Policy Principles for Fintech

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Recent technological advances offer new opportunities for financial service providers and the consumers and businesses that use them, improving quality and lowering costs.

The financial services industry is an information industry, where money is simply a nominal representation of real value (goods or services). Yet, compared with some information industries that reaped disruptive gains from information technology (IT), the financial-services industry has experienced mostly incremental innovation. For example, the creation of the Internet enabled innovations to route voice traffic over networks, changing telephony from an expensive, intermediary-driven system to the efficient global system we have today. The financial services industry is potentially at a similar inflection point, where expensive, dedicated single-purpose networks and systems are giving way to cheaper, general-purpose ones. Collectively referred to as "fintech," the businesses pushing this transformation promise improvements in financial-services industry productivity, greater ease and lower prices for consumers, and greater access for those now underserved by the financial-services sector. These innovations are poised to radically improve how consumers and businesses transfer money and make payments, store value, save and invest, borrow, and insure themselves against risk. But achieving this will require policymakers to actively support fintech transformation.

Fintech, a combination of the words "financial technology," is a somewhat nebulous term that refers to the set of companies focused on using the latest innovations in information technology to improve financial services. These improvements benefit consumers and businesses by creating more convenient, higher quality, and cheaper services. By lowering costs, more consumers can not only save money, but also take advantage of financial

services and have greater access to capital; this includes those traditionally underserved by the financial industry.[1]

Many fintech companies are experimenting with new business models. For example, companies such as Taulia Inc. offer alternative-lending services, such as supply chain finance, which gives businesses easier access to capital to help with paying their bills while they wait for their customers' payments to process. Similarly, peer-to-peer lending marketplaces, such as Prosper, establish direct channels between borrowers and lenders, taking a small fee for each transaction. Alternative lending is not the only business-model innovation; however, fintech companies are also changing their business models for payments, transfers, personal finance, and insurance.

Fintech companies, including start-ups and established financial-services organizations, also offer solutions that are reducing costs and boosting the performance of financial services, such as by eliminating intermediaries. For example, crowdfunding platforms connect entrepreneurs directly with small investors, circumventing the traditional banking system and reducing intermediation costs associated with bank loans. Optimistic about the potential benefits of fintech, investors poured $22.3 billion into fintech start-ups worldwide in 2015, an increase of 75 percent from the year before.[2]

As a result, competition is increasing in the fintech sector. In 2015, the *Economist* estimated that there were over 4,000 active fintech start-ups, and more than a dozen are valued at over $1 billion.[3] McKinsey estimates that new entrants will increasingly battle for customers with incumbents over the next decade, with the top five banking businesses (i.e., consumer finance, mortgages, lending, retail payments, and wealth management) at risk of losing between 20 and 60 percent of their profits by 2025.[4] Existing financial institutions have also embraced fintech, although some at a slower pace. The percentage of banks with an innovation strategy—a plan to use advancements in technology to gain competitiveness—increased from 37 percent in 2009 to 73 percent in 2015.[5] Some financial institutions are forming strategic partnerships with technology companies.[6] Others have set up their own venture capital firms to acquire or invest in fintech start-ups, have created innovation labs, incubator and accelerator programs, or have in-house development departments to develop technological solutions.[7]

There are a number of challenges confronting the development and adoption of fintech firms' services. Fintech companies face a complex regulatory environment that was designed for older business models and is slow to adopt change. As fintech firms operate internationally, they must also contend with restrictions on where they can store and transmit data and with regulations designed to protect domestic incumbents. And the broader financial-services sector continues to face a number of evolving security threats, from data breaches to large-scale theft and fraud.

To address these challenges and capture the benefits of financial innovation, policymakers should work to encourage the growth of fintech. This report offers 10 principles to guide policymakers in their approach to this innovative new sector:

1. Support fintech transformation.
2. Work to ensure that regulations encourage innovation in financial services.
3. Remove duplicative regulations in financial services.
4. Regulate fintech at the national level.
5. Use regulatory enforcement actions to incentivize fintech companies to protect consumers.
6. Create tech-neutral rules for fintech.
7. Create a level playing field between incumbents and new entrants.
8. Promote fintech cybersecurity.
9. Support standards development and financial data interoperability.
10. Promote international harmonization of laws affecting the financial services sector.

PRODUCTIVITY POTENTIAL FROM FINTECH

The financial services industry has a long history of using IT for innovations. In the 1950s, the Diners' Club and American Express—then a mail-delivery company—brought consumers the first credit cards to ease the burden of carrying cash.[8] In the late 1960s, banks introduced self-service ATMs to improve customer convenience and make their tellers more efficient.[9] In the 1970s, stock exchanges began to replace manual floor-trading with electronic stock-trading to make trading faster and cheaper.[10] In the 1980s, banks began experiments with online banking, using computers and networks to allow consumers to make bank transactions whenever they wanted.[11] In the 1990s, banks began embracing Internet banking, and in the 2000s, most adopted mobile banking.[12]

Because of the adoption of IT, labor productivity—the increase in output produced by workers given a unit of effort—has increased across the financial-services sector. For example, U.S. commercial banking labor productivity grew by 153 percent from 1987 to 2015, twice as fast as labor productivity in the overall economy.[13] IT has allowed firms to pick off the "low-hanging fruit" of relatively easy-to-improve efficiencies, such as automating routine tasks. For example, credit unions automate their back-end processes, such as data entry, saving them hundred of hours a month in routine IT tasks.[14] In addition, IT enables businesses to fundamentally reengineer processes, including organizational changes. For example, electronic and mobile banking offered banks a new way to communicate with their customers, reducing the need for bank branches and changing the role of tellers.[15] Similarly, self-service options, such as automated ATMs, have helped banks and financial-service providers reduce their costs and boost their productivity.[16]

But the next wave of IT-based financial-services productivity will depend on significantly different business and service models, with technology significantly reducing the role of the
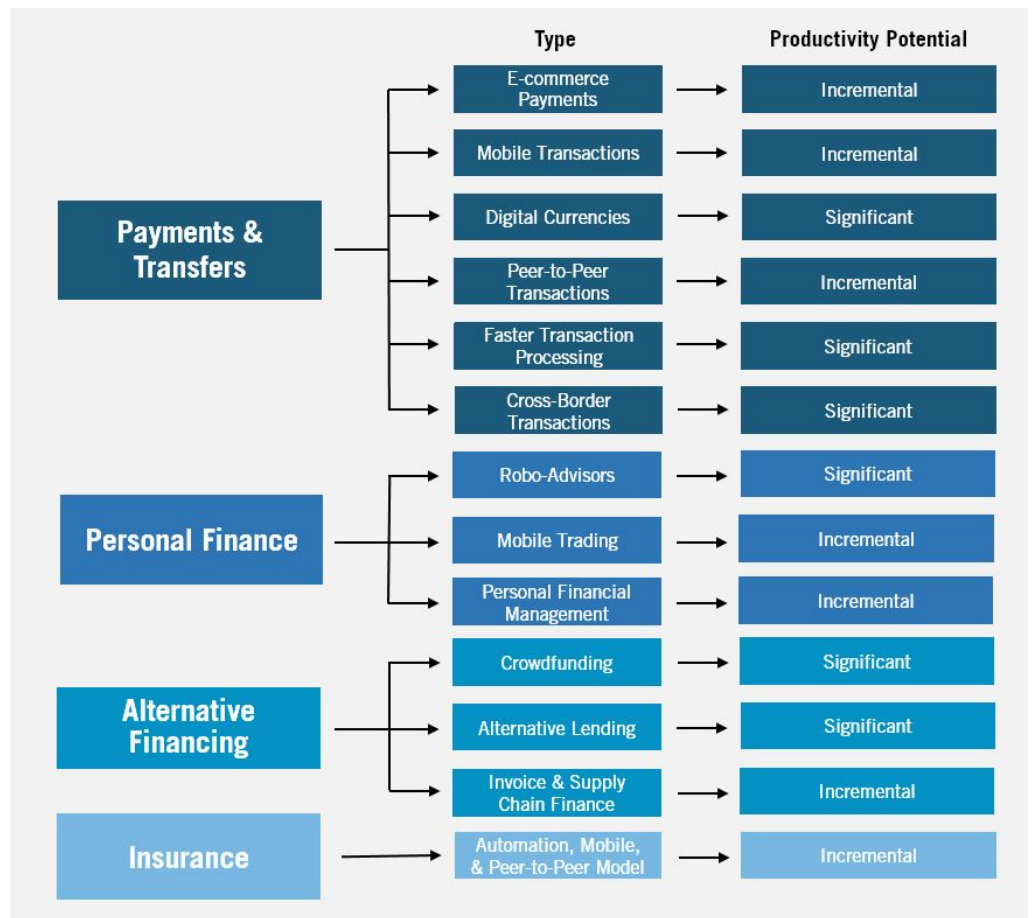
intermediary. By streamlining infrastructure, fintech companies can reduce the number of intermediaries and, by extenstion, the costs of providing financial services. For example, peer-to-peer lending platforms connect lenders directly with borrowers, removing traditional financial institutions from the process altogether and offering lenders higher rates and borrowers greater flexibility in their loans. This opportunity extends beyond lending, as new fintech companies take over payment processes historically controlled by banks. And in the world of personal finance, companies such as Wealthfront and Betterment are using IT to circumvent traditional investment advisers and help consumers plan their investments with minimal fees.[17] By cutting out intermediaries, fintech firms are able to pass cost savings to consumers.

Fintech is reducing employee and material costs, and cutting out intermediaries to create lean and efficient financial services.

In addition to reducing intermediation costs, fintech will continue to enhance productivity for both the financial-services sector and its customers. Fintech options are reducing both material and employee costs for the industry. For example, fintech enables workers in the financial services sector to be more efficient, reducing the burden of employee costs on businesses. One report estimated that up to 30 percent of employees in the banking industry could be replaced with technology by 2025.[18] Similarly, businesses are digitizing their services to cut first-order material costs. For example, the invoice financial company Taulia offers a service called "dynamic discounting," which uses e-invoicing to allow a supplier to opt for early payment in return for a discount. This process not only ensures greater business efficiencies for Taulia's internal operations and its customers, but could reduce material waste by an estimated 1.5 million pounds of carbon dioxide and 100,000 pounds of physical waste between 2015 and 2018.[19] Fintech also creates markets that allocate resources more efficiently. For example, online peer-to-peer lending firms create marketplaces where buyers connect directly with sellers, helping to better match supply with demand.

Each category of fintech has a varying degree of potential productivity gains, where fintech applications that are more likely to reduce intermediation costs offer significant gains and those that simply enhance financial services, such as by making financial services more efficient or convenient, offer incremental productivity gains. (See Figure 1.) For example, certain innovations in payment, such as mobile wallets, enhance users' experience but may not offer the same disruptive productivity gains as peer-to-peer lending, which reduces the need for traditional intermediaries.

Figure 1: Potential productivity gains across four financial services sectors.

	Type	Productivity Potential
Payments & Transfers	E-commerce Payments	Incremental
	Mobile Transactions	Incremental
	Digital Currencies	Significant
	Peer-to-Peer Transactions	Incremental
	Faster Transaction Processing	Significant
	Cross-Border Transactions	Significant
Personal Finance	Robo-Advisors	Significant
	Mobile Trading	Incremental
	Personal Financial Management	Incremental
Alternative Financing	Crowdfunding	Significant
	Alternative Lending	Significant
	Invoice & Supply Chain Finance	Incremental
Insurance	Automation, Mobile, & Peer-to-Peer Model	Incremental

The following section will discuss the major categories of financial services affected by recent innovations, describing the technologies that enable them and the innovative services they offer.

PAYMENTS AND TRANSFERS

Fintech is changing how people transmit money, both in the form of payments—where money is exchanged for something of value—and transfers—where money is transmitted between individuals or organizations. Many financial companies are using new technologies to create faster, cheaper, and more convenient payment and transfer systems. As of November 2015, 8 of the 18 fintech start-ups valued above $1 billion worldwide primarily offered payment or transfer systems.[20] Fintech is changing how payments and transfers occur in several major areas, including e-commerce payments, mobile payments and transfers, person-to-person transactions, faster payment processing, digital currencies and blockchains, and cross-border transactions. In all of these areas, fintech promises new services and lower transaction costs.

Figure 2: The eight payment and transfer fintech start-ups that are valued above $1 billion as of November 2015.[21]

Payment Company	Valuation	Description
Square	$6.00 billion	Square offers proximity payment terminals that process mobile and credit-card payments.
Stripe	$5.00 billion	Stripe is an online payments platform that allows merchants to accept credit-card payments and offers data-analytics services.
One97 Communications	$4.00 billion	One97 is a mobile wallet service and mobile commerce platform.
Powa Technologies	$2.70 billion	Powa provides payment and infrastructure technology to the e-commerce industry.
Mozido	$2.39 billion	Mozido is a mobile payments platform for people with mobile phones but no bank accounts.
Adyen	$2.30 billion	Adyen is a payment platform for e-commerce, mobile, and point-of-sale payments.
Klarna	$2.25 billion	Klarna offers payment process services to online merchants and retailers.
TransferWise	$1.01 billion	TransferWise offers a global transfer system used for remittances.

E-Commerce Payments

E-commerce grew rapidly in the 1990s, as consumers and businesses used the Internet to conduct business online efficiently and conveniently. Enabled by various applications—web services (e.g., email and online shopping carts) and secure communication protocols—companies could sell goods directly to users online. Online sales have steadily risen. For example, retail e-commerce sales in the United States increased from $4.9 billion in 1998 to $342 billion in 2015.[22]

Online merchants receive payments using payment gateways—processors that communicate between a merchant's bank and a consumer's bank—to facilitate and secure online transactions.[23] Credit cards are the most popular online method for payment gateways, followed by PayPal accounts—which connect to a consumer's credit card or bank account but keep the card information undisclosed to the merchant.[24]

Fintech companies have worked to improve this process, such as by incorporating application program interface (API) software—where developers create customized software solutions—into their products to interact with users, better analyze business and consumer data, allowing users to easily sign up for accounts, send payments to merchants, and get instant approval of payments.[25] Amazon has taken e-commerce a step further, offering its users physical buttons—called Dash Buttons—that connect to the Internet.

These are correlated with a brand item (e.g., Tide laundry detergent), so that when Amazon users run out of a particular item, they can push the button and automatically reorder the product from Amazon's website.[26]

Mobile Payments and Transfers

Many financial companies capitalize on the number of consumers who use smartphones, offering mobile payment solutions for both online and offline payments as well as transferring money to others.[27] Mobile payments and transfers are facilitated by mobile banking and mobile wallets.

Mobile Banking

Mobile banking allows customers of a financial institution to use a mobile device to conduct financial transactions, such as paying bills, transferring money, making a deposit, or checking their balance. Mobile banking, like online banking on a computer, lowers costs for the financial institution and saves time and money for the consumer. For example, Bank of America offers a downloadable smartphone app that allows customers to access their account information, transfer funds, and deposit checks electronically, saving them a trip to the bank or ATM.[28] These applications continue to grow in popularity. According to the Federal Reserve, 52 percent of smartphone-owning U.S. adults with a bank account used mobile banking in 2015, and 11 percent said they will adopt mobile banking within the next year.[29]

Mobile Wallets

Mobile wallets are the digital equivalent of a physical wallet, storing digital valuables, such as personal identification, transportation tickets, and credit card or bank account information on a smartphone. Unlike physical wallets that simply store information, however, mobile wallets can transmit payments or execute transfers between parties. Mobile-wallet services offer consumers the convenience of instant transactions, without entering credit-card information and pin numbers each time they make an online transaction. Some mobile-wallet services remove intermediation costs by creating direct relationships with credit-card companies, passing along the savings to consumers and merchants.[30] Mobile wallets can either be remote mobile wallets or proximity mobile wallets (or function as both).

Remote mobile wallets, also called digital wallets or cloud wallets, can transmit payments or transfers between two or more parties that are not physically close to one another.[31] In a remote mobile wallet, the payment information used for online payments (e.g., credit-card account number) and user identification are stored in the cloud, so while remote mobile wallets often function through a mobile device, it is not necessary. Other remote mobile wallets act like debit cards, using a central account that stores value, so that when the wallet is used for purchases, the total of each transaction is subtracted from the wallet's balance. If the balance approaches zero, users can reload the wallet using their bank account. In addition, consumers use remote mobile wallets to transfer money directly from their bank account to other individuals. For example, PayPal's mobile wallet allows this.[32]

Increasingly, mobile users around the world are opting to use remote mobile wallets to make transactions. In the second quarter of 2015, 21 percent of online transactions in Asia, 30 percent in Europe, and 27 percent in the United States used remote mobile wallets to make payments.[33] In some developing countries, remote mobile wallets have become decoupled from bank accounts. Referred to as "mobile money," this approach allows companies to provide financial services such as cashless payments, transfers, and deposits to those underserved by banks. For example, M-Pesa is a popular mobile money system facilitated by remote mobile wallets in Nairobi, Kenya.[34] This system uses SMS-text messaging rather than more advanced mobile technology, but it does fill a niche in an unbanked market by providing access to financial services.

Proximity mobile wallets also store identification and payment credentials, enabling consumers to use mobile devices to make payments at physical locations by authorizing and completing transactions that are in close proximity. To set up a proximity mobile wallet, users scan their credit cards onto a proximity mobile wallet using their smartphone or smartwatch. When making a purchase, users simply touch or wave the mobile device at physical point-of-sale (POS) terminals. This is a convenient method for consumers, and offers merchants—many of whom used to operate as cash-only businesses—a cost-effective alternative for receiving payment.[35] The payment credentials in a proximity mobile wallet can be securely exchanged with a POS terminal using a variety of different technologies described in the box below.

BOX 1: PROXIMITY PAYMENT TECHNOLOGY

Proximity payments are supported by several different technologies.

1. Near-field communication (NFC) is a wireless communication technology used to exchange data between a device and POS terminal.[36] To make a payment, consumers place their NFC-equipped smartphone a few centimeters from the POS terminal with a NFC-tag reader.

2. Host-card emulation (HCE) is open-source software that stores a user's information in the cloud rather than on a physical device, using NFC to transfer the information to a POS terminal at checkout.[37] When HCE is used, software creates a virtual representation of the payment information and transfers the information from the device directly to a POS terminal using NFC to execute the payment.

3. QR codes are machine-readable codes displayed from apps on a user's phone that a POS can read to authenticate transactions with user information stored in the cloud.[38] Merchants scan the code to start the transaction.

4. Bluetooth low-energy (BLE) beacons are devices that use sensors to detect a smartphone using wireless data transfer technology.[39] By using BLE-powered beacons, merchants can be alerted instantly of customers' presence, send coupons to nearby customers, or enable hands-free payments at POS terminals.[40]

Merchants can use fixed or mobile POS terminals to accept payments from proximity wallets. Fixed POS terminals use a standard credit-card reader with a wired connection at a store's checkout counter, while mobile POS terminals use a special attachment that turns smartphones, tablets, or wireless devices into portable POS terminals. Fixed POS terminals offer a number of ancillary services to merchants to manage their sales, such as storing information on customers' purchase histories and inventory, and have been upgraded in recent years to accept mobile payments.[41] In contrast, mobile POS terminals, such as Square, are easily portable and offer merchants more flexibility to take payments from customers anywhere in their store. Mobile POS can also support both card transactions and proximity mobile payments.[42]

Person-to-Person Payments and Transfers

The growing prevalence of online and mobile payments and the popularity of e-commerce platforms has given rise to person-to-person (P2P) transactions, in which users can transfer value from their bank account or credit card to someone else's account, whether as a payment or money transfer. Consumers use these services to transfer funds to friends or family or pay "micro-merchants" (e.g., babysitters, repairmen, individuals selling goods over sites like eBay). Prior to the Internet, individuals exchanged value with cash or checks, or had to go in-person to a bank or money-transfer company like Western Union.[43]

Over the last decade, a number of fintech companies began to offer P2P platforms that allow consumers to transfer money from their bank account or credit card to another person's account over the Internet, via text messaging, or using an app on a smartphone.[44] P2P payment systems offer a convenient and fast way for users to pay one another electronically, reducing the hassle of carrying around cash or credit cards. While PayPal was a pioneer in P2P payments, creating a third-party vendor that transferred and accepted funds from banks and credit cards, a number of banks and other financial services companies have started to offer new and innovative services.[45]

These services charge little to no fee per transaction, depending on the type of account.[46] For example, Venmo charges a 3 percent fee if a user wants to pay from a credit-card account, but no fee from a debit account or Venmo's own account system.[47] Other P2P payment applications, such as Dwolla, charge a monthly fee (starting at $25) to use the service, but no transaction fees.[48] Banks such as Bank of America, JP Morgan Chase, Wells Fargo, and Capital One have also developed their own P2P mobile payment services that do not charge a fee for certain transactions.[49] As a result of their convenience and low costs, in the United States, mobile P2P transaction volume—including payments, transfers, international remittances, fees, and wages—could grow from an estimated $16 billion in 2015 to $86 billion in 2018.[50]

Faster Transaction Processing

Payment processors are companies that manage transactions for consumers using a variety of different payment methods (e.g., credit cards, debit cards, online checks), and enable merchants to receive payments. In the past, financial institutions, usually banks, authorized

transactions by sending an authorization code to a merchant to let them know the cardholder's line of credit or if the account had enough funds to cover the transaction amount. Financial institutions would then aggregate all of the transactions into batches, and settle each batch from a particular merchant all at the same time—typically within 48 hours of the transaction.[51] For example, the Automated Clearing House Network (ACH) is a batch-processing system that moves money directly from one bank account to another through direct deposit.[52] However, batch processing is slow and can lead to extended payment delays for businesses and consumers if errors occur.[53]

New technology has enabled customers, businesses, and financial institutions to conduct payments without the need for batch processing, resolving transactions in real- or near real-time. For example, several large banks, including JPMorgan Chase, Bank of America, and Wells Fargo, use a system called clearXchange that allows their customers to conduct P2P payments that clear in real time.[54] To be sure, batch processing is still very popular in the United States, with some payment companies like WePay choosing to use the ACH network because it is cheaper, albeit slower, than both clearXchange and credit-card processing.[55]

New technology has enabled customers, businesses, and financial institutions to conduct payments in real- or near real-time.

Several governments around the world have encouraged the move to instant payments, creating policies to facilitate the adoption of real-time or near-real-time payment infrastructures—national payment systems that are supported by technology-driven processes, which help facilitate instant transaction processing speeds across numerous financial businesses and institutions.[56] For example, the U.K. government and private industry developed the nonprofit-run Faster Payments clearing system, which is overseen by the Bank of England and open to any financial institution able to meet the necessary technical requirements; the system offers customers near-real time processing speeds for a variety of different financial services companies, such as the mobile payment company Paym.[57] In the United States, banks, credit-card companies, and tech companies are innovating to improve transaction speeds.[58] For example, Square Instant Deposit allows businesses and consumers to automatically deposit funds whenever they want.[59] In addition, the U.S. Federal Reserve has organized a Faster Payments Task Force to assess how to create faster payments for providers across the payments' industry.[60] However, no national instant-payment system has yet emerged.

Digital Currency Businesses

Over the last few years, many fintech companies have developed financial services around digital currencies. While both represent information, digital currencies exist purely in electronic form, while physical currencies use paper and metal (i.e., bills and coins) to represent information.[61] A digital currency can either be issued by a central authority or generated in a decentralized network where no single entity controls its functions. These digital currencies, called cryptocurrencies, use encryption techniques to regulate and decentralize the creation of units of currency and verify the transfer of funds. In the mid- to late-2000s, cryptographers created decentralized cryptocurrencies as a way to exchange value outside the traditional banking system.[62] While the most popular example of this

type of digital currency is Bitcoin, there are dozens of cryptocurrencies.[63] In addition, no country has created a digital fiat currency (i.e., a currency backed by a government), but this may change in the future. For example, the Bank of Canada, which is the country's central bank, is experimenting with a digital fiat currency called CAD-COIN.[64]

On the Bitcoin network, to trade or buy something, users submit their account number, called their "public key," and password, called their "private key," for verification on a public ledger, called a "blockchain."[65] Each transaction has a unique identifier that is not tied to its owner's name, protecting the user's confidentiality, while allowing one-on-one transactions to occur between people who had no previous interaction. When users want to exchange digital currency for products or services, they can use a digital wallet service, which can be either a type of remote or proximity mobile wallet mentioned earlier, to send and receive digital currency or exchange it for fiat currency.[66] There are many different types of fintech companies that use digital currency, such as currency exchanges, payment processors, digital-wallet services, and investment funds.

There are a number of benefits to using digital currencies. First, because many digital currencies do not require personal identifying information, unless users choose to publish their transactions, they will remain pseudonymous (associated only with their public key). Second, digital currencies have small or no fees associated with processing transactions. Indeed, bitcoin transactions generally charge less than a penny, whereas credit-card fees are between 2 and 3 percent of the paid amount, plus 20 to 30 cents per transaction.[67] Third, users of digital currencies can quickly send payments at any time to anywhere in the world using blockchain technology. (See Box 2.) The technology that enables these systems also has the potential to improve the transaction speeds of traditional payment systems, and some major financial institutions, such as Deutsche Bank, are researching how to use it to improve processing.[68] However, bitcoin transactions usually take a few minutes to clear, which is slower than instant-payment systems.[69]

However, fintech companies and users face several challenges to adopting and using decentralized digital currencies as a unit of exchange. First, the speed of transactions and relative anonymity of digital currencies makes them vulnerable to misuse for criminal activities, such as money laundering and criminal funding.[78] Second, various countries, such as Russia and China, fully or partially prohibit digital currency transactions.[79] Third, the value of decentralized currencies is highly volatile due to their relatively small market size (i.e., because the price is determined by supply and demand, it takes a smaller amount of money to affect the price of a virtual currency than a fiat currency), which generates uncertainty among the businesses and users that adopt them.[80] Indeed, one of the primary reasons many people start using cryptocurrencies is as a speculative investment, rather than as currency.[81] For example, in November 2015, bitcoin prices surged over 16 percent

briefly in response to a single fraudulent scheme.[82] To be sure, some fiat currencies can also be volatile in response to a country's economic or political decisions, circumstances that do not affect non-fiat digital currencies. For example, the United Kingdom's pound sterling became more unstable than bitcoin following the country's vote to leave the European Union.[83]

Finally, despite the views of some digital-currency advocates, it is unlikely that there will ever be an effective global currency, as currency valuations need to reflect changes in the underlying global competitiveness of national economies. To see the problem of global currencies, one only needs to look at the European Union, where a single currency has made some member states no longer price competitive in the global market, while making others more competitive.[84] Because of these limitations, digital currencies currently are used in addition to fiat currencies, rather than as a substitute.

Cross-Border Transactions

Cross-border payments are transactions that involve individuals, companies, or financial institutions in two or more countries.[85] Traditional cross-border payment systems, which primarily operate through brick-and-mortar bank branches, are relatively costly.[86] Because these systems do not run on a global retail-payment system, a single cross-border transaction could go through multiple intermediary banks and multiple jurisdictions before reaching its final physical destination. During this process, each bank takes a cut of the transaction, making international transfer time-consuming, expensive, and inconvenient for both consumers and businesses. As a result, various financial companies are using fintech to improve cross-border transactions for their customers, increasing efficiency and reducing costs.

One analogy to innovation in cross-border transactions is Skype. Prior to Skype and other voice over Internet Protocol (VoIP) applications, making international long-distance calls was expensive, with intermediary phone companies taking a sizeable share of the cost. But once Skype pioneered IP-based calls, the service removed intermediaries and cut costs for consumers.[87] Fintech has the potential to do the same for cross-border financial transactions. There are two areas ripe for transformation: personal remittances and cross-border business-to-business (B2B) payments.

Personal Remittances

Personal remittances are transfers of money from expatriates to their country of origin. According to the World Bank, with the growth of global migration, personal remittances grew from $68 billion in 1990 to an expected $586 billion in 2015.[88] In 2014, the United States was the top remittance-sending country, transferring out $131 billion, or 22 percent of the global volume.[89] Migrant remittances have a greater economic and social impact than official development assistance or foreign direct investment, and are a key funding source for many developing countries. Indeed, in 2014 the total of remittances that exited the United States was nearly four times larger than the $36 billion U.S. foreign aid budget.[90]

Remittances traditionally operate as expensive wire transfers, where multiple brick-and-mortar banks pass along money from a sender to a receiver. During this process, each bank charges a fee, making remittances costly, inefficient, and subject to exchange-rate fluctuations across multiple countries.[91] As a result, in the fourth quarter of 2015, the global average cost of sending remittances was approximately 7 percent per $200 (the average per-capita remittance by poor migrants in developing countries).[92] In addition, a relative lack of transparency in the traditional remittance market makes it difficult for consumers to compare services, fees, and transaction speeds of competing remittance services.[93]

To address this inefficiency, dozens of online-based technology start-ups—such as WorldRemit and TransferWise—have emerged to bypass the traditional banking system and provide cheaper, faster, and more convenient services.[94] These companies use software to operate their own electronic exchange systems, which circumvent traditional international transfer systems. For example, TransferWise automatically converts currency to the current market exchange rate.[95] The company holds bank accounts with a positive balance in each country where it operates, and when a consumer wants to send money internationally, the company takes a part of the balance from its bank account in that country and sends it to the recipient's local bank account. This system avoids traditional intermediation fees and ensures currency is exchanged at a fair rate. Senders and receivers can go online or use smartphones to complete money transfers, saving up to 90 percent of the fees a bank might charge for the same service.[96] In addition, money-transfer operators, such as MoneyGram, are partnering with mobile networks and mobile-wallet providers, such as M-Pesa, to offer cheaper remittance services.[97] This is, of course, an intermediary workaround solution. Ultimately, all banks will be based on these kind of interoperable software systems, whereby interchanges can be automatic.

Digital currencies and blockchains have the potential to support faster, safer, and cheaper remittances.[98] This process works by converting the user's remittance total to digital currency, sending it to an account in the destination country, and converting it to that country's currency for the receiver. Digital currency remittances are cheaper because it is less expensive to maintain a mobile app than a traditional retail payment system, resulting in reduced fees. Some digital-remittance companies claim to operate 45 percent cheaper than traditional physical networks.[99] Incumbent financial institutions, such as Visa, are also reviewing the feasibility of adopting blockchain technology to lower costs and improve customer experiences for remittances.[100]

Cross-Border Business-to-Business Payments

While there have not been many advances in business-to-business (B2B) payments compared with consumer payments and transfers, one area of B2B payments that has seen a lot of innovation is cross-border payments. According to McKinsey, in 2014, B2B transactions contributed to 75 percent of revenues from banks' cross-border payments ($145 billion)—representing a total of $155 trillion in transaction value in 2014.[101] However, for SMEs, international payments are generally costly and complicated—for

many of the same reasons as remittances. Because of the lack of economies of scale, SMEs making smaller transaction must often pay less favorable rates than larger companies making big transactions.[102]

A growing number of nonbank players—such as firms that have had success in the remittance market—are getting into the cross-border B2B payments ecosystem. For example, Align Commerce offers SMEs faster cross-border transaction services by using the Bitcoin blockchain to facilitate payments without using intermediaries, much as digital remittance companies bypass the traditional international wire transfer system.[103] Similarly, the start-up Transpay has created its own independent cross-border payments network for businesses to send money outside of the traditional money-payment system.[104]

PERSONAL FINANCE

Consumers use personal finance services to help them make better decisions about accounting, taxes, spending, investing, retirement, and estate planning. But these services are labor intensive, meaning not only that they put financial management advice out of reach of many people, but that they also act as a drag on productivity growth. Advances in financial-management software, including automated personal investment advisers and personal financial-management software, are improving productivity and lowering prices.

Robo-Advisors

Because investing requires a set of skills and financial knowledge that most individuals lack, consumers often rely on professional investment advisers to make investment decisions. However, financial advisers often charge high fees and usually require their clients to make a large minimum investment. As a result, high-income consumers are the primary users of traditional investor services. After the 2008 financial crisis, many customers lost confidence in traditional investment-management institutions, which led to wide adoption of new technologies to manage investments, especially among millennials.[105]

The result was automated, digital wealth-management companies, commonly referred to as robo-advisors, such as Acorns, Betterment, SigFig, and Wealthfront, which are automated financial and investment tools that use algorithms to manage customers' investments, focusing on low-cost and low-risk investments.[106] Robo-advisors remove the need for an relationship between a human adviser and investors. To use a robo-advisor, customers complete an online questionnaire to gather information such as personal incomes, investment goals, and attitudes toward risk taking. The services then use algorithms and asset-allocation tools to process this data, identifying acceptable levels of risk for each individual consumer and selecting the most appropriate investment portfolio.[107] These services automatically rebalance their clients' portfolios as needed. Most robo-advisors, like Betterment and SigFig, are not trying to beat the market, instead focusing on passive fund management and exchange-traded funds (ETF)—combinations of stocks, bonds, and other securities that track indexes, which often have lower fees than mutual funds.[108] Others, like Schreiner Capital Management and Alpha Architect, offer actively managed investments that try to beat the market.[109] In addition, E*Trade offers a robo-advisor service that allows

users to select ETF funds or both ETF funds and actively managed funds.[110] In the latter, users' portfolios are curated by a human investment team that makes changes to investments based on market conditions.

Robo-advisors offer new opportunities in wealth management for both businesses and consumers. First, automation lowers financial-management costs, savings that are passed along to customers in the form of lower fees, increasing the product's accessibility. The minimum balance required to start an account on a robo-advisory service is typically low. For example, unlike many traditional financial-management companies, Betterment does not have a minimum investment requirement, instead charging a small percentage for accounts with relatively large investments (e.i., above $10,000).[111] As a result, the U.S. Department of Labor has extolled the value of robo-advisors for retirement investors to lower costs and avoid conflicts of interest.[112] To be sure, some robo-advisors that focus on actively managed investments have high minimum investment requirements (e.g., Alpha Architect has a $50,000 minimum).[113] Second, human advisers may have cognitive biases and perverse incentives that steer clients toward products that are in the adviser's financial interest rather than their clients', while most robo-advisors typically try to achieve stable growth through passive fund management and do not suffer from the same limitations.[114] Third, robo-investors improve transparency in personal investment services. While some traditional wealth-management services charge hidden fees for investments, robo-advisors give customers greater visibility into how their money is invested, as well as increased control over their investment portfolios, allowing them to adjust financial goals and risk preferences. These benefits have led to a growth in popularity of robo-advisors. Assets under management (AUM)—the total market value of investments managed by financial managers—by robo-advisors in the United States went from nothing in 2012 to $14 billion at the end of 2014, and could potentially grow to $5 trillion by 2025.[115]

Human financial advisers offer many options to their clients that robo-advisors do not, such as a larger range of investment options, more flexibility in asset allocation, and financial coaching. Furthermore, in 2015, the Securities and Exchange Commission (SEC) and the Financial Industry Regulatory Authority (FINRA) cautioned that because robo-advisors only collect certain information about their clients before making decisions, these services may suggest investments that do not accurately reflect the investors' needs.[116] While some researchers have criticized robo-advisors for these shortcomings, increasing consumer understanding of the risks and limitations of these tools will enable investors to know when best to use them to capture the technology's benefits.[117]

Mobile Trading

In addition to digital wealth-management services, many stock brokerage firms and start-ups have introduced mobile apps that allow investors to track investments, allocate assets, and trade in real time. Before mobile trading apps, users had to make trades through professional-investment or financial advisers, which had the same drawbacks discussed above. Now, active investors have a convenient mechanism to make trades whenever and

wherever they want, and firms benefit from more trading activity, which can increase their commissions.

These services also offer features that allow investors to make trades in unique ways. For example, E*Trade's mobile app includes a bar-code scanner, which allows users to determine what company makes a particular product, and if that company is publicly-traded, to invest in that company.[118] Furthermore, some apps allow investors to create complex trading strategies. For example, TD Ameritrade's Mobile Trader app allows investors to set specific prices at which they want to sell or buy a particular stock, automatically triggering the trade if the stock hits that price.[119]

However, the mobile apps of many big brokerages (e.g., E*Trade and Scottrade) charge transaction fees of $7 to $10 per trade and require minimum balances (e.g., $500 for brokerage at E*Trade).[120] Newer services are employing different business models to reduce these fees. For example, the mobile app Robinhood allows quick buying and selling of stocks with no commission per trade and no minimum balance required.[121] Instead of fees, this app makes money by taking interest from uninvested cash balances and interest from customers who trade on margin using a line of credit.

Personal Financial Management

Personal financial-management (PFM) software, such as personal accounting software and mobile apps, has enabled everyday consumers to better handle their personal finances, including stock portfolios, budgets, and taxes. PFM has freed people from depending on spreadsheets to plan their budgets, making money management convenient and easy. While this trend started in 1984 with Intuit's Quicken personal accounting software, over the past decade a number of money-management tools have emerged that improve upon the concept with new technologies.[122]

Analytics tools, artificial intelligence, and mobile applications now enable users to better understand their spending habits, track their budgets, and monitor their accounts. For example, Mint is a free web service and mobile app that connects directly to users' financial accounts, allowing them to make budgets and set financial goals, while tracking bank accounts, credit card, investments, and loan transactions and balances.[123] Users are able to organize spending into categories (e.g., restaurants, groceries, rent) and see helpful charts of how much money they spend on any one category during a specified period of time.[124] Mint's mobile application can also warn users if their accounts are low, about to go over budget, or if their bills are due. Other mobile applications, such as Balance, function as digital check registers, allowing users to manually input information to track their budgets without the need to connect their financial information to a third party.[125] Finally, services like Cleo offer a free digital assistant that uses artificial intelligence to help users manage their money.[126] Users can text the Cleo digital assistant questions about their spending habits or ask about how to save money.

ALTERNATIVE FINANCING

After the 2008 financial crisis, due to increased compliance costs associated with lending, banks shifted their loan products to larger base amounts, which opened up opportunities for businesses providing alternative financing—financial instruments that operate outside of the traditional financial system, such as banks and capital markets—to offer new sources of funding for businesses and citizens.[127] Furthermore, new online platforms developed to connect investors with borrowers, allowing large groups of people to give or lend small portions of money to help innovative products and services come to market, support good causes, or invest in start-ups.

Three major fintech-driven developments in alternative finance are crowdfunding, alternative lending, and invoice and supply-chain finance.

Crowdfunding

Securing funding for certain projects, such as philanthropic causes, significant personal events, or starting a company, can be difficult. For example, if a couple wanted to get funding to help pay for their wedding, they would seek assistance from their close friends and family. Similarly, in the past, entrepreneurs or start-ups would receive initial funding for their businesses by either using their own money or seeking financial support from those close to them. Entrepreneurs would then seek out angel investors, venture capital firms, or banks for additional funding after they developed an idea in order to bring it to market or to further grow their business in the market. New online platforms have changed this dynamic by allowing people to raise funds or capital publicly from a large number of individuals. This method, known as crowdfunding, expands the pool of investors available to individuals and start-ups to anyone on the Internet who is willing to help out or interested in making products or services a reality.[128]

There are five different forms of crowdfunding: reward-based, equity-based, debt-based, donation-based, and hybrid models.

Reward-Based Crowdfunding

Reward-based crowdfunding platforms, such as IndieGoGo and KickStarter, allow entrepreneurs to share fundraising campaigns openly to entice investors with products or gifts as an incentive.[129] In these systems, businesses and nonprofits of all sizes post projects to a crowdfunding platform, setting a goal to raise a certain amount of capital. Entrepreneurs generally use social media to market this investment opportunity.[130] If platform users are interested in the product or service and invest, then they are rewarded with early access to products or gifts as an incentive.

Equity-Based Crowdfunding

Equity-based crowdfunding allows start-ups to attract investors interested in purchasing an ownership stake in their business. For example, Crowdcube and Startup Valley both bring together start-ups and investors, allowing people to buy equity in a business in exchange for their investment.[131]

The success of several equity-based crowdfunding platforms has prompted these companies to broaden their focus from crowdfunding in early business stages to financing in late business stages. For example, OfferBoard provides funding for companies that have already launched their products and are looking to expand their business by raising $2 million to $200 million in capital.[132] Other new online financing platforms allow investors to participate in more complex forms of financing. For example, the iCapital Network allows wealthy individuals and independent financial advisers to invest in private equity and real estate at a much lower threshold than is typical.[133] Another platform, Intralinks DealNexus, helps merger professionals connect with larger businesses to assist with mergers and acquisitions.[134]

Debt-Based Crowdfunding

In debt-based crowdfunding, a business can solicit funding in the form of a loan made up of small payments from a large group of people, with the expectation that these funds will be repaid over time with a fixed rate of interest. This is also a form of alternative lending.

Donation-Based Crowdfunding

In donation-based crowdfunding, individuals seek philanthropic donations or gifts with no expectation of financial return. In this model, investments do not require project owners to offer a reward or incentive. For example, GoFundMe allows people to raise funds for multiple reasons, such as for significant events (e.g., weddings), difficult circumstances (e.g., illnesses), or education (e.g., tuition fees).[135]

Hybrid Models of Crowdfunding

Finally, hybrid crowdfunding platforms incorporate a mix of two or more of the above models.[136] In the hybrid of reward-based and equity-based crowdfunding, a business can list rewards for backers, and if the initial project funding goal is successful, the business can also get equity financing. For example, the company Fundable offers a hybrid model where project owners can choose either a rewards-based crowd funding campaign or an equity-based campaign.[137] The dual option allows project owners that were previously successful with rewards-based crowdfunding to run a second crowdfunding campaign to secure more investments.

Alternative Lending

Traditionally, consumers and businesses go to banks or credit unions for loans. However, after the 2008 financial crisis, regulatory requirements for traditional financial institutions tightened, causing them to raise prices or stop offering financial products and services with higher risks or lower financial returns—especially unsecured personal loans, small business loans, student loans, auto financing, and mortgage loans.[138] In addition, lenders that write small business loans have traditionally found it difficult to make loan decisions because every small business is unique and cash flows are often more variable than larger businesses. As a result, it is difficult and expensive to constantly monitor each business to ensure its viability and assess its ability to repay its debts.[139]

New technologies, such as e-invoicing and data analytics, enable lenders to better offer loans and select their borrowers.

Online alternative lending—sometimes referred to as an online form of nonbank lending—developed to fill these needs. Alternative lenders are online platforms that operate outside the traditional banking system (but are often backed by institutional investors), providing lending options to customers that are underserved by traditional financial institutions.[140] With access to new technologies and the Internet, businesses and individuals can now easily share more data with underwriters, such as credit, bank statements, and tax records, in a fast and efficient manner. For example, the alternative lender Lending Club assesses an individual borrower's FICO credit score, applied loan amount, debt-to-income ratio, credit report, and online application to automatically generate an anonymous ranking associated with each borrower without revealing that person's identity to investors.[141] Investors are then matched to borrowers based on an investor's preset ranking criteria for loans. This has enabled some online platforms to use an analytics-based approach to better evaluate the risks of lending to a particular business or individual. Alternative lending can also provide a faster alternative for consumers seeking personal loans or businesses seeking working capital.[142] Indeed, while nonbank small business loans often bear higher interest rates than bank loans, they offer lower loan rejection rates and faster approval.[143]

Technology-based alternative lending brings greater consumer benefits, providing viable funding streams for small business to grow and to hire employees, which enhances overall economic growth. In the United States, Morgan Stanley predicts this market will grow from $12 billion in 2014 to $122 billion by 2020.[144] Traditional financial institutions have started to collaborate or partner with nonbank lending platforms.[145] For example, a bank may refer declined customers to an alternative lender in exchange for referral fees.[146] Competition in the alternative lending market has increased. Some technology and payment companies have entered into the lending market, such as Amazon, PayPal, and Square.[147]

There are three primary types of online alternative lending: online balance sheet lending, peer-to-peer lending, and lender agnostic marketplaces.

Online Balance Sheet Lending

Nonbank balance sheet lenders offer short-term loans to businesses, typically used to fund working capital or inventory purchases. Two examples of online balance sheet lenders are Kabbage and OnDeck Capital, which offer short-term business loans.[148] Kabbage uses an algorithm that analyzes a customer's business data, such as business transaction information, sales and revenue, average delivery time, and social media.[149] Borrowers can receive their approval decision from Kabbage within minutes, while others receive their funding within 24 hours.[150]

Given the brevity of these loans (usually less than 9 months), businesses using this option often pay higher rates.[151] For example, on an annualized basis, a business could pay anywhere from 30 percent to 120 percent of the loan.[152] The average online balance sheet loan is about $40,000.[153]

Peer-to-Peer Online Lending

Peer-to-peer lending platforms—also called person-to-person lending or debt-based crowdfunding—provide a platform that connects individuals and businesses with institutional investors.[154] There are two primary types of peer-to-peer lending: peer-to-peer business lending—debt-based transactions where multiple individual investors contribute to a single business loan, and consumer lending—where individual borrowers use an online platform to get a loan from multiple individual lenders. In the peer-to-peer consumer-lending model, borrowers are connected with capital from the crowd, including individual consumers, businesses, and others. These platforms could be open to all investors or limited to accredited ones, and loans have interest rates that range from 8 to 24 percent on loans up to $250,000 that last as long as three years.[155] Two examples of peer-to-peer lending platforms that offer consumer and business loans in the United States are Lending Club and Prosper.[156]

In addition to consumer and business loans, peer-to-peer lending can also offer many other products. For example, SoFi and CommonBond offer student loans; SoFi and Realty Mogul offer mortgages; and DriverUp offers auto loans.[157] Some peer-to-peer lending models have also seen a shift in their user base and sources of investment. For example, peer-to-peer companies like Lending Club and Prosper, which were originally intended to attract individual consumer investors, now have over 80 percent institutional investors, including banks and hedge funds.[158]

Lender-Agnostic Marketplaces

Lender-agnostic online marketplaces create platforms where small businesses can shop and compare a wide range of products from a variety of lenders, including banks, the online community, online business sheet lenders, venture capital firms, and others. These marketplaces charge a small fee on a loan when the borrower accepts its terms. For example, Biz2Credit allows businesses to shop a network of lenders for equipment financing.[159] Similarly, Fundera offers a marketplace where businesses can shop for a variety of different loan products.[160] By creating a marketplace for borrowers and lenders, these platforms allow businesses to compare multiple options, increasing the transparency in the system. This knowledge reduces costs for businesses searching for the right loan and increases access to credit for underserved communities.

Invoice and Supply-Chain Finance

Businesses can also seek financing based on their accounts receivable (i.e., the amount of money that their customers owe them) and their accounts payable (i.e., the amounts businesses owe to their suppliers). These types of transactions link multiple entities together in a supply chain—including the buyer, seller, and financier—to lower costs and improve transactions' efficiency. This type of financing has two primary methods: invoice financing and supply-chain finance.

Invoice Financing

Invoice financing lets businesses borrow money based on amounts due from customers, known as invoices, as a method to gain quick access to capital. This method gives

businesses the flexibility to pay their suppliers and employees or reinvest in their operations while they wait for their customers to pay them.[161] Previously, invoice financing had been conducted bilaterally between businesses and a lender. But with the new technologies and e-invoicing, a number of companies can now offer small businesses the ability to monetize outstanding payments quickly and easily over the Internet.

There are two primary types of online invoice financing: factoring and discounting.[162] With factoring, a business sells its outstanding invoices to a lender, who pays the majority of the amount owed to the business upfront and remits the remainder of the amount after it collects payment from the consumer, exacting a small fee for this service. With discounting, a lender advances the majority of the invoice to the business, which collects the payment from its customers and repays the lender, minus a fee.

Businesses benefit from online invoice financing models through increased access to funding and convenience. Online invoice-financing marketplaces allow companies to sell their invoices or receivables to many different investors, reducing the cost of funding. For example, MarketInvoice offers businesses the ability to sell their invoices or receivables to multiple investors in an online marketplace.[163] Using these services, businesses can connect their accounting software (and therefore their business data) directly to the invoice-financing platform. Businesses can then apply for a loan based on the value of individual invoices and receivables, and this payment can be made almost instantly.[164]

Because invoices act as collateral, this form of financing benefits lenders more than extending a line of credit—which is unsecured and leaves a business little recourse if it cannot repay what it borrows. The lender also limits its risk by not advancing the full invoice amount to the borrowing business. However, invoice financing does not eliminate all risk, as there is a difficult collection process if a customer is unable or unwilling to pay the invoice. To reduce the likelihood of this occurring, lenders use algorithms to measure the risks associated with each business. Among other things, risk models analyze how reliable a business is with its payments and the frequency at which it borrows money.[165] More reliable and repeat customers are able to borrow at a better discount.

Supply-Chain Finance

Supply-chain finance, also known as supplier finance or reverse factoring, allows businesses to extend the amount of time they need to pay suppliers while providing the option for suppliers to get paid quickly. In contrast with invoice financing, supply-chain finance is often initiated by the buyer, who reaches out to a third-party lender for financing based on the amount that the business owes its provider (i.e., amounts payable).[166] This type of transaction is often a collaboration between the buyer and seller that works to both of their advantages.[167] (See box 3.)

Supply-chain finance usually involves the use of technology to automate and track the approval and settlement process for each transaction. Traditionally, these platforms were only efficient at a large scale, where businesses bought large amounts from their suppliers.[168] But with new technology platforms, supply-chain finance has become available to organizations making smaller transactions, which has made this form of financing more accessible. Just as with invoice financing, buyers and suppliers can connect directly to a supply-chain lender's platform, sharing their business data and uploading e-invoices quickly and easily.[169] For example, the company Taulia Inc. offers an easy supply-chain-finance platform that connects businesses and suppliers, including major brands such as Coca-Cola, Pfizer, and John Deere.[170]

INSURANCE

Transforming the insurance industry is a new frontier for fintech.[171] Automation, new sources of data, mobile technologies, and new insurance models are all changing how insurers offer products and services.

First, automation is helping insurers cut costs and provide improved services. At its heart, insurance is about pooling shared risks. Traditionally, insurance-premium rates were fixed—prices were based on the risks of the insured property or liability over a long period of time. And insurance products were usually distributed through a human sales force, such as insurance brokers and agents. But with the adoption of new technologies and business strategies, insurers can shift pricing (also called underwriting) to a dynamic and personalized auto-underwriting model, based on real-time data collection.[172]

Second, as new sources of data emerge, insurers increasingly will be able to demonstrate correlations between certain characteristics and claim costs—called actuarial justifications—which will reduce premium costs for some, while increasing them for others. For example, certain behaviors, such as smoking, increase individual's medical costs, while others, such as exercising frequently and eating healthily, reduce the likelihood of requiring medical

attention. As more people adopt technology, such as wearable tech, and exchange this data with their insurers, data will prove actuarial justifications, and their premiums may go down.[173] Even for people whose premiums go up, the financial incentive to change behavior will increase, leading to reduced overall societal costs. For example, in 2014 Apple announced a partnership with Humana, a health-care benefits company, to allow customers to share their wellness data aggregated on Apple HealthKit data with the Humana Vitality app in order to receive discounts on their monthly healthcare premiums.[174] Similarly, in 2015, the life-insurance provider John Hancock offered discounted premiums to policyholders willing to share the data gathered from a free fitness wearable provided by the insurer.[175] Consumers obviously like the discounts. A 2014 survey of 900 U.S. adults revealed that nearly 60 percent of them would be more likely to use a fitness-tracking device if it meant the possibility of lower health-insurance premiums.[176]

Third, just as mobile phones are making e-commerce more convenient and efficient, they are also making insurance faster, cheaper, and more customer-centric. Many U.S. insurance companies are adopting, or plan to adopt, mobile apps with human interaction to support seamless customer engagement and assist in underwriting, customer service, and claims.[177] Insurers use the data they gather on these mobile apps to get deeper insights into consumer behaviors over time, helping them engender higher consumer satisfaction rates and grow their subscriber base.[178] The primary market for insurance mobile apps has been for car insurance. For example, Esurance provides online insurance through its mobile app to efficiently improve policy application and maintenance.[179] By using the mobile app, policyholders can easily make a payment, file and track a claim, get real-time video appraisals, and call roadside assistance. These services can reduce an insurer's timeline, to make the process of filing a claim more convenient for consumers.

Finally, insurers are also exploring peer-to-peer insurance models. For example, Berlin-based Friendsurance is on online peer-to-peer insurance fintech firm that enables consumers with a similar property or casualty risk type to form a group and get cash refunds at the end of the policy period if no claims are made.[180] This model creates incentives for policyholders to monitor their own risks, benefiting the insurers by decreasing moral hazards costs—costs that arise when one person takes more risks because another person bears the costs of those risks— and benefiting policyholders by lowering premiums. In 2013 and 2014, more than 80 percent of Friendsurance's policyholders received a portion of their premium back, at an average of 33 percent of the paid premium.[181] Another start-up, Lemonade, is aiming to bring this peer-to-peer insurance model to the United States.[182]

However, it is still challenging for fintech start-ups to find a footing in the U.S. insurance sector due to high barriers to entry.[183] Insurance regulatory requirements are complicated. Insurance in the United States is still regulated mostly at the state level, and requirements differ state to state, making the nationwide development and marketing of a new insurance product a tedious and expensive process.[184] In addition, insurers have to accept adverse selection risk: Consumers who potentially have higher risks tend to buy new insurance products, making it riskier for start-ups who have fewer assets to cover the risks.[185]

BOX 4: REGTECH

Another type of IT use that is important to financial services is regulatory compliance technology, commonly referred to as regtech, which supports efficient regulatory compliance, reporting, and risk management within the financial-services sector. Regtech is important to the financial-services industry since it is highly regulated, with many government watchdogs who require companies to meet compliance and reporting obligations. As new types of financial services are created and businesses offer their services over the Internet to multiple jurisdictions, the complexity and costs of compliance have become increasingly burdensome. For example, from 2012 to 2014, JPMorgan Chase spent $2 billion to add 13,000 new employees to support regulatory and compliance efforts.[186]

To improve regulators' ability to enforce laws, increase transparency, and reduce the cost of compliance, businesses are starting to offer solutions focused on addressing regulatory challenges, such as regulation gap analysis, compliance tools, transaction and regulatory reporting tools, activity monitoring tools, real-time risk-assessment tools, and many others.[187] For example, Trulioo offers financial institutions anti-money-laundering and Know Your Customer compliance software that automates basic compliance tasks.[188] By simplifying compliance, regtech allows businesses to put money into more productive uses, reducing a barrier to entry into the market and reducing risk in the system.

Furthermore, regtech can improve the quality and efficiency of supervision by giving regulators access to modern reporting and analytics infrastructure that they can use to find and correct misuse.[189] Indeed, regtech is an opportunity for a partnership between regulators and compliance companies that benefits both parties. As a result, various governments are showing interest in regtech technologies. For example, the United Kingdom Financial Conduct Authority issued a paper in November 2015 calling for public comments to help the U.K. government better understand and promote regtech.[190] To date, no U.S. regulator has made a similar call for comments.

As policymakers approach regtech, here are a few recommendations they should keep in mind:

- This use of IT is not unique to financial services. Policymakers should support the use and adoption of regtech, not just for financial services, but also for a wide range of other industries under intense scrutiny, such as the health-care industry, public utilities, and sectors with environmental reporting requirements.
- Regulators should partner with financial institutions offering regtech applications to support these services by removing inconsistencies of interpretation and updating obsolete reporting portals to improve reporting efficiency.
- Policymakers should encourage financial regulators and fintech companies to develop open-source platforms for financial regulation, where the system can stream machine-readable reporting data directly to the regulator. This type of system allows third parties to create apps for analytics and visualization of that data, improving transparency in the system.[191]

THE CHALLENGES CONFRONTING FINTECH FOR BUSINESSES AND POLICYMAKERS

A number of challenges may limit rapid growth and fintech transformation. Companies implementing fintech, whether incumbents or new entrants, face a complex and uncertain regulatory environment, rules designed for old business models, and restrictions on where they can store and transmit data. Slow-moving regulatory processes have difficulty keeping up with rapidly developing fintech applications. In addition, differences in national financial regulations make it even more difficult to develop seamless, cross-border solutions. Finally, the financial sector also faces security issues that can lead to fraud, theft, and network downtime.

A Patchwork of Complex Regulations

Most countries have a highly complex regulatory environment for financial services. As a result, policymakers find it challenging to support fintech innovation and uphold consumer and financial system protections.

International Regulations

Financial companies doing business across borders must navigate a complex patchwork of rules to bring their services to global markets, since each country has different financial regulations. Imagine if every nation had significantly different regulations for social networks. Global solutions, like Facebook or Whatsapp, would have had a significantly more difficult time scaling their services internationally. This is the challenge facing many fintech companies, especially those focused on cross-border payment and transfer systems, such as digital currencies and remittances.

Fintech companies, which often offer global, scalable products over the Internet, face significantly different regulations from nation to nation.

Fortunately, there are already many international efforts to harmonize regulations. Several international bodies are getting involved in rules regarding fintech. For example, Basel III is a comprehensive set of regulations created by regulators from 27 countries to help mitigate global financial risk, improve banks' transparency, and coordinate global economic policy.[192] Basel III, which is expected to be implemented by 2019, will affect fintech applications offered by the traditional banking sector. For example, Basel III discourages loan securitization and requires that banks modify their risk models, both of which when fully implemented will restrict the types of lending services banks can offer.

In addition, in March 2016, the Financial Stability Board (FSB), comprised of central bankers, regulators, and finance ministry officials from the Group of 20 economies, agreed on a framework for categorizing different fintech applications, and assessing the potential risks that fintech may pose for the broader financial services system.[193] Finally, industry-wide initiatives have helped establish market standards and bring more harmony to international standards. For example, the Single Euro Payments Area (SEPA) and TARGET2 are EU initiatives for retail payment systems and large value payment systems, respectively, that have harmonized how payments are conducted across borders in EU member states, helping the financial industry update legacy systems to address new technologies.[194]

National Regulations

How fintech fits with financial regulations is still an open question. Many rules designed to specifically address recent advances in fintech are still under regulatory review, or regulators have simply not addressed how current laws apply to new kinds of technology-enabled services—all of which has created significant regulatory uncertainty. While countries around the world have created patchworks of national laws that address financial innovation, this section will focus on the efforts of U.S. federal regulators.

There have been a few direct efforts by U.S. federal regulators to address fintech innovation. For example, in March 2016, the Office of the Comptroller of the Currency (OOC), which oversees the national bank-chartering system, became the first federal regulator to issue a formal call for officials to start crafting a new framework aimed at governing the rapidly growing fintech sector.[195] Similarly, the Consumer Financial Protection Bureau (CFPB) recently started accepting complaints from consumers encountering problems with online alternative lenders, and could use that data for future enforcement purposes.[196] In addition, the U.S. Federal Reserve also requested public comment on a 2013 consultation paper about improving the U.S. payment system, the results of which were published in 2015.[197] Finally, several federal agencies have issued guidance on virtual currencies, including the Securities and Exchange Commission (SEC) and the IRS.[198]

Many different types of U.S. federal regulations apply to fintech companies, including banking laws; consumer protection disclosure requirements; prohibitions on unfair, deceptive, or abusive practices; and anti-money-laundering rules. First, banks must follow federal banking laws, which exempts them from getting licensed by each state as a money sender.[199] Some fintech companies want to become banks themselves in order to offer banking services, but the approval process is very difficult.[200] Indeed, from 2009 to 2013, only seven new banks received charters from the federal government.[201] The OCC is investigating whether to create a charter for fintech companies, allowing them to offer deposit and loan services without complying with state regulations.[202]

Second, financial companies must comply with consumer-disclosure requirements, which are often the centerpiece of consumer financial protection regulations. For example, the Community Reinvestment Act, the Equal Credit Opportunity Act, the Fair Credit Report Act, the Fair Debt Collection Practices Act, the Fair Housing Act, the Real Estate Procedures Act, the Truth in Lending Act, the Trust in Savings Act, and securities law all require financial institutions to provide detailed disclosures to consumers.[203]

Third, there are multiple federal entities governing legal prohibitions on unfair, deceptive, or abusive practices, such as the Federal Trade Commission (FTC), CFPB, and federal prudential bank regulators, such as the OCC and the Federal Deposit Insurance Corporation (FDIC).

Finally, the United States has a patchwork of anti-money-laundering (AML) regulations.[204] AML rules have gained more attention recently, as regulators have increasingly become

concerned that terrorists and criminals will exploit fintech to support their illegal activities.[205] The federal government has targeted fintech companies for violating AML laws. For example, in May 2015, the Financial Crimes Enforcement Network (FinCEN)—an agency that operates under the umbrella of the U.S. Department of Treasury—took civil action against the virtual currency exchange Ripple labs for not following AML rules, resulting in a $700,000 fine.[206]

Subnational Regulations

Subnational governments, such as states, have compounded the problem of multiple and varied laws between countries by creating their own additional rules and regulations. U.S. state regulation of the financial industry made sense when local brick-and-mortar banks handled payments, insurance, loans, and consumer finances, but less so in an age where financial services operate across borders. Subnational regulation can introduce unnecessary and unreasonable compliance costs for businesses and threaten the viability of various innovative approaches to online financial services, such as virtual currencies. Firms using fintech applications are increasingly facing a confusing patchwork of conflicting subnational laws that could limit deployment of this technology.

For example, in the United States, the insurance industry is regulated at the state level, and when a new company tries to bring an insurance product to market, it must comply with at least 50 different sets of rules.[207] Similarly, payment and virtual currency businesses must get a state-issued money sender or transmitter license. In some cases, states have passed laws to specifically regulate digital-currency businesses. For example, in June 2015, the New York Department of Financial Services created regulations that were similar to the state's money-transmitter licensing but specific to virtual-currency businesses.[208]

Restrictions on Information Flows

Many fintech companies are offering global solutions that function most effectively when unconstrained by national borders. And yet, the problem facing fintech (and other platform-based digital services) is that current international trade rules do not reflect modern trade and its reliance on data. The current rules governing services trade, embodied in the World Trade Organization's General Agreement on Trade in Services, are outdated. Few effective mechanisms exist to address the discriminatory use of "behind the border" regulatory barriers that restrict services trade, including in the financial sector.

Dozens of countries have erected measures that force data to be stored within a country's geographic borders—a practice known as "data localization."[209] Some defenders of these policies assert that they are designed to increase the privacy or security of their citizens' data, but as ITIF has clearly shown in *The False Promise of Data Nationalism*, absolutely no increased privacy or security results from mandates that restrict data from leaving a nation.[210] Instead, these policies are motivated by misguided self-interest: By creating rules that advantage domestic firms over foreign firms, many countries believe they will build a stronger domestic tech industry or gain short-term economic value, such as jobs in domestic data centers.

Data localization can have many negative impacts on fintech firms, including making data processing much more difficult, if not impossible. To the extent that data-localization policies require businesses to build out physical infrastructure in every jurisdiction in which they operate, these impositions increase costs, raising prices for consumers and reducing the international competitiveness of a nation's firms. For example, Venezuela has passed regulations requiring that IT infrastructure for payment processing be located domestically.[211] Similarly, rules in countries, such as Russia, South Korea, and China, that restrict how all personal information about their citizens can leave their borders can also have an undue effect on the financial sector.[212]

One of the biggest opportunities to push back on barriers to financial-data flows was the Trans-Pacific Partnership (TPP) trade agreement. The TPP takes a number of positive steps that address modern trade barriers, including provisions that prohibit forced data localization.[213] However, the TPP's carve-out for financial data—at the request of the United States—was a step backwards that could be misused to justify data-localization policies. No sector, including the financial sector, should be exempt from prohibitions against policies that limit cross-border data flows.[214] Thankfully, the U.S. Trade Representative is currently working on a fix to this issue that would be included in other future trade deals, such as the Trade in Services Agreement (TiSA).[215]

Slow Pace of Regulation

National regulators often cannot keep up with the pace of innovation in financial services. The standard U.S. rulemaking process forces regulators to spend a considerable amount of time exploring the issues related to new market developments, allowing for public comment (typically within 90 days), and for regulators to review those comments before finalizing the rule.[216] These rules are often decided without regulators receiving real-world feedback about regulatory effects, and once decided, rules are rarely revisited. As one regulator explains, this process increases the pressure for regulators to get the rules right the first time to avoid "protracted litigation over authority," which further increases the time it takes to implement them.[217] For example, as of July 2016, the SEC has missed 271 deadlines for regulations proposed in the Dodd-Frank Act.[218] This sluggish regulatory pace is not optimal to keep up with the pace of fintech innovation. It remains to be seen whether regulators can keep up with change, and whether the rules they create for fintech strike the right balance between encouraging innovation in financial services and protecting consumers.

Security Concerns

The entire financial services sector, including fintech firms, has to grapple with numerous evolving security threats.

Financial companies are under constant attack from numerous malicious actors—such as nation states, criminal hackers, and hacktivists—seeking to cause mischief or steal money. In addition, insider threats that result from poor security practices, disgruntled employees, and weaknesses in third-party providers can cause damage not just to financial institutions themselves but also to the businesses and consumers they serve.[219] These threats can result

in data breaches, large scale theft or fraud, corrupt data, and downtime in networks that can be costly to financial institutions and their customers.

Many fintech businesses have been the target of hackers trying to steal money. For example, once the world's largest Bitcoin exchange, Mt. Gox declared bankruptcy after hackers stole a portion of 850,000 bitcoins, valued at that time to be roughly $450 million, which the company said went missing from its exchange. (Mt. Gox later said it found 24 percent of the missing bitcoins.)[220] More generally, financial institutions have also suffered numerous large-scale data breaches in the last few years. For example, a cyberattack on JPMorgan Chase in 2014 led to a data breach that affected more than 76 million households and 7 million small businesses.[221] These data breaches are expensive. A 2014 study found that the average cost of a data breach is $201 per stolen record, and $206 if that record is stolen from the financial sector.[222]

Fraud has also been on the rise.[223] The Federal Trade Commission recorded 1.2 million complaints of fraud in the United States in 2015, an increase of incidents by nearly 300 percent since 2005.[224] The growing popularity of mobile payments has resulted in a growth of "card-not-present" fraud—a type of unauthorized credit card usage where merchants do not have access to physical cards to verify the actual cardholder authorizes the purchase.[225] This type of fraud has increased losses from $2.1 billion in 2011 to an estimated $3.8 billion in 2016, and will likely continue to grow.[226] Furthermore, recent data breaches and successful cyberattacks have resulted in incidents of large-scale fraud. For example, hackers used security flaws in the software of the Society for Worldwide Interbank Financial (SWIFT), which is the global financial network that roughly 11,000 financial institutions around the world use to transfer funds across borders, to commit several fraudulent transfers from its member banks, stealing millions.[227]

Besides stealing money, cyberattacks can also corrupt or destroy a financial institution's critical data. For example, in 2013, several South Korean banks were the target of malware—the umbrella term for software designed for malicious purposes—that erased the banks' institutional and customer data.[228] Concern for this issue caused the U.S. Federal Financial Institutions Examination Council (FFIEC) to recommend that financial institutions develop a plan to respond to destructive malware attacks to ensure their backup systems are not corrupted or destroyed.[229]

Internal system errors and external threats, such Denial of Service (DDoS) attacks—where an attacker temporarily interrupts an online service by flooding it with superfluous web traffic—can lead to outages and downtime in networks, disrupting business and incurring significant financial and legal costs for the affected financial institution. For example, in 2011, an upgrade to Bank of America's website accidently caused an outage of its online services for six days.[230] Similarly, in 2012 alone, hackers used DDoS attacks to cause disruptions in several major online banking sites, such as Bank of America, BB&T, Capital One, Citigroup, Fifth Third Bank, HSBC, PNC, U.S. Bancorp, and Wells Fargo.[231] In these attacks, no information or money is stolen, but the disruption can cost financial

institutions up to $100,000 an hour, according to a survey of IT professionals across a diverse range of U.S. industries conducted by the information services and analytics company Neustar.[232]

Unsurprisingly, many fintech firms are working diligently to close security gaps. Fintech firms have adopted hardware, software, and analytics to fortify their defenses, as well as security practices to reduce insider threats. Banks and various payment companies have started to roll out various security technologies and practices to fortify their products and prevent fraud, such as adopting encryption, behavioral analytics, tokenization, 3-D secure, EMV chip technology, and the National Institute of Standards and Technology (NIST) cybersecurity framework. [233]

POLICY PRINCIPLES TO ENABLE FINTECH TO FLOURISH

Given the transformative potential of fintech, policy should tilt toward enabling fintech transformation. The following are 10 principles that policymakers should follow as they assess how and when to support and regulate fintech.

1. Support Fintech Transformation

Governments should promote the transformation of the financial services industry through fintech. One way is by adopting the technology for their own transactions. By becoming early adopters, national, subnational, and local governments can promote broader adoption of fintech. This will help to reduce risks associated with fintech and encourage others to adopt and invest in the technology. For example, a state government could enable a universal mobile payment option for all state-government services, allowing users to pay their taxes and acquire their hunting or fishing licenses from the same convenient platform. These efforts should also include adopting solutions from fintech companies to improve government operational reporting, financial transparency, management, and budgetary decisions. The government of Estonia, for example, has started to use blockchains to secure over 1 million patient health records.[234]

National governments should also fund research and development (R&D) for fintech applications, focusing on underlying technological challenges, such as improving cybersecurity, exploring innovative uses for fintech applications, and implementing instant-payment-processing systems. Government investment in R&D played a key role in developing various technologies, such as smartphones and the Internet.[235] Because early-phase technology research often proves concepts rather than creates commercially viable products and can exhibit significant spillovers, firms are likely to underinvest. Similarly, technical financial infrastructures, such as instant-payment systems, rely on standardized technical specifications to allow independent systems to interface and work seamlessly together, which often requires cooperation between the public and private sector.

2. Work to Ensure That Regulations Encourage Innovation in Financial Services

Because of fintech's considerable benefits, national regulators should ensure that regulations enable innovation to flourish while at the same time achieving regulatory goals.

Policymakers should balance the risks associated with fintech with a recognition of the potential for productivity-enhancing disruption.

Because the financial services industry is rapidly evolving, policymakers should draw clear boundaries and set priorities for regulation. For example, regulators may place a higher priority on examining rules for alternative lending than crowdfunding because of the higher risk of abuse. Furthermore, policymakers should decide what is out of scope for fintech regulations. Certainly some technologies that enable fintech—such as operating systems or underlying technical architectures—also enable a host of other nonfinancial activities.[236] The goal of this prioritization is to signal to the market that a company is not necessarily going to be subject to regulations just because it is tangentially related to fintech.

Currently, several efforts are underway for various regulators to understand and foster growth in fintech. For example, in the United States, the Office of the Comptroller of the Currency's recent report on supporting innovation in the federal banking system, the first principle is to support responsible innovation by understanding and evaluating different types of fintech products and services to ensure a "thoughtful assessment of associated risks."[237] Similarly, the United Kingdom has created a national strategy for how to foster fintech innovation. As part of this, the U.K. financial regulator, the Financial Conduct Authority (FCA), launched "Project Innovate" to help companies work with regulators to launch innovative financial products, and plans to expand this program to allow fintech firms to test products in the market under regulatory scrutiny.[238] In the United States, the CFPB has a similar program called "Project Catalyst," in which regulators work with innovators to encourage them to adopt consumer protection directly into their products and services in the hopes that the agency will not pursue enforcement actions against them.[239] These education efforts and "regulatory sandboxes"—where regulators work with companies to understand how they are incorporating technological innovations into their products and test how regulations would affect these services—help regulators support both innovation and consumer protection.

3. Remove Duplicative Regulations in Financial Services

The patchwork of laws governing fintech companies can create duplicative requirements from multiple regulators. For example, consumer-disclosure requirements are often the centerpiece of consumer financial protection regulations.[240] Unfortunately, financial-disclosure requirements are arduous and costly, and as a result an entire industry has evolved to focus on developing compliance systems.[241] Similarly, in the United States, there are dozens of federal watchdogs who police anti-money-laundering rules, leading to duplicative requirements.[242]

Where there is a lot of overlap, policymakers should strive to coordinate and centralize these activities to streamline the process and reduce the regulatory burden on fintech companies.

Policymakers should balance the risks associated with fintech with a recognition of its benefits, such as enhancing productivity and reducing costs.

4. Regulate Fintech at the National Level

One of the largest challenges of regulating Internet-based business models is that they are often subject to the jurisdiction of subnational governments, such as states, that create their own rules and regulations. When compounded, a fintech company offering solutions across the United States could face rules from each state and territory where it operates, not including federal requirements. This system creates unnecessary and unreasonable compliance costs on businesses and threatens the viability of a national market for fintech.

A better approach would be for states either to defer to the national government or work in partnership with all states to create a single, national approach to policy. In the former situation, U.S. states would give the federal government a grace period wherein Congress or federal regulators would have the right of first refusal for creating rules that govern a particular fintech-enabled service.

If national regulators choose not to regulate a fintech application and subnational governments, such as state regulators, still believe they need to intervene, they should do so. But subnational governments should cooperate to harmonize their policies, so that there is not an undue burden on companies operating across borders. For example, 47 states, the District of Columbia, Puerto Rico, and the Virgin Islands, passed the Uniform Electronic Transactions Act, harmonizing their laws concerning the retention of paper records and validity of electronic signatures.[243] However, subnational governments should avoid creating rules designed to protect incumbent financial institutions over new ones.

5. Use Regulatory Enforcement Actions to Incentivize Financial Services Companies to Protect Consumers

In the United States, regulators such as the FTC, CFPB, and SEC are closely scrutinizing fintech applications to protect consumers. For example, the FTC recently launched a series of policy forums where it will be discussing the implication of fintech on consumers, starting with marketplace lending.[244] This regulatory oversight keeps companies in check, promotes fair competition, and upholds consumer protections. To maximize its effectiveness and minimize any negative effects, any agency action should create a system of incentives that promotes desirable behavior and discourages undesirable behavior in a marketplace, doing so in a way that limits compliance costs. However, regulators can also go too far and regulate against companies acting in good faith to bring an innovation to market. This approach would limit fintech innovation, because if innovators fear they will be punished for every mistake, they will be much less assertive in trying to develop the next fintech application and will spend more time and effort on compliance, rather than innovation. For example, penalizing a company for a small technical violation of a consumer-protection statute that caused little or no harm to consumers will likely push that company to spend more resources on lawyers rather than on improving the fintech product itself.[245]

Instead, regulators should evaluate enforcement actions based on two dimensions: whether the company acted intentionally or negligently and whether a company's action resulted in real consumer harm.[246] Regulators would then use a sliding scale to determine penalties, where unintentional, harmless actions receive no penalty and intentional, harmful actions receive large penalties. As they evaluate enforcement actions, regulators should treat negligence as intentional. This strategy will not punish companies for innovating and will send clear signals to companies about what behavior is off-limits to better protect consumers.

6. Create Tech-Neutral Rules

Policymakers should adopt technology-neutral rules that neither favor nor disadvantage any particular fintech application, to create a level playing field for innovation. While financial regulators should take into account differing technologies, they should treat similar products and services with similar rules. For example, virtual currency businesses often function similarly to mobile payment businesses and transfer services. Each of these types of businesses should function under similar rules.

Clearly, all fintech businesses are not the same. The concerns associated with money-laundering abuse from unregulated digital currencies may not be the same as from traditional banking. Where there are differences in technologies, policymakers should establish rules that recognize the risks distinct to (or irrelevant to) particular fintech applications.

7. Encourage a Level Playing Field Between Incumbents and New Entrants

A key goal of any regulation of fintech should be to create a level playing field between new entrants and incumbent financial services to ensure neither has a regulatory advantage. Traditional financial companies, such as banks, tend to have a higher regulatory burden, and are the focus of many different national and subnational regulatory agencies. In contrast, entrants and start-ups tend to have less of a regulatory spotlight on them. For example, the start-ups Prosper and Lending Circle are able to operate under U.S. financial regulations more easily than banks, which were saddled with a higher number of restrictions after the 2008 financial crisis.[247]

While policymakers should not regulate all new fintech applications as they would traditional financial goods and services, they should seek to create parity between market entrants and market incumbents. Unfortunately, many market incumbents (e.g., banks) that are experimenting with fintech applications are restricted by a set of rules that many new entrants (e.g., start-ups) are able to escape. Policymakers should ensure companies offering similar fintech products and services follow similar sets of rules, ideally designed in a way that supports fintech innovation.

8. Promote Fintech Cybersecurity

The importance of cybersecurity continues to grow for fintech businesses as they become more reliant on interconnected systems. And yet, despite this digital transformation, both the public and private sector have failed to keep pace with cybersecurity threats. Financial

businesses, especially banks, continue to be the target of both hacking that has resulted in the exposure of millions of consumer records. And complex financial systems continue to lack resiliency, which can result in errors when financial institutions make changes to complex IT systems.[248] The public sector has a role to play in ensuring high levels of cybersecurity and reducing the risks of fintech firms.

To ensure that fintech companies are creating secure services, governments should create incentives for better cybersecurity in fintech products through purchasing, regulation, and oversight. Through procurement processes, governments can ensure that the fintech products they adopt have a high level of security. National regulators can also give the private sector incentives for cybersecurity in fintech applications. Regulators should work with financial institutions to create industry-led cybersecurity standards for various fintech applications. The goal of these efforts should be to shift company resources to improving cybersecurity and better protect consumers without setting prescriptive standards. Finally, regulators should ensure that the private sector keeps its promises related to cybersecurity through enforcement actions. For example, in March 2016, the CFPB imposed its first consent decree with $100,000 penalty on Dwolla Inc.—an Iowa peer-to-peer payment system—for misrepresenting its data security practices by failing to implement appropriate security measures.[249]

9. Support Standards Development and Financial Data Interoperability

National governments should engage with the financial-services industry for private-sector led standards development and best practices around fintech issues, and seek opportunities to participate and promote international collaboration on consensus-based standards adoption. Data standardization and harmonized definitions could allow financial regulators to improve their efficiency by enabling them to share information and decrease risk across the financial sector. However, while regulators around the world have made progress with data harmonization, a number of barriers remain, such as national legal and regulatory impediments to sharing data. In addition, many financial institutions still have not adopted "an integrated data dictionary and taxonomy," which is required by the Basel Committee.[250] Furthermore, global regulatory frameworks and financial infrastructures, such as wholesale payments systems, also differ in the definitions they apply to financial concepts and data.

Policymakers should strive to remove the existing regulatory impediments to sharing and using data for regulatory purposes. This step includes removing inconsistences from how different financial regulations around the world interpret regulatory requirements and definitions, helping to achieve clarity between regulators and the industry. The private sector should work with national regulators to intensify efforts to standardize data, how it is shared, and the definitions of regulatory concepts.

National government should also promote financial data interoperability—the ability of different IT systems to communicate, exchange data, and cooperatively use that data—especially among new technologies, embedded financial architectures, and regulators.

Though industry should lead standards development and harmonization, national governments can bring together disparate market players across different financial services industries, standards bodies, and encourage and promote interoperability across different types of financial data.

10. Promote International Harmonization of Laws Affecting the Financial-Services Sector

Digital technologies are driving a rising share of services trade in the global economy, especially in the financial-services sector.[251] The IT revolution has reduced the transaction costs and information asymmetries associated with international trade through platforms and support services that make it easier for fintech firms to access international markets. Digital innovations, such as digital currency, online marketplaces, and remittance services, overcome many of the traditional constraints to international trade in services. Indeed, as of 2014, more than one-third of global financial investments were cross-border transactions.[252]

To enhance financial services around the globe, governments should seek to harmonize their laws and regulations that focus on the financial services industry, such as those affecting routing transactions, transparency, anti-money-laundering, regulatory compliance, and international access to financial data for law enforcement. A sound international framework of cooperation and coordination based on harmonization is essential to effective regulation and supervision of fintech applications, reducing systemic risks to financial stability, and ensuring innovation in financial services proceeds apace.

Countries should also avoid restricting financial-data flows and should actively push back on localized barriers to these data flows. One opportunity to accomplish this is in the Trade in Services agreement (TiSA), which is the next chance to build on the TPP's e-commerce and data-flow rules, and can update the current framework of rules to address these barriers and to protect the financial-data flows that many fintech applications rely on. The 23 members negotiating TiSA represent 75 percent of the world's $44 trillion services market.[253] An ambitious and strong e-commerce chapter could lead to greater harmonization on the treatment and protection of data and data flows. This would allow fintech and other digital services to streamline business practices and increase efficiency around the globe.[254]

CONCLUSION

At its heart, financial services are about the transfer of information. As such, the industry should be poised for significant transformation as fintech enables technology to automate functions now performed by humans and using cheaper, more general-purpose technology. However, given that the financial-services sector is highly regulated, policymakers will need to actively support fintech innovation for this transformation to occur in a timely manner, in part through innovation-friendly regulations.

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