months later than K Bank, has succeeded in outpacing its rival by posting a profit after two years in operation. Indeed, the growth of Kakao bank has been no less than spectacular. According to a 10 June 2021 article in the newspaper *Chosun Ilbo*, the bank's over-the-counter market value was estimated at more than 41 trillion won (\$37.3 billion). It is larger than the market capitalisation of each of the four largest commercial banks in Korea.

Given Kakao Bank's experience, it was only a matter of time before K Bank recorded a profit once its capital and customer base had become large enough to obtain scale economies. After suffering ballooning losses, K Bank has managed to post a profit in 2021.³³

6 REGULATION OF THE FINTECH INDUSTRY

One of the main objectives of this chapter is to ascertain whether the existing regulatory system is comprehensive and flexible enough to cope with the FinTech industry's growth and changes in its relations with legacy financial industries. A preliminary conclusion drawn from the analysis of the preceding sections is that it is not and that it requires reform, although we do not necessarily argue for creating a separate regulatory framework for the FinTech industry, but rather an expansion of the existing financial sector legislation and regulation to accommodate changes in new as well as old financial service provision and providers.

6.1 General observations

We start with some of the principles financial regulatory authorities need to abide by in regulating the FinTech sector.³⁴ One general principle is that it is not desirable to regulate the FinTech sector through legislation alone, but rather use legislation to establish general principles and then set forth regulation for details. This allows a more flexible and swifter regulatory response to developments in the rapidly changing FinTech sector. While one can legislate every decade or so, legislation is a slow process, while regulation can be

33 The poor performance came as KT, K Bank's second-largest shareholder with a 10% stake, failed to raise its stake in the lender to 34% by participating in its recapitalisation after the mobile carrier was investigated over a possible antitrust law violation.

34 Given the novelty of FinTech and the regulatory challenges it poses, there seems to be a lot of 'benchmarking' going on in terms of following the lead of other countries in terms of designing regulatory frameworks for FinTech, especially benchmarking for the UK. While such cross-border fertilization can result in herding trends, a thoughtful approach to such benchmarking can have positive learning effects, especially if such benchmarking is based on careful contextual adjustments of rules.

changed much more quickly and can thus react to market developments more swiftly. The current discussion of the reform of the EFTA 14 years after its initial enactment is a case in point, as the FinTech sector has since then undergone rapid growth and major structural changes.

A second principle is a risk-based approach, which focuses on prudential regulation of financial intermediaries and applies a less rigorous approach to other non-intermediating financial service providers. This would imply regulation (including licensing) and off- and on-site supervision and possible resolution for such intermediaries. However, this principle might ignore the critical position that some non-intermediating financial service providers have in infrastructure services (e.g. cloud and clearance services). So, both business and market linkages have to be taken into account when deciding on a FinTech's regulatory regime.

A third principle is to recognise that regulation of financial services has two opposing objectives. One is to enable efficiency and competition. The other is to protect investors and savers and avoid the failure of non-intermediating institutions to prevent stability risk for other institutions and segments of the financial system. Given that these two objectives can clash, it is important to define whether two different regulatory institutions should be in charge of these objectives or whether the financial regulator should obtain a secondary objective as in the Bank of England with the competition.

These opposing objectives on the FinTech industry regulation also imply that, on the one hand, a light-touch approach is called for in the case of novel products and services (in the form of a regulatory sandbox) or as long as new providers are not directly involved in intermediation and have not taken on a systemically important role in the overall financial system. On the other hand, it requires frequent review of the supervisory status of FinTech companies to see whether they have grown to a relevant size or into a systemically important role that would require including them in the standard regulatory perimeter (in return, requiring a banking license).

Regarding the opposing objectives, one very specific recommendation is to create a forward-looking monitoring unit that is charged with identifying market trends and new products and services and providers. Such a unit would be complementary to other regulatory authorities that focus on specific providers or specific markets and would thus be able to take an encompassing cross-sectional view. It should stand outside the traditional regulatory reporting lines but still draw on the data and skill set of regulatory authorities.

A second specific recommendation would be to create a college of authorities whose jurisdiction is potentially affected by new financial service providers such as BigTech companies. This would include financial supervisors, but also competition authorities, financial crime authorities and data protection authorities. This college should be

a standing committee, regularly meeting to discuss new trends and development and regulatory concerns. A secretariat for this college could be charged with collecting the necessary data to monitor developments effectively.

Turning to the regulation of specific segments of the FinTech market, several market frictions on marketplace funding need to be addressed.³⁵ On the one hand, (i) coordination problems among investors, and thus possible runs, and (ii) adverse selection and moral hazard problems call for prudential regulation. On the other hand, market power and market barriers call for conduct regulation. Even where financial platforms are not intermediaries in a formal sense, as all the risks are with investors, there are still run risks that might call for prudential regulation if (i) a large segment of the population is affected; and (ii) there are connections between regulated institutions and these platforms as in the case when banks own a platform and, for reputational reasons, have to support investors on the platform. More generally, if institutions from other segments of the financial system such as insurance companies or investment funds invest on lending platforms such as P2P, those platforms might become part of the shadow intermediation chain.

Another important aspect, if such platforms keep growing, is orderly resolution, which ensures the continuation of payments to investors if the platform fails. One important concern with lending platforms is when secondary markets are allowed to sell loans originated on such platforms. If such a secondary market is established, this can further increase the interconnectedness between platforms and other parts of the financial system and their potential as a source of systemic risk (Havrylychuk 2018).

For BigTech companies like ICT firms, one critical dimension is their cross-border nature, which, among other things, calls for strict firewalls between financial service providers and other platform businesses. More so than in other cases, where financial institutions are subsidiaries of non-financial companies, the link between BigTechs and their financial service subsidiaries must be clearly defined and monitored, and ideally kept as an arms-length relationship, so that the financial service subsidiary can function without relying on funding and operational support from the parent platform company.

6.2 Reform of EFTA

There is an emerging consensus that it is impractical, if not impossible, to create a separate regulatory framework for a FinTech industry comprising so many heterogeneous firms producing different financial services. It appears that Korea's regulatory authorities also believe that it is far easier administratively – and, in fact, more efficient – to regulate a financial activity regardless of who performs it than it is to regulate specific financial institutions.

35 Some of this is based on Havrylychuk (2018).

This pragmatic approach suggests that the regulatory authorities are content to rely on an amended EFTA (to be legislated in 2021) as the basic framework and complement it with various regulatory rules and laws established for legacy financial institutions for overseeing the FinTech industry. Questions therefore arise as to whether this approach can deal with the rapid growth and multiformity of FinTech firms' platform services, which could render the financial system susceptible to market failures and systemic risk. There is also scepticism as to whether the proposed reform of the EFTA can help level the playing field by removing obstacles that stand in the way of integrating the FinTech industry into the legacy financial system

The current approach seems to allow many new FinTech companies to come into the market to offer various new financial services and products without being subjected to any old or new regulations. Over time, however, if firms belonging to any category of the FinTech industry behave in a way that could disrupt the existing order of financial markets or pose systemic risk, authorities plan to introduce new laws and regulations to put a harness on them and, in some cases, close them down within the purview of the EFTA.

The FSC announced its plans for reforming the EFTA on 24 July 2020 (FSC 2020). The main policy initiatives included in the amendment are divided into four categories: (i) deregulation of FinTech business; (ii) big techs' entrance in the financial industries and associated regulations; (iii) leveling the playing field for incumbent financial companies, FinTech firms, and BFFs; and (iv) a regulatory sandbox.

(i) Deregulation of the FinTech business

- **The relaxation of restrictions on entry into the FinTech industry**, including lowering minimum capital requirements to between 300 million and 20 billion won (\$272,700 to \$18.2 million) from between 500 million and 50 billion won (\$454,500 to \$45.5 million) depending on the size of the FinTech business.
- **Introduction of the My Payment service.** The business licensees, the payment initiation service providers (PISP), are allowed to carry out their customers' payment and transfer orders without actually holding the customers' funds through a single website or mobile app for all customer accounts. My Payment service providers are also required to obtain licenses for My Data business stipulated in the Credit Information Use and Protection Act. The minimum capital requirement for my payment firm is 500 million won (\$454,500)
- **Designation of a one-stop payment service provider.** FinTech firms qualifying for the new scheme are allowed to issue and manage customers' payment accounts, which can be used for payroll transfer and payments for credit cards, insurance premiums, utilities and other financial transactions. The minimum capital

requirement for a license is 20 billion won (\$18.2 million). Opening up the one-stop payment service business to legacy financial firms to create a level playing field is under discussion.

- **Expansion of the scope of business for FinTech firms**, including the introduction of a small-sum charge allowance. Under this reform (i) FinTech firms may provide up to 300,000 won (\$272.7) in small-sum charges to customers; (ii) other credit card functions are restricted and consumer protection measures are ensured; and (iii) the one-time deposit cap for prepaid cards is increased from the current 2 million won (\$1,818.2) to a maximum of 5 million won (\$4,545.5), enabling the usage of prepaid cards in diverse sectors, including home appliances and tourism.

(ii) Big techs' entrance into the financial industries

The EFTA amendment plans to introduce conduct regulations for platform business and partnerships and affiliations between BigTechs and incumbent financial companies. The plan also includes setting up rules and principles for BigTechs entering into financial industries on compulsory liquidation, approval of mergers and acquisitions, business transfer, protection of consumers' capital, and extraterritorial application of domestic regulations.

(iii) Level playing field

This involves plans to level the playing field for financial companies, FinTech firms, and big techs to ensure fair competition and prevent regulatory arbitrage (although no actual plans have so far been announced).

(iv) Regulatory sandbox

A regulatory sandbox is a system that exempts or suspends existing regulations for two years (which can be extended for another two years) for innovative financial services that can enhance the financial industry's competitiveness and consumer benefits. The introduction of the system is stated in the Special Act on Support for Financial Innovation that came into effect on 1 April 2019. The FSC has designated a total of 135 financial services as innovative, including loan comparison platforms, drive-through exchange services, data-based credit rating systems such as telecommunications information or the company's tax information. Two cases have completed testing for evaluation and are already approved for operation. A practical question remains as to what type of law or administrative arrangement is needed to facilitate the marketing of the services and products that have completed the testing.

The discussion of the growth and structural changes in the FinTech industry over the past decade and a half in the preceding sections of this chapter raise several concerns that need to be addressed in regulating FinTech firms to ensure stability and inclusiveness of the FinTech industry and the overall financial system. In what follows, we will discuss some of the outstanding issues.

6.3 FinTech regulations: Specific issues

This section discusses specific challenges in the current regulatory framework for FinTech firms in Korea and suggests reforms.

Integration of the FinTech with incumbent financial industries

The EFTA is a broad regulatory framework covering financial and non-financial firms specialising in the electronic finance business. For more than a decade, regulatory authorities relied on the EFTA as a regulatory system for FinTech firms. During this period, most of the firms were engaged in easy payments and remittances, and there was no need to create a separate regulatory framework for other services.

However, new financial technologies and the growth of financial platform businesses have expanded the scale and scope of FinTech firms' services and changed their relationships with incumbent financial firms to more competitive than complementary. This evolution has created a grey zone of regulation in the EFTA as it has excluded financial platform business in its coverage, necessitating reform of the Act to broaden its regulatory domain.

Even after the reform, however, the amended EFTA will not be comprehensive enough to determine the legality of diverse activities of FinTech firms. To serve as an efficient system of regulation, the Act will need to be complemented by a large number of other laws and regulations including, among others, the Credit Information Use and Protection Act, the Financial Consumer Protection Act, the Special Act on Support for Financial Innovation, and various laws applicable to regulating specific financial services FinTech firms provide, such as P2P platforms, asset management and overseas remittances. This complexity could potentially create room for regulatory arbitrage.

In reforming the EFTA, Korea's regulatory authorities have also moved closer to lowering or dismantling the wall separating the FinTech industry from incumbent financial industries to build a level playing field and allow fair competition for integration among incumbent financial institutions, BFFs and other smaller FinTech companies.

The plan for the integration is likely to face two obstacles. First, the banking and FinTech industries are subject to two different regulatory systems – the Banking Act and EFTA – although they provide the same electronic payment and financial platform services. Second, as Philippon (2016) notes, it is unclear whether a level playing field can be created in a financial system where banking, securities, insurance and FinTech industries are all oligopolies.

At the same time, most FinTech firms, including big FinTech companies, may not be mature enough to provide the same services as incumbents do better or cheaper, and hence may not be ready to be integrated. Under these circumstances, as Philippon (2016) argues, the tenet of a level playing field as an objective of regulation may not necessarily apply to FinTech firms' integration into the legacy financial system.

The preceding argument does not necessarily lend support to the rationale for constructing a separate regulatory framework for the FinTech industry. But given the infancy of the industry, it may be necessary to offer a helping hand to FinTech firms, particularly smaller ones, to improve their competitiveness and speed up the integration process. To this end, the FSC plans to establish a “FinTech assistance centre” as part of the programme arranging policy loans, business consulting, and startup support for the FinTech industry. At this stage the programme details are unknown, but the government backing would be more efficient if it is complemented by an independent body specialised in overseeing FinTech firms’ activities to identify those firms in need of assistance and determine the kinds of support from which they could benefit.

Controlling the oligopolistic structure of the FinTech industry

The FinTech industry has become an oligopoly, controlled by three or four BFFs, which should be brought under tighter regulatory scrutiny.³⁶ As noted in Section 4, it is important to note that the dominating position of BigTechs comes from network externalities and the data–network–activities (DNA) virtuous cycle (BIS 2019), which results in a winner-takes-all equilibrium. To rectify the non-competitive market structure, it would therefore be desirable to pursue a combination of policies that (i) reinforce the role of small and medium-sized FinTech firms, (ii) tighten regulatory control over financial platforms owned by BigTechs, and (iii) encourage competition between financial platforms and incumbent banks and NBFIs by allowing FinTech firms to provide intermediation services.

On balancing the three alternative measures, the FSC has not clarified its policy. The 2020 EFTA reform plan, which has introduced open banking, My Data, My Payment, and one-stop payment service providers, is expected to strengthen the competitiveness of FinTech firms. Much of the competitive gain will evaporate if the reform also allows banks to enter financial platform businesses to help level the playing field.

Building a firewall between the financial and non-financial business of BigTechs

In the regulation of FinTech firms, there is confusion about whether the Internet portals such as Naver and Kakao or their financial subsidiaries should be subjected to regulation. The FSC has no jurisdiction over the Internet portals, but their financial subsidiaries, Naver Financial and Kakao Pay, as independent corporate entities, are under the Commission’s purview. However, unlike Naver, Kakao has licenses for electronic prepayment instruments, PG and escrow services. But as long as it is not engaged in financial platform operations, these services do not make Kakao liable for FSC regulation.

There has been a widely held concern that Naver and Kakao may abuse their financial subsidiaries as their financial arms to help foster the growth of other non-financial firms within their organisations. This concern has underpinned the need to controlling the

³⁶ One-stop payment service operators for which Naver Financial and Kakao Pay are qualified will be subject to the FSC’s stricter regulation for approval of the merger, division, and business transfer.

two BigTechs. To dissipate this fear, the FSC must work with Fair Trade Commission to monitor and tighten its regulation to prevent unfair internal transactions between the BFFs and other non-financial subsidiaries belonging to the same BigTechs. These transactions could be structured to give unfair benefits to the internal firms involved, making them liable for violating the Monopoly Regulation and Fairtrade Act in close inspection.

A case in point is Naver Financial's lending programme in partnership with Mirae Asset Capital, in which only SMEs participating in Naver's smart stores as sellers or buyers could obtain a loan at an interest rate lower than those prevailing in the market. There is a legitimate question as to why these Naver customers are favoured clients at Naver Financial, a public financial institution open to all creditworthy borrowers. Unless it is made accessible to other SMEs, the lending programme could run the risk of being regulated as an unfair internal transaction. Naver Financial claims that it is not ready to use the existing credit rating system or to develop its own credit risk analysis model for lending to SMEs at large. This difficulty cannot serve as an excuse for dealing exclusively with clients of Naver's other businesses when Naver Financial is registered as an independent financial institution.

Regulation of financial subsidiaries of BigTechs will not be enough to prevent the exchanges of inside information and the performance of transactions between financial and non-financial firms in BigTechs. As discussed above, this might involve requiring these large platform companies to introduce firewalls with their financial subsidiaries.

The retail bias of the FinTech industry

FinTech firms, large and small, are biased towards delivering financial services geared to simplify and expedite financial transactions of consumers and financial investors. Because of this bias, there has been a vacuum for online intermediation services, particularly SME lending, and a focus on household financial services, where transaction costs are lower and the clientele is more homogenous.

This problem has become more severe after the restructuring of P2P platforms in 2020. It is unclear whether the new Internet banks will help fill the gap, but it is also uncertain whether the FSC is prepared to charter new online banks and broaden the scope of their lending services. An investigation to analyse the underlying causes of the bias against lending to households and SMEs is overdue.

Consumer protection

The planned reform of the EFTA (FSC 2020) states the need for "broadening the scope of electronic financial transactions from contact-less transaction to digital financial transaction in order to provide a wider range of protection for consumers" but with few details. A review of BFFs' financial platform operations in Section 4 points to the need to strengthen regulations on some of these firms' services for consumer protection. One such

service is the advertising of financial assets and products of other financial institutions; another is the financial advisory service of managing customers' financial accounts and investments in financial assets using robo-advisor algorithms and customer data.

As part of their platform services, FinTech firms advertise and post the relative merits and demerits and recruit investors to sell financial products and services produced by legacy financial companies for a fee. These services are not regulated. In many cases, FinTech firms' responsibilities as agents are not specified, particularly regarding the repayment of investments.

A recent controversy at Toss shows how serious the ambiguity can be if investors misunderstand a FinTech firm's responsibility for redemption. Toss advertised an investment product created by a P2P firm, Tera Funding, on its website. Investors believed that they concluded their investment contracts with Toss acting as the agent of the P2P. Tera Funding was unable to repay the P2P investment when it was due. The investors claim Toss is responsible for covering their losses, but the FinTech firm refuses to accept any responsibility.

Robo-advisors for portfolio management could do better than human counterparts as there is so much room for improvement. More importantly, unlike with human advisors, the fixed cost of installing and managing a software program falls as the number of service clients increases. However, there are important downsides to robo-advising. One such shortcoming is the difficulty of predicting how long it would take for robots or their operators to earn investors' confidence and trust. Another is the danger that algorithms can be manipulated to promote the interest of FinTech firms themselves or their business partners belonging to the same big techs.

Internet banking

According to the law governing Internet banking, only ICT enterprises can hold a majority stake in an Internet bank. The rationale for this restriction is not clear; it is an obvious case of a barrier of entry to online banking. Whatever the justifications for chartering three Internet banks were, K, Kakao and Toss will gain a great deal of leverage in competition vis-à-vis other FinTech firms. The Internet bank charter is a highly sought-after concession and, as such, the regulatory authorities need to articulate their policy of issuing Internet bank licenses in the future.

There is no clear division of labour between Internet banks and BFFs; Internet banks can offer practically all the financial platform services of BFFs. Although BFFs are not allowed to engage in financial intermediation business directly, they can take deposits and lend to their online customers under the guise of a partnership with incumbent banks.

Assuming that the same regulatory standards are applied to these new banks as to existing banks, one can make a case for expanding the Internet banking sector. But it is important to realise that these new entrants face both advantages of lower costs (than

incumbents) and disadvantages of having to meet potentially higher capital requirements if they cannot qualify for the Internal Ratings Based (IRB) capital regulation as they lack enough time-series data.

Construction of a FinTech database

Last but not the least, there is an urgent need to build a database for the FinTech industry. One of the problems confronting the regulators is the deficiency of information and data on the financial activities of FinTech firms, particularly those of small ones that densely populate the FinTech industry. In the aftermath of the 2020 EFTA reform, which has broadened the scope of the financial business of FinTech firms, this problem will become more serious than before. The regulatory authorities cannot regulate what they do not know.

7 CONCLUDING REMARKS

Banks and NBFIs have shown a great deal of interest in digitalising their management of assets and liabilities and internal operations. But their interest has hardly translated into any increase in investment in developing and applying new financial technology. In contrast, the FinTech industry has made great strides in expanding and diversifying its new financial services and products. Most FinTech firms are no longer specialised in the electronic finance business as they have evolved into financial platform operators. However, despite its rapid growth and diversification of services, the FinTech industry remains a relatively small segment of the financial system. It is an infant industry, and like other legacy financial industries, it is characterised by an oligopolistic market structure.

Although FinTech firms are not financial intermediaries (they are not allowed to receive deposits and lend), their relationships with legacy financial institutions have become more competitive than complementary as they are allowed to provide new financial services such as My Payment and one-stop payment facilities. Financial regulatory authorities have yet to clarify whether they will further expand the scope of services to include financial intermediation as part of a scheme to foster FinTech firms in the future. This uncertainty has complicated the design of a regulatory system for the FinTech industry, and will continue to do so.

At present, there is no consolidated regulatory system for the FinTech industry. Most FinTech firms are governed by the EFTA legislated in 2006 if they are specialised in the electronic financial business, particularly easy payments and remittances. But as they have diversified their services beyond the payment business, it has become apparent that the EFTA is outdated and too narrow in coverage to serve as a regulatory system for the FinTech industry.

The amendment of the EFTA, to be legislated in 2021, is expected to provide a legal basis for the conduct of financial platform companies, but even after the reform, the FSC will need to apply a large number of other rules and laws established for regulating legacy financial institutions in overseeing the activities of FinTech firms.

In revamping the EFTA, the FSC affirmed its policy of integrating FinTech businesses into legacy financial institutions. As part of the new policy, the FSC plans to ease entry into the FinTech industry, remove many restrictions on FinTech services, and develop a level playing field for fair competition among incumbent financial firms, FinTech companies and large financial platform operators (BFFs owned by tech giants like Naver and Kakao).

However, there is concern that the integration path will not be smooth as the FSC's plan is likely to run into many regulatory hurdles. One such obstacle is the discriminatory practice of subjecting legacy financial firms and FinTech firms to different rules and regulations even though they provide the same easy payment and platform services, thereby committing the contradiction of 'same activities, different rules'. The legacy financial industries are accountable to regulation within a clearly defined regulatory framework, such as the banking law, but it is unclear how the FSC will apply so many different rules and laws, many of which were established for incumbent financial institutions, in regulating different activities of FinTech firms.

Another difficulty is that the FSC is likely to find it challenging to level the playing field for both legacy and FinTech firms for two reasons. Most FinTech firms, including financial platform operators, are providers of fee-based financial services. By and large, they still maintain complementary rather than competitive relationships with incumbent financial firms. This complementary relationship makes it difficult to define a level playing field for banking, securities, insurance and FinTech industries, and even more so when they are all oligopolies. Another reason is that the FinTech business is a young and immature industry. There is no reason to believe that the FinTech firms can provide the same services as legacy firms do cheaper and better. As Philippon (2019) notes, the principle of leveling the playing field may not apply to the integration of FinTech firms.

Before taking any concrete steps for the integration, the regulatory authorities may need to clarify many of the basic characteristic features of the FinTech industry, beginning with definitions of a FinTech firm and a financial platform operator, and consolidate the regulatory framework for the FinTech industry. Beyond these definitions, our analysis points to specific policy recommendations, both at the institutional and legislative/regulatory level: (i) create a forward-looking monitoring unit charged with identifying market trends; (ii) create a college of authorities whose jurisdiction is potentially affected by FinTech and big tech companies; (iii) force large platform firms to establish firewalls between their platform business and financial service subsidiaries; (iv) consider a common financial sector regulatory framework, which helps incumbent banks and

FinTech companies compete on a level playing field; (v) make competition an explicit mandate of regulatory authorities of banks and FinTech companies; and (vi) strengthen consumer protection.

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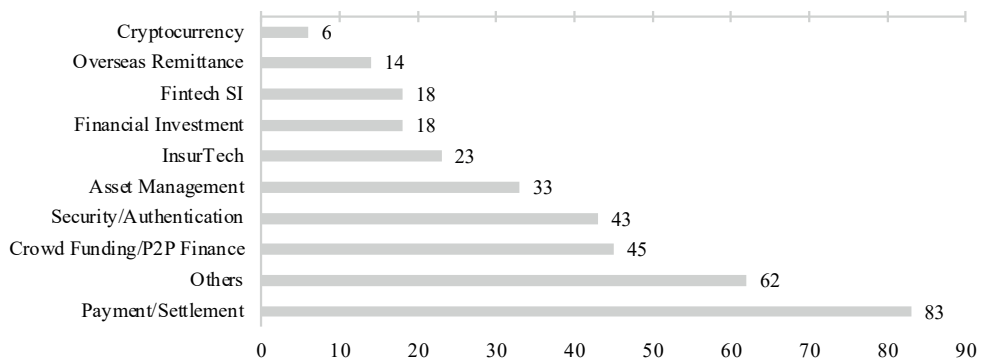
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APPENDIX A1. ESTIMATES OF FINTECH FIRMS

The Korea Internet and Security Agency (KISA) estimates that there were 580 firms in 2019. Of these, only 345 companies responded to its annual survey. The KISA classifies these into ten different categories in terms of their business operations, as shown in Figure A.1. This study does not use either the number or the classification of the KISA. The Agency's numbers, which are grossly underestimated, are reported to gauge the relative shares of different categories of firms in the FinTech industry. The number of "other FinTech firms" is the second largest, following payment and remittance firms. These include:

- DATAHERO (robo-advisor, data service, automation contents and data platforms)
- Finmart Co., Ltd. (a customised financial information comparison platform for customers to select appropriate financial products)
- Pience (identifying the purpose of a customer's location and delivering optimal information through the combination of location-based service and financial services)

FIGURE A.1 NUMBER OF KOREAN FINTECH COMPANIES BY MAJOR CATEGORY AS OF 2019 (ESTIMATES BY KISA)



Source: Korea Internet & Security Agency (2020).

TABLE A.1 FINANCIAL SERVICES AND PRODUCTS PROVIDED BY BFFS

Category	Services & Products	Naver financial	Kakao pay	Toss	Payco	Bank Salad
E-finance Business	Easy Payment & Remittance	✓	✓	✓	✓	✓
	Electronic Pre-paid Payment Instruments	(Registered on Nov 1, 2019)	(Registered on Apr 14, 2017) ²	(Registered on Sept 7, 2015)	(Registered on Apr 11, 2017)	(Registered on Jun 21, 2019)
	Escrow	(In partnership with Mirae Asset Capital)	(Kakao Corp's acquisition of Escrow license)			X
Non-E-finance Business ^a	Electronic Debit Payment Instruments	(Registered on Oct 8, 2020)	(Registered on Apr 14, 2017)	(Registered on Jul 20, 2017)		X
	Payment account: One-stop payment providers	✓	✓	✓	✓	✓
	Lending (In partnership)	(Mirae Asset Capital)	(Intermediary platform for loans from multiple financial institutions)	X	X	X
	CMA (In partnership)	(Mirae Asset Daewoo)	(NH Investment & Securities)	(Shinhan Investment & Securities)	(Hanwha Investment & Securities)	X
	Credit Card issuance and selection (advisory and Affiliate Programs)	(Banks and credit card companies)	(Banks)	(Hana Card)	(Lotte Card)	X (Advising credit card selection)

Category	Services & Products	Naver financial	Kakao pay	Toss	Payco	Bank Salad
Non-E-finance Business ^a (contd.)	Money Change (In partnership with banks)	✓	✓	✓	✓	✓
	Securities Business	(Partnership with Mirae Asset Daewoo)	(Kakao pay Securities established in Feb 2020)	(Obtained a preliminary license for a securities firm)	(Partnership with Hanwha Investment & Securities)	X
	Advertisement of Other Financial Institutions' products and services	✓	✓	✓	✓	✓
	Consolidation of Financial Accounts from Different Sources	✓	✓	✓	✓	✓
	Platform Services for Financial Investments	✓	✓	✓	✓	✓
	Insurance	"NF Insurance" as general agent (GA)	Acquisition of INBYU ^c	"Toss Insurance" as general agent (GA)	(Advisory services for insurance products)	X
	Internet Bank	X	*Kakao Bank	*Toss Bank	X	X

Source: Author's compilations based upon reports published by respective FinTech firms and Financial Supervisory Services.

Note: a) Excluding Bank Salad, the other large Fin Tech firms started offering many financial services (included in this table) other than easy payment and remittance services in 2020. Exceptions are CMA, credit card, money change and internet banking services before 2020. 2) Kakao Corp. registered as an electronic financial business on July 19, 2007, and Kakao pay on April 14, 2017. Electronic financial businesses are allowed to own and manage other non-financial firms. c) Kakao pay acquired the online insurance startup INBYU in July 2019.

TABLE A.2 FINANCIAL INDICATORS OF FIVE FINTECH FIRMS

Category	Naver financial	Kakao pay	Toss (Viva Republica)	Payco	Bank Salad (Rainist)
Assets^a in billion won (\$ million)	851.8 (774.4)	525.8 (478.0)	297.2 (270.2)	331.0 (300.9)	-
Liabilities^a in billion won (\$ million)	828.8 (753.4)	476.8 (433.5)	161.2 (146.5)	59.2 (53.8)	-
Capital^a in billion won (\$ million)	5.0 (4.5)	9.5 (8.6) <hr/> 5.5 (5.0) ^c	13.8 (12.5)	7.3 (6.6)	4.2 (3.8)
Market valuation^b in trillion won (\$ billion)	8.7 (7.9)	9.8 (8.9)	5.3 (4.8)	1.5 (1.4)	0.6 (0.5)
Membership^d in million	30	30	17	10	7
MAU^e in million	14	20	10	4.1	1.7

Source: Author's compilation based on FSS, DART; FSS (2021); NICE Information Service (2020); Seo (2020); Kim (2021); EBEST Investment & Securities (2020); Sung (2019); Park (2020); Payco (2020).

Notes: Won values are converted into US dollar amounts using the exchange rate of 1,100 won to the dollar. a) As of December 2019. b) As of October 2020 and for Bank Salad, as of August 2019. c) Excluding the holdings of the Ant in China. d) Cumulative membership of Naver financial, Kakao pay and Payco as of December 2019; for Toss and Bank Salad, as of April 2020. e) Monthly active users (MAU) as of the 4th quarter of 2019.

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Financial innovation has been a characteristic of thriving and efficient financial systems for centuries. The latest wave of financial innovation related to digitalisation, however, has the potential to change the landscape of financial service providers quite dramatically, including with the emergence of FinTech and BigTech companies as major players in the financial system. This book comprises five papers that analyse the pattern and progress of financial digitalisation across the globe and across a number of different dimensions and draw conclusions for regulatory policies.

The first four chapters draw on international experience and comparison, discussing the impact of financial digitalisation on the future structure of the financial system, providing a literature survey on the impact of financial digitalisation on the efficiency and stability of the financial system, focusing on innovations in money and payments, specifically the combination of new forms of digital assets with new forms of payment technology, and describing the regulation of cryptocurrencies across different jurisdictions.

The final chapter tries to adopt these lessons to the specific case of Korea, documenting the oligopolistic structure of Korean banking and the limited innovation that has taken place within the sector. It documents the development of the FinTech sector over the past decade and the regulatory challenges that this has posed. It ends with general and Korea-specific recommendations for regulatory reform.

The authors of the different chapters are among the leading experts in the field, combining academic excellence with experience in the public and private sectors.

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