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MOSSAVAR-RAHMANI CENTER
for Business and Government

Digitizing Finance: Fintech As A Solution For Consumer Financial Health and Inclusion

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June 2020

M-RCBG Associate Working Paper Series | No. 149

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DIGITIZING FINANCE:

FINTECH AS A SOLUTION FOR CONSUMER FINANCIAL HEALTH AND INCLUSION

Third in a series of six papers on Regulation Innovation by Jo Ann Barefoot

Note: This is the third in a series of papers arguing that traditional regulation intended to promote consumer financial protection and inclusion has substantially failed and should be redesigned to leverage new digital technology that can make both finance and financial regulation better and less costly. For the previous papers in the series, see [here](#).

As discussed in the [first](#) and [second](#) papers in the Regulation Innovation series, the evidence is compelling that current regulatory policy aimed at consumer financial protection and inclusion is producing poor results, and sometimes counterproductive ones, at a high cost to industry and therefore consumers. While this system may have been the best one possible in the past, new technology today can improve it dramatically.

This third paper discusses how emerging digital technology can foster very widespread consumer financial inclusion and health. The force driving this opportunity is digitization, which for financial services – as with everything else – can make things work better, faster, and cheaper, simultaneously, and will also enable continuous and accelerating improvement over time. Digitization can do for consumer finance what the smartphone has done for phone calling, messaging, social connection, information-gathering, navigating, scheduling, travel planning, weather reporting, news reporting, health monitoring, still photography, video photography, and hailing a taxi – it’s a long and growing list. In fact, much of the revolution coming to consumer finance will come, not surprisingly, in the consumer’s phone.

New technology has the potential to succeed where regulation has failed in improving consumers’ financial lives. It can bring nearly everyone in the world into the financial system, shield them from predatory products, and make it easy for them to manage their financial activities -- and even their own financial behaviors -- in ways that help them thrive.

This paper discusses that opportunity, while Paper 5 in the series will discuss related downside risks of many of these same innovations.

The following strives to organize this analysis around *consumers' actual needs and problems*, rather than adopting the product-centric framing more commonly used in discussing fintech.

Finance expert and author Helaine Olen has asked the question, “Which is easier? Educating and changing the financial practices of 300 million Americans or changing the financial frameworks surrounding them?”¹ The answer is that changing people’s habits is harder -- often impossible – while changing the frameworks is becoming increasingly easy. Consumers’ money problems (other than not having enough of it) fall into two broad categories. One is lack of *access* – people being unable to get a financial service because it is not affordable or is not available to them at all, or because they cannot qualify for it, as with being declined for a loan due to credit history. The other is harm caused by the products consumers *do* access, either because of how the service is designed and priced or how the person uses it.

Four interrelated factors feed into these two problems: 1) the current high costs of “manufacturing” and distributing financial services; 2) their complexity; 3) consumers’ behavioral mistakes and lack of financial knowledge; and 4) risk evaluation practices that prevent some people from getting services they could actually use responsibly if given access. Today, fintech innovators are attacking every one of these problems.

The Promise of Fintech

This paper will describe specific innovations emerging in financial products and channels. Before examining them, it is worth training a consumer-focused lens on what their impact could look like. How might these developments ultimately come together in people’s daily lives? The following scenario is by no means certain but is fully realistic.

¹ <https://www.theatlantic.com/business/archive/2016/05/financial-literacy/480807/>

Imagine someone who today falls in the category of the “underserved” consumers described in Paper 2 in this series, struggling with time-consuming and stressful financial tasks and paying high prices for the services she uses. Within a decade or less, through the kinds of innovations described in this paper, she will have a vastly better chance of affording the financial services she wants, including loans. If she’s capable of repaying a loan, she’ll be able to get a good, well-priced one, even if she lacks a credit score or has a comparatively low score, and the loan will be well-tailored to her ability to repay. She’ll be able to build up some savings without having to struggle, and she’ll be able easily to smooth out peaks and troughs in her flows of income and expense, without recourse to expensive payday loans or checking account overdrafts. She may receive these services from banks and payday lenders that will have brought improved technology into their offerings, or she may receive them from other sources, ranging from small startups to “Big Tech” firms like Amazon and Google.

This consumer’s budgeting and billpaying will be under control, handled by her smart and affordable high-tech voice assistant, communicating via conversation through her phone and other connected devices. She will be able to precision-time her billpaying electronically and will do it from home, without having to travel around her town cashing checks and making payments as she does today. The voice assistant will continuously help her optimize payment timing and will also track daily spending, helping the consumer reach goals she has set for herself (or best-practice goals she has asked the assistant to set up for her). The digital helper will answer her questions about whether it would break her budget to have dinner tonight with friends or buy something for her children. If she wants it to, the smart device can point out, in real time, how much she can spend as she enters a store, since it will know where she is.

This consumer won’t carry a credit card balance and she will never incur late fees. She’ll know where she stands in paying off her student loans, as well as when and how to start saving for a mortgage, and for retirement. As she begins to build up some wealth, she’ll have a smart robo-financial advisor long before her assets would be substantial enough to attract a human one. When she needs a new financial

service, her assistant will screen out scams and low-rated products and providers, and offer good choices with explanation of their pros and cons.

Her assistant will keep her focused on understanding her financial life by making the conversation interesting and humorous, and by using positive behavioral incentives like celebrating savings milestones or embedding games in money management. If she wants to, she'll set up an avatar personality for the assistant that makes her enjoy managing her funds – maybe her mother, or her high school basketball coach, or a dragon or a kitten. If she wants to understand financial topics in more depth, her assistant will tell her about them, while she works out or commutes or prepares dinner.

If she's a safe driver with a safety-engineered car, and/or if she maintains a healthy lifestyle, and/or if she lives in a home with advanced safety technology, she'll enjoy insure-tech pricing more favorable than what she has today. If she has a family member who wants to come to the United States for college or to escape war or violence in a home country, she'll know that the relative can establish identity here, and therefore get a bank account. If she sends remittance money to family in another country, the process will be nearly free. If she runs a small business, she'll find it easy to get appropriate, well-priced financing based on her electronic business records, which will make loans more affordable and enable repayment terms that can fluctuate, timed to the rhythm of her company's cash flows. If she drives for a ride-sharing car service, she'll be paid immediately after each gig.

The smart digital assistant will answer her questions and perform assigned tasks, and will also (if she wants it to) take the initiative to coach her – for instance by suggesting savings and spending targets and initiating discussions about progress toward goals. This will enhance her “mindfulness,” which can help her maintain focus on long-term rather than short-term needs. At the same time, the assistant will make many good financial habits automatic, so that the consumer need not put constant effort – time and thought and self-restraint – into managing them.

This consumer will know whether she’s “financially healthy” and if not, what to do. She may choose to manage her money as she does her physical health, actively measuring where she stands against a universally understood benchmark, as with a blood pressure monitor or fitness tracker that counts her daily steps.

Compared to today, this woman will be saving hundreds or even thousands of dollars each year, money that she won’t have to spend on financial fees and high interest rates (which, as discussed in Paper 2 in this series, can amount to an estimated \$40,000 over a typical consumer’s lifetime²).

Regardless of income, wealth, age, and station in life, tens of millions of consumers like these will have good prospects of enjoying actual financial health – control over present day challenges, progress toward a solid future, and importantly, windfalls of money, time, and energy that can be redirected from financial struggles and stress, into investment in family, work, and wellbeing.

The Fintech Landscape

The changes described in this glimpse of the future are emerging through what is known as “fintech.” The term refers broadly to innovations that bring digital-age technology into any product category or activity of consumer finance, such as payments, credit, investing, insurance, financial advice, and management of tasks like budgeting and billpaying. Fintech innovation encompasses not only products, but also how products are produced, priced, delivered, and used.

In 2015, the World Economic Forum published a study that surveyed fintech globally and found transformational change underway across all major financial product categories.³

² “Spent, Looking for Change,” American Express 2014 <http://www.spentmovie.com/>

³ http://www3.weforum.org/docs/WEF_The_future_of_financial_services.pdf

This paper will describe the major trends underway. Note that company examples are cited in the footnotes. These should not be construed as endorsing any particular provider. Rather, they are offered to add concreteness to the overview.

As discussed further below, some innovators are inventing new or altered classes of products like marketplace lending (which matches borrowers and lenders online, often providing better rates)⁴ or robo-investing (which can serve people with insufficient wealth to merit a personal financial advisor⁵). Some companies are changing how products are designed and how pricing is structured (e.g. radically simplified and fee-free versions of traditional products). Many are changing how services are delivered to consumers (e.g. mobile phones, voice interface, and payments traveling on the internet rather than through bank system clearinghouses). Some are changing how loans are underwritten (e.g. through big data and artificial intelligence that can fine-tune risk analysis of people who fail traditional screening but are nevertheless able to repay loans). Some innovators are using data to enhance insurance underwriting and delivery through “insure-tech.”^{6 7} Some are speeding up payments (e.g. cryptocurrencies⁸) and making them easier to manage (e.g. peer-to-peer apps that offer convenience and speed, including sharing of payments;⁹ Some are making it easy to save,¹⁰ pay bills,¹¹ budget, and otherwise manage money,¹² again, sometimes by voice.¹³

⁴ Examples are <https://www.lendingclub.com/>, <https://www.sofi.com/>, and <https://www.prosper.com/>

⁵ Examples are <https://www.betterment.com/> and <https://www.wealthfront.com/>

⁶ <http://www.insurancejournal.com/news/national/2016/10/17/429441.htm>

⁷ <http://www.jsbarefoot.com/podcasts/2016/8/16/insure-tech-qed-founding-partner-caribou-honig>

⁸ Examples are <https://bitcoin.org/> and <https://www.ethereum.org/>

⁹ An example is <https://venmo.com/>

¹⁰ An example is <https://digit.co/>

¹¹ Examples are <http://www.toptenreviews.com/money/accounting/best-bill-paying-services/>

¹² An example is <https://www.mint.com/>

¹³ An example is <https://www.capitalone.com/onefocus/bank-alexa/>

Innovators are also changing how customer identity is authenticated (e.g. through biometrics and electronic attestation); how privacy is protected; how products are created and maintained (e.g. distributed ledger technology replacing traditional “back office” operations); and how consumers evaluate products and pricing (e.g. online comparison and shopping tools).

Importantly, nearly all fintech companies are employing many of these kinds of technology shifts simultaneously – the innovations are intertwined.

Small business lending is undergoing a parallel transformation, driven by the same technologies including online interface and the explosion of data. A key innovation is the Square reader – the payment “dongle” that attaches to the mobile phone of, say, a food truck vendor or taxi driver.¹⁴ Square and others are enabling even the smallest companies to join the digital economy, not only by easing how businesses take customers’ payments, but also by digitizing their records of cash flow. That data, in turn, is enabling low cost, accurate, automated underwriting, which is fueling growth in online sources of working capital.¹⁵ With the advent of contactless payments, these functions will become even more easy and ubiquitous.¹⁶

The leading edge of most of this innovation comes from startups backed by venture capital. While Worldwide investment in fintech ventures has been reported at \$39.6 billion in 2018, up 120 percent from the prior year.¹⁷ Chinese fintech Ant Financial raised a record \$14 billion, the largest amount for any private company for the year.¹⁸ Major venture firms are active in the space, and VC’s have also emerged that specialize in fintech.

¹⁴ <https://squarefinancial.co/>

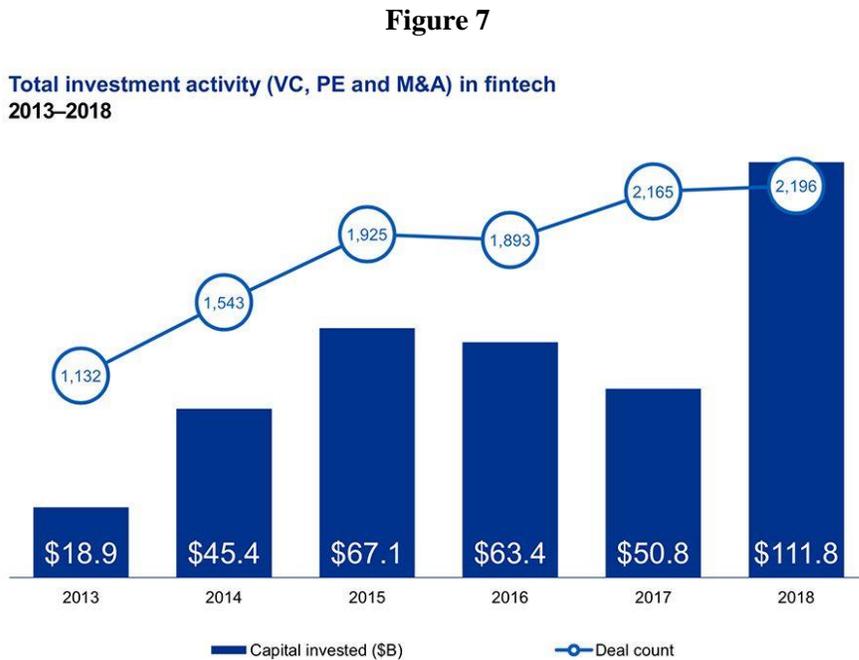
¹⁵ https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2877201

¹⁶ <https://squareup.com/townsquare/what-is-a-contactless-payment>

¹⁷ <https://www.trulioo.com/blog/vc-investments-fintech-2018/>

¹⁸ <https://www.trulioo.com/blog/vc-investments-fintech-2018/>

Venture-backed investment is also supplemented by funding from other sources, including mergers and acquisitions of fintech firms. Consultancy Europe reported 2018 investment as more than doubling to \$112 billion worldwide.¹⁹



Source: Consultancy Europe

Startup founders typically come from technology backgrounds rather than finance, and often describe their motivation as arising from frustration with traditional banking.²⁰

Despite their origins in new, small companies, these innovations increasingly permeate the banking system. In a 2017 update to the World Economic Forum study cited earlier, researchers found that fintech has not yet altered the industry’s competitive structure, but is markedly impacting how banking is done, with banks moving to adopt new technologies they increasingly see as superior.²¹

¹⁹ <https://www.consultancy.eu/news/2390/global-fintech-investment-more-than-doubled-to-112-billion>

²⁰ This common founder motivation is reflected in my discussions with many guests on my podcast program, Barefoot Innovation, in episodes with firms like Simple, Digit, LendUp, Lending Club, Petal, Moven, Varo, Personal Capital, Loot, Social Eco, Bee, Betterment, Circle, Ascend and Green Dot. <http://www.jsbarefoot.com/podcast/>

²¹ <https://www.weforum.org/reports/beyond-fintech-a-pragmatic-assessment-of-disruptive-potential-in-financial-services>

This shift is difficult for banks, which are traditionally conservative and slow-to-change. Rather than attempting to home-grow innovation, many are importing new products, ideas and, cultures directly from small innovators. Most large banks have created innovation hubs, labs, or accelerators where they experiment with new technology, often inviting participation by startups. Many even mimic tech startup settings and culture by locating their labs in converted warehouse space with furnishings like beanbag chairs and ping pong tables, and with executives shedding suits and ties in favor of jeans and tee shirts.²² Banks are also forming partnerships with fintechs – for example, JPMorgan Chase has an arrangement with OnDeck,²³ which runs a technology platform for small business lending.

Another model for bank innovation is acquisition. A 2017 PricewaterhouseCoopers survey found that half of the world’s financial services companies expected to make a fintech acquisition in the next three to five years.²⁴

Broadly speaking, fintechs and banks have complementary strengths and weaknesses that are likely to draw them more and more together. Fintechs are generally better at being innovative, at creating a compelling user experience (UX), and at using data for functions ranging from credit underwriting to compliance. However, they often struggle to acquire customers and they have a high cost of funds, in the form of venture capital. Banks, conversely, already have customers and have a low and stable cost of funds since they take in insured consumer deposits. Also, unlike fintechs, they have access to the payments system – the closed networks through which payments are cleared. These contrasting capabilities are likely to intensify a trend that is already underway, in which banks and fintech startups work together through models that include acquisition of the fintech, partnering, referral arrangements, and vendor relationships.

²² <https://www.bloomberg.com/news/photo-essays/2016-12-05/a-look-inside-wall-street-s-innovation-labs>

²³ <https://www.lendacademy.com/an-in-depth-look-at-the-ondeckjpmorgan-chase-deal/>

²⁴ <https://www.bloomberg.com/news/articles/2017-04-05/big-banks-poised-to-scoop-up-fintech-startups-report-finds>

In late 2016, the Office of the Comptroller of the Currency sparked controversy by initiating a plan to create a new type of national bank charter for fintechs,^{25 26} a step that could accelerate integration of fintech innovation with mainstream banking. This move has drawn litigation, but may proceed in some form. Meanwhile other avenues are being explored by nonbanks seeking banking charters, including through state-chartered, FDIC-insured Industrial Loan Corporations (ILC's),²⁷ and applications for conventional national banking charters.²⁸

While startups tend to dominate the fintech dialogue, another emerging trend is entry into finance by “big tech” firms like Amazon, Apple, Google, and Facebook, all of which already offer a growing set of financial services (as do telecom firms, especially in the developing world). In 2016, Apple, Google, Amazon, and several other firms formed a Washington lobbying organization called Financial Innovation Now, or FIN, signaling their growing interest in the financial space. In 2017, a spate of articles reported rumors that Amazon might buy Capital One.²⁹ In March 2018, Amazon triggered headlines with reports that it might partner with one or more large banks to offer checking accounts aimed at people who today are “unbanked” or have high-cost accounts.³⁰

These developments reflect the size and momentum of fintech innovation. Countries like the United Kingdom, Singapore, and the UAE have formally adopted strategies striving for regional or global fintech leadership as a driver of economic growth. The Alliance for Financial Inclusion, made up of central banks and financial regulators of over 90 countries in the developing world, drives fintech

²⁵ <https://www.occ.gov/topics/responsible-innovation/comments/special-purpose-national-bank-charters-for-fintech.pdf>

²⁶ <https://corpgov.law.harvard.edu/2016/12/11/occ-to-issue-special-purpose-national-bank-charters-to-fintech-companies/>

²⁷ <https://www.americanbanker.com/news/square-to-apply-for-industrial-bank-inflaming-ilc-debate>

²⁸ https://www.varomoney.com/press_release/varo-money-granted-preliminary-approval-for-national-bank-charter/

²⁹ <http://www.bankingtech.com/735552/amazon-looking-to-buy-capital-one/>

³⁰ <https://www.usatoday.com/story/money/2018/03/05/report-amazon-checking-accounts-something-similar-could-coming-soon/394470002/>

initiatives for the same reason,³¹ as do multi-national institutions like the World Bank³² and NGO's like the Bill and Melinda Gates Foundation³³ and Omidyar Network³⁴ and Omidyar's affiliated venture fund, Flourish Ventures.³⁵

Technology meets Demography

A critical factor in this growth is that two major currents of change are converging. One is technological, through the trends discussed in this section. The other is demographic – specifically, the emergence of millennials as the largest generation that has ever lived (see Figure 8).³⁶ Millennials (people born between 1980 and 2005), now outnumber other age groupings both globally and in the United States, where they comprise about one-third of the population.³⁷ Fintech innovations typically target millennials initially, both because these customers tend to be early adopters of new technology and because they are an enormous market whose preferences will shape industry trends for decades, much as the baby boomers did at the same stage of life. Seventy-five percent of millennials have a social media account, and 25 percent point to their relationship with technology as what makes their generation unique.³⁸ They tend to have high expectations, demanding products that can be accessed online, are easy and even enjoyable to use, and that are simultaneously bespoke and inexpensive. Most of those traits are

³¹ <https://www.afi-global.org/>

³² www.worldbank.org/en/topic/financialinclusion

³³ <https://www.gatesfoundation.org/What-We-Do/.../Financial-Services-for-the-Poor>

³⁴ <https://www.omidyar.com/our-work/financial-inclusion>

³⁵ <https://flourishventures.com/>

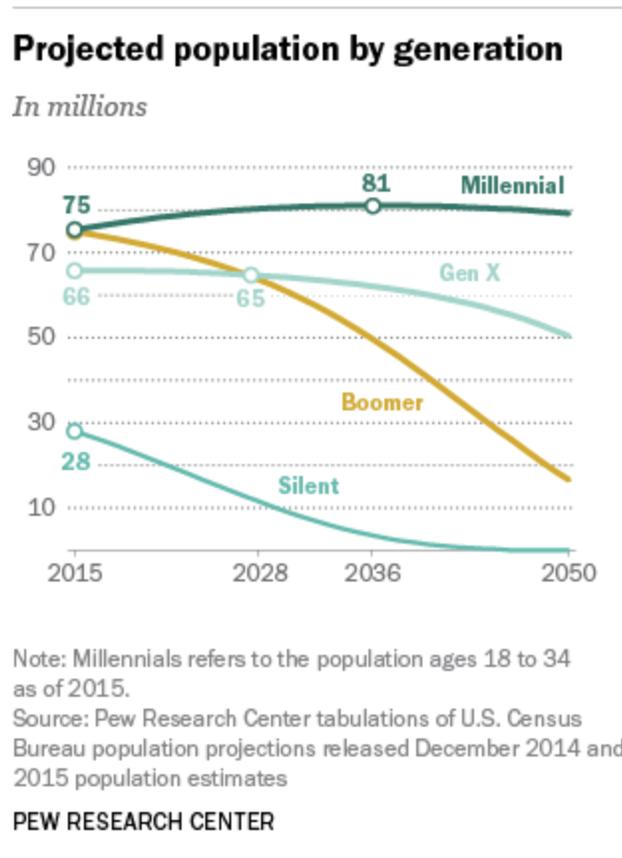
³⁶ <http://www.pewresearch.org/fact-tank/2016/04/25/millennials-overtake-baby-boomers/>

³⁷ https://www.whitehouse.gov/sites/default/files/docs/millennials_report.pdf

³⁸ Same

not normally associated with traditional banking by consumers generally,^{39 40} and specifically not by millennials.^{41 42}

Figure 8



Source: Pew Research Center

Millennials also have distinctive needs. They hold most of the \$1.3 trillion in outstanding U.S. student debt.⁴³ Along with GenXers (a small generation), they will inherit an estimated \$30 trillion in

³⁹ <http://www.nytimes.com/2012/04/03/opinion/nocera-why-people-hate-the-banks.html>

⁴⁰ <https://www.bloomberg.com/news/articles/2017-11-20/banks-beware-most-customers-suspect-tech-can-do-your-job-better>

⁴¹ <https://www.forbes.com/sites/laurashin/2016/10/18/survey-on-consumer-attitudes-toward-fintech-spells-trouble-for-banks/>

⁴² <https://www.fastcompany.com/3027197/sorry-banks-millennials-hate-you>

⁴³ www.pewresearch.org/fact-tank/2017/08/24/5-facts-about-student-loans/

wealth over the next few decades.⁴⁴ They are highly diverse. William H. Fray, in a 2016 Brookings Institution report, says, “Racial diversity will be the most defining and impactful characteristic of the millennial generation,” and notes that this group will play a central role in converting the United States to a “majority minority” nation.⁴⁵ Companies that cater well to their needs and tastes may have an opportunity to scale up aggressively as this customer segment grows in purchasing power. Fintechs focused on millennials generally view them as a market entry point and have plans to serve the full age spectrum by offering everyone superior products and user experience, over time.⁴⁶ Meanwhile traditional banks and financial companies whose business models depend on loyal baby-boomer customers face the risk of losing market share.

Enabling Technologies

Before examining the types of consumer problems that fintechs are trying to solve, it is worth reviewing the main technologies that underlie their innovations. Fintech is more “tech” than “fin” in the sense that its main drivers are not in the financial realm at all, but rather are the enormous worldwide technology shifts that are transforming how people live. The foundation for all this change is the explosion of data and new ways of putting it to use – broadly, the shift from the analog to the digital age.

The key forces at work can be grouped in six interconnected technology trends:

Big data:

The first trend is so-called “Big Data” -- the accelerating availability of information generated from the digitization of modern life. Sources of this data include online activities, social media usage, entertainment consumption, geolocation trackers like cars and phones, cameras and facial recognition technology, other biometric information, online availability of government databases, and the Internet of Things (IoT) – the communications between all the tiny computers embedded in smart devices from

⁴⁴ <https://www.cnbc.com/2016/06/15/the-great-wealth-transfer-has-started.html>

⁴⁵ <https://www.brookings.edu/blog/the-avenue/2016/06/28/diversity-defines-the-millennial-generation/>

⁴⁶ <http://www.jsbarefoot.com/podcasts/2017/3/9/a-millennial-building-for-millennials-ollie-perdue-of-loot>

thermostats and baby monitors to cars and keys, and even refrigerators and laundry equipment. This trend is generating both new kinds of information and greater volumes of traditional information. It is also capturing and storing data in ways that are easy to access, including through cloud computing, that facilitate use of data and also drive down costs and potentially will strengthen security.

Artificial intelligence and machine learning:

The second trend is creating the tools needed to make good use of all this data. Artificial intelligence (AI) and its branches, including “machine learning,” “deep learning,” “neural networks,”⁴⁷ and Natural Language Processing (NLP) can leverage rapidly expanding data in ways that not only gather information and calculate numbers, but actually “learn” and “think.”⁴⁸ They have the capability to search essentially all the digitized information in the world (which is expanding exponentially as discussed in Paper 5), identify patterns that are meaningful for a given task or goal, and, through continuous feedback cycles, become continuously smarter over time. As discussed below, the combination of more data and fast, smart pattern recognition is enabling, among other things, more finely-tuned risk assessment of creditworthy loan applicants who today are screened out by traditional methods, as well as easier identity authentication and development of personalized services through robots.

Cloud computing:

A third critical trend is the move of information processing and storage from “on-premises” servers into cloud computing environments. Cloud solutions like Amazon Web Services (AWS), Google Cloud and Microsoft Azure have made it possible for any business, including very small ones, to store, access, and use vast amounts of data without having to incur the expense of traditional on-premises mainframe computers or having to allocate major capital investments for centralized IT changes. Users in the cloud pay for only the computing power they need, when they need it. This is a key driver of the

⁴⁷ <https://www.forbes.com/sites/bernardmarr/2016/12/06/what-is-the-difference-between-artificial-intelligence-and-machine-learning/>

⁴⁸ <https://www.nytimes.com/2017/05/23/business/google-deepmind-alphago-go-champion-defeat.html>

nimbleness and efficiency of fintech startups – without the cloud, these companies generally could not join the financial services marketplace.

The superiority of cloud computing is drawing banks and financial regulators into these systems as well. That process raises a range of regulatory questions that are being addressed, but once the transition is in place, innovation is likely to surge among traditional financial companies.

Voice technology:

The fourth trend is natural voice interface that translates complex information into easy, interactive dialogue (and into numerous languages). By supplementing today’s ubiquitous graphical user interface (GUI) with a “conversational user interface,” technology is reaching millions of people who currently struggle with how financial information has traditionally been conveyed and put to use. These people may be impacted by factors like age, language, cultural background, visual impairment, literacy and numeracy, and confidence regarding financial topics and situations. Voice-assisted services can enable everyone to have a proactive personal financial advisor seamlessly helping them with their financial activities, integrated across all their devices.⁴⁹

Digital ledger technology (DLT) and blockchains:

The fifth trend is evolution of the blockchain and distributed ledger technology (DLT). Invented by Bitcoin, DLT is fueling both digital currency and numerous other breakthroughs.

The blockchain is a “distributed ledger” that acts as a shared, transparent, immutable, real-time ledger of a series of transactions or records. The information in the chain can be seen at all times by everyone who has access, which may be granted to specific people on a “closed” blockchain or may be made available to everyone on an open ledger, where the information can move transparently on the internet.

The initial use case for blockchain technology was digital or cryptocurrency. DLT can make financial transactions auditable, impossible to duplicate, and fully visible at all times to a wide audience.

⁴⁹ David Pierce, “We’re on the Brink of Crazy Smart Digital Assistants,” Wired Magazine, 9/16/15
<http://www.wired.com/2015/09/voice-interface-ios/>

Because these currencies are transacted on the internet rather than through traditional clearinghouses, they can also speed up payments, enable micropayments in smaller than normal units of currency, and provide security to people in countries where government-run payment systems are insecure or unreliable. DLT can essentially make moving money instant and free, just as sending an email over the internet is instant and free, for the same reasons. Central banks and central payments clearinghouses are exploring how to learn from this mold-breaking innovation.⁵⁰

DLT also has the potential to reduce numerous costs that contribute to making financial services unaffordable for millions of consumers. Large banks are exploring closed blockchains to streamline “back office” operations like procurement chains, and to reduce the need for legal contracts and capital requirements to cover risk arising from functions like the time lags in settling foreign exchange transactions.⁵¹

Mobile technology

The final trend is mobile technology, which is arguably the most democratizing force in the history of finance. Mobile phones are making it possible to serve virtually everyone, everywhere, profitably, due to the extremely low cost and near-ubiquitous penetration of this channel. In 2016, use of mobile banking by millennials was approaching 70 percent.⁵² Eighty-two percent of smart phone users between 18 and 24 use mobile banking.⁵³

In addition, the phone will increasingly be the hub that links together each consumer’s full spectrum of financial relationships and activities. It will gradually consolidate financial records and functions electronically in one place, thereby creating easier and more effective ways to manage them, including through voice (after all, the connecting device is a telephone).

The profound impacts of expanding mobile technology are discussed later in this paper.

⁵⁰ <https://azure.microsoft.com/en-us/overview/what-is-cloud-computing/>

⁵¹ <https://www.coindesk.com/blockchain-worth-trouble-blythe-masters-say-yes-sibos/>

⁵² <https://bankinnovation.net/2016/03/millennials-mobile-banking-usage-is-now-close-to-70/>

⁵³ <https://thefinancialbrand.com/65628/digital-banking-consumer-trends/>

Each of these six trends is individually potent. Importantly, they are also converging in ways that leverage one another and can bring sudden leaps of progress. They are engendering new products, revolutionizing the cost and difficulty of providing financial products, and changing how customers use financial products, thereby expanding the universe of markets and customer types that can be reached and profitably served.

Increasingly, these technologies are also moving onto digital platforms on which further innovation can be built easily and continuously. The problems being solved include many that were not even perceived as such, until the technology arrived to do things better. Again, this cycle of innovation building on innovation is in the nature of digital technology.

Following is an overview of how this technology is changing finance, organized around the traditional consumer problems that innovators are trying to solve. Some of the developments described are well established while others are nascent, but all are already under way and all rely on technology that already exists.

Again, this paper emphasizes the positive benefits of these innovations for financial health and inclusion for consumers and small businesses. Paper 5 in this series will explore their related problems and dangers.

Solving for Affordability and Inclusion

A 2018 study by the World Economic Forum described global financial inclusion as reaching a pivotal moment. The report, “Advancing Financial Inclusion Metrics: Shifting from Access to Economic Empowerment,”⁵⁴ opened with this statement:

Financial inclusion is at a turning point. Due to advances in technology, the unprecedented advent of transactional and behavioral big data and greater multi-stakeholder collaboration, there is a realistic opportunity to reach the financially excluded – estimated to be 2 billion – and the many more who are underserved.

⁵⁴ http://www3.weforum.org/docs/WEF_White_Paper_Advancing_Financial_Inclusion_Metrics.pdf

As discussed earlier, consumers' problems with the financial system cluster in two broad categories. One is a failure of "inclusion" – large numbers of people being unable to get good services, and the second is a failure of "protection" -- people being harmed by the services they do get, and/or being unable to build genuine "financial health." This section will discuss the former, and the next will address the latter.

While public policy has sought to promote "financial inclusion" for decades, the term is generally not defined in laws and regulations. For our purposes, we can think inclusive finance as a desired state in which most people would enjoy the use of high-quality financial services, and in which these services are priced appropriately for the person's individual risk profile and for the costs of serving them. This means that higher-risk consumers would pay more to cover the risk they present – since if they don't, providers will avoid serving them -- but they would *not* be subject to predatory pricing or to high prices driven by structural failures in markets or regulation. It also means that as technology drives down transaction and service costs, more people will become profitable to serve.

Inclusion is impeded by three common and intertwined barriers: that people cannot get access to good services at all (for instance, because they cannot get to a bank branch), or cannot afford them, or cannot qualify for them. Technology is on track to solve all three problems.

Perhaps most notably, technology is in an early stage of slashing the cost structures that underpin finance. In March 2015, the *Financial Times*' Martin Wolf quoted Andrew Haldane of the Bank of England as saying, "astonishingly," that "the unit cost of U.S. financial intermediation seems to be unchanged over a century."⁵⁵ That pattern is no longer holding.

This section identifies eight distinct (and again, overlapping) technology factors that are either reducing costs – thereby, again, expanding the universe of customers who can be profitably served⁵⁶ -- or

⁵⁵"Good News—Fintech is Disrupting Everything" <https://www.ft.com/content/425cb3ca-e480-11e5-a09b-1f8b0d268c39>

⁵⁶ This cost restructuring of has ramifications far beyond financial inclusion, including the likelihood that incumbent companies that fail to modernize will find themselves with severe competitive disadvantages, which could in turn lead to systemic risk issues in the years ahead.

removing other barriers to widespread access and inclusion. Some of these same innovations will be discussed again in the following section on consumer protection, as they impact that challenge as well.

For each factor, examples are offered of specific innovative companies in the category, presented in footnotes and for illustrative purposes only. It should be emphasized that, while these innovations all show promise, there is a high rate of failure among individual fintech startups, as is true of new small businesses in any field. Mention of any given firm should not be interpreted as a recommendation or endorsement.

Online and mobile financial delivery:

Most banking in the United States is already done online, with 51 percent of adults using this channel.⁵⁷ Banks and nonbanks are inventing new online business models that leverage the low costs of internet and mobile services compared to traditional brick and mortar branch banking (examples are online lending and marketplace lending). Most nonbank financial product innovators have mobile-first and/or online-only delivery channels. Banks, meanwhile, are shifting their mix of channels⁵⁸ but largely are maintaining both old and new ones simultaneously – i.e. branches, ATM’s, checks, telephone banking, online and mobile – because they have customers who use them all, and sometimes also because they face regulatory pressure to keep them, especially branches.⁵⁹ Nevertheless, they are closing branches at an accelerating rate.⁶⁰ As the industry as a whole migrates to emphasis on lower-cost delivery channels, finance services will become more affordable across the board. This is a common effect of technology and especially digitization, driving down prices in everything from word processing and calculators to photography, and to the telephone itself.

⁵⁷ www.pewinternet.org/2013/08/07/51-of-u-s-adults-bank-online/

⁵⁸ <https://www.wsj.com/articles/banks-double-down-on-branch-cutbacks-1517826601>

⁵⁹ Evaluation of performance under the Community Reinvestment Act, which covers only banks and thrift institutions is a three-part analysis, with one part being a “services” test. It rewards opening and maintaining branches in low-and moderate-income areas. Community groups tend to emphasize this issue and criticize or protest branch closure.

⁶⁰ <https://www.economist.com/news/finance-and-economics/21725596-banks-have-shuttered-over-10000-financial-crisis-closing-american>

Online services include both consumer and small business lending, sometimes aimed at nationwide markets and covering a range of short-term credit products. Some providers are “marketplace lenders”⁶¹ that use online platforms to match individual borrowers with willing lenders, which may be either individuals or institutional investors. These companies often serve borrowers who cannot get bank financing. They sometimes offer rates more favorable than those available to these kinds of customers through traditional nonbank channels.

Even more transformative than online service is the shift to services that are “mobile-first” or mobile only. As noted earlier, the mobile phone is probably the most democratizing financial development in history. The phone can deliver services almost everywhere, to almost everyone, at a fraction of the cost of traditional delivery channels. People for whom no bank would ever have built and staffed a physical branch have suddenly become a desirable market, due to the mobile phone.

Mobile phone adoption in the developing world has spread faster than in more developed countries, mainly because telephone landlines had been less widespread.⁶² These phones are now approaching ubiquity. In 2013, the UN found that 6 billion of the world’s 7 billion people had access to a phone, while only 4.5 billion had access to a toilet.⁶³ The World Bank has created a Global Findex database on financial inclusion. In 2018, it reported that 69% of adults in the world – 3.7 billion people – have access to a bank account or mobile money provider.⁶⁴ Since 2011, 1.2 billion people have been added to the formal financial system, with more than half a billion joining just since 2014. The World Bank set a goal for full financial inclusion in which every adult would have a financial account by 2020.⁶⁵ While about two billion people still do not, the gap is closing rapidly because “banking” can so easily be

⁶¹ Examples are <https://www.lendingclub.com> and <https://www.prosper.com/plp/how-it-works> and www.fundingcircle.com/

⁶² Much of this movement began with Vodafone’s MPesa product in Kenya, which has been widely emulated and enables people to make payments through their phones. In much of the world, telecoms are greater drivers of financial inclusion than are traditional financial companies. <https://www.mpesa.in/>

⁶³ <http://newsfeed.time.com/2013/03/25/more-people-have-cell-phones-than-toilets-u-n-study-shows/>

⁶⁴ <https://www.worldbank.org/en/news/press-release/2018/04/19/financial-inclusion-on-the-rise-but-gaps-remain-global-findex-database-shows>

⁶⁵ <http://www.worldbank.org/en/topic/financialinclusion/overview>

brought into the phone.

“Financial inclusion has been identified as an enabler
for 7 of the 17 [Sustainable Development Goals](#).”

World Bank Report on Financial Inclusion, April 2017

In many of these markets, people have a phone but poor broadband. However, solutions to that problem are underway, as well.⁶⁶

Broadly speaking, widened financial inclusion begins with a mobile-based transaction account that equips people to make payments and receive money. Once that relationship is established, it becomes possible to add other financial services including loans, insurance and savings and investment options.

The influx of hundreds of millions of people into the financial system obviously raises major challenges for regulators in their quest to assure financial stability and consumer protection, especially since many newly minted customers lack past experience and sophistication with finance. As will be discussed in Paper 4 of this series, the same technologies that are modernizing finance are also transforming regulation. Many less developed countries are playing leading roles in this modernization, creating high tech and scalable regulatory programs to manage the rapid influx of consumers. Some are essentially “leapfrogging” the traditional regulatory models and moving straight to digital tools.

While mobile finance has grown more slowly in the United States than in the developing world, the U.S. has experienced the same pattern of benefits for financial inclusion. This is largely because lower-income and minority consumers have been disproportionately high users of smartphones, including for financial tasks. As illustrated in Figure 9 below, a 2016 Federal Reserve Board study on Consumers

⁶⁶ <https://www.forbes.com/sites/timworstall/2013/05/25/googles-excellent-plan-to-bring-wireless-internet-to-developing-countries/#6ee3b2e9253c>

and Mobile Financial Services found that smartphone usage by low-income and black and Hispanic consumers exceeded use by others. This pattern also held for using the phone for payments.⁶⁷

Figure 9

Smartphone usage by race/ethnicity					
Percent, except as noted					
Race/ethnicity	Smartphone usage				
	2011	2012	2013	2014	2015
White, non-Hispanic	41	50	57	68	74
Black, non-Hispanic	47	54	63	66	76
Other, non-Hispanic	45	54	76	83	88
Hispanic	55	60	72	82	82
2+ races, non-Hispanic	43	59	64	65	79
Total	44	52	61	71	77
Number of respondents	2,002	2,291	2,341	2,603	2,244

Source: Federal Reserve Board, March 2017

The same study similarly found that “underbanked” consumers with mobile phones were “much more likely to report being either a mobile banking or mobile payments user than fully banked respondents.” The disparity was 55 percent compared to 39 percent for mobile banking, and 34 percent to 20 percent for mobile payments. One reason is that the “digital divide” in access to personal computers and broadband internet caused many lower-income consumers to skip the era of online banking and go straight to cell phones.

In short, mobile services solve for two of the most intractable obstacles to financial inclusion: how to physically reach more people and how to do so with profitable, but widely affordable, pricing.

Cloud computing:

⁶⁷ <https://www.federalreserve.gov/econresdata/consumers-and-mobile-financial-services-report-201603.pdf>

A second factor that expands inclusion by reducing industry costs is cloud computing. As noted earlier, part of the reason that startups can readily enter the financial services industry today is that they do not need to acquire and maintain mainframe computers. Rather, they typically use online cloud computing providers⁶⁸ at a fraction of the cost that banks carry for these functions. (Banks, too, are migrating to these systems as their regulators become satisfied that these new formats can provide adequate data security.)

Robotics:

A third breakthrough in affordability is emerging in the form of AI-enabled robots, both digital and physical, which, again, can reduce the cost of delivering services. One example is so-called robo-investing, which is providing active, customized investment guidance to people with insufficient wealth to merit a personal financial advisor.⁶⁹ Another is that “chatbots” are cropping up in all manner of financial tasks, eliminating the high cost of using humans to answer questions and solve problems.⁷⁰ For instance, robots can be trained to monitor consumer complaints and even in some cases address them. (The Japanese company Softbank has created a physical “emotional robot,” Pepper, trained to recognize and respond to basic human emotions -- see footnote for a video.)⁷¹

Inclusive underwriting:

A fourth technology trend is addressing the fact that traditional credit evaluation standards currently exclude many people who have a demonstrable ability to repay a loan.

Traditional loan underwriting relies heavily on review of the applicant’s credit history, as compiled by one of the three major credit reporting agencies. These companies (Experian, Equifax, and Transunion) leverage information shared with them by lenders, which report data on their customers’

⁶⁸ Examples are <https://aws.amazon.com/> and <https://cloud.microsoft.com/en-us/>

⁶⁹ Examples are <https://www.betterment.com/> and <https://www.wealthfront.com/>

⁷⁰ An example is <https://www.varomoney.com/>

⁷¹ <https://www.youtube.com/watch?v=i8bk39a9xM0> and <https://www.wired.com/2016/06/pepper-emotional-robot-learns-feel-like-american/>

payback performance, and which also use the credit bureaus' aggregated information to evaluate new loan applications.

Quantitative credit scoring emerged in the 1950's along with the growth of consumer finance itself. In 1989, the Fair Isaacs company advanced the process by creating the FICO score, a three-digit number that reflects credit history information. This invention was a great driver for financial inclusion, because it facilitated highly reliable and very efficient evaluation of credit risk – again, it reduced cost structures around underwriting and thereby could expand access.^{72 73}

Standard credit scoring models not only have high predictive accuracy,⁷⁴ but also meet regulatory standards for avoiding bias.⁷⁵ However, by definition, credit scores only help people who have them, and whose scores are acceptable to lenders.⁷⁶ This means the current system skews against consumers who have either scant or complex credit histories -- who lack a credit score, or have a low score caused by factors that may no longer apply or may be difficult to evaluate. Such consumers are often labeled as “thin file” or “no file,” referring to their credit histories, but many have provable records of timely payment of bills that are not factored into credit scores, because the companies the consumer pays do not report data to the bureaus. For such consumers, lenders generally find it too time-consuming and expensive to try to separate good from bad risks,⁷⁷ especially for smaller loans, because it would require high-cost human effort to evaluate each case. The expense makes the loan unattractive and potentially unprofitable.

⁷² These same forces also fueled rapid expansion of consumer credit which has in turn contributed to long-term reductions in household savings rates and have sometimes led to over-borrowing. Those problems, too, can be addressed through innovative technology, as discussed in the next section.

⁷³ Standardized scoring may also have helped reduce the potential for bias in underwriting by reducing the role of subjective human judgment, as discussed in other sections.

⁷⁴ Notably, however, they can fail, as happened spectacularly in the subprime mortgage crisis that began in 2006-7

⁷⁵ <https://www.theatlantic.com/technology/archive/2016/12/...credit-scores/509333/>

⁷⁶ <https://www.forbes.com/sites/markgreene/2016/12/29/how-much-does-your-credit-score-affect-your-interest-rate/#762ce087b85b>

⁷⁷ <https://medium.com/@LetsTalkPayments/alternative-data-in-financial-services-is-a-double-edged-sword-e084e7e1f8c6>

With newer data and technology, however, it is becoming possible to conduct such sorting efficiently, by using fuller data sets that permit more granular analysis.⁷⁸ Some lenders, especially outside the United States, are exploring use of other factors like social media patterns and psychographic analysis of customers⁷⁹ and are reporting early success, including for lending to women.

In the U.S., most of the momentum for use of alternative data is focused on evaluating digitized information about the customer's own cash flows of income and payments, which can now be electronically accessed by lenders from the person's bank account records, if the customer gives permission. Even applicants with no credit scores or credit histories can often demonstrate high creditworthiness by showing lenders their patterns of income and of spending over time, including the fact that they dependably pay their bills to entities that do not report information to credit bureaus. Many or most fintech lenders are using these alternative methods and are asserting that the results are simultaneously more inclusive and at least as predictive as traditional scoring.

In 2018, a new nonprofit organization, FinRegLab,⁸⁰ was established to conduct empirical testing of this and similar questions arising from fintech. In 2019 it released research that suggested strong potential for cash-flow underwriting to be both more inclusive than traditional credit analysis and equally predictive, if not more so.^{81,82} Similarly, the CFPB issued a "No Action Letter," or NAL, to the fintech company Upstart, indicating that its use of alternative underwriting data does not appear to raise regulatory concerns.⁸³ Bureau fair lending head Patrice Ficklin and innovation lead Paul Watkins wrote in a related blog post, "As a result of these innovations, some consumers who now cannot obtain favorably priced credit may see increased credit access or lower borrowing costs."

⁷⁸ An example is <https://www.petalcard.com>

⁷⁹ <http://www.autoremarketing.com/subprime/how-finance-companies-dabble-psychographic-analysis>

⁸⁰ <http://finreglab.org/> I chair the board of directors of FinRegLab.

⁸¹ <https://finreglab.org/reports/cash-flow-data-underwriting-credit-empirical-research-findings>

⁸² <https://finreglab.org/the-use-of-cash-flow-data-in-underwriting-credit-small-business-spotlight>

⁸³ <https://www.consumerfinance.gov/about-us/blog/update-credit-access-and-no-action-letter/>

Paper 5 in this series will discuss potential problems with these new types and uses of data, including potential “disparate impact” and inadvertent discrimination of the kind explored in Paper 2. If new models prove themselves, however, they can be expected to drive far greater financial inclusion by helping more people qualify for credit, and by making credit more affordable for large numbers of credit-worthy people who are currently consigned, *en masse*, to high-risk pricing. Recognizing both the potential benefits and risks, the CFPB is working toward addressing these concerns, both by requesting public input⁸⁴ and through the No Action Letter mechanism.⁸⁵

Identity authentication:

A fifth driver of expanded access is the emergence of new high-tech forms of identity authentication. As discussed in Paper 2 in the Regulation Innovation series, anti-money laundering “Know-Your-Customer” (KYC) rules require financial companies to verify customers’ identities before allowing them to open a bank account and connect to the payments system. In the developing world, this process locks out large numbers of people who lack identity documents, disproportionately impacting women.⁸⁶ In the United States, it also causes difficulties for new immigrants and for people with complex situations that impede easy, instant authentication.

Today, these problems are increasingly being addressed through new biometric identification methods, in much the way consumers can now use a thumbprint or facial recognition to unlock a mobile phone. In the world’s most ambitious project to date, the government of India has collected biometric data – fingerprints, retina scans and facial recognition – on more than 1.2 billion men, women and children.⁸⁷ This enables people to identify themselves and thereby link into the digital economy through the

⁸⁴ <https://www.consumerfinance.gov/about-us/newsroom/cfpb-explores-impact-alternative-data-credit-access-consumers-who-are-credit-invisible/>

⁸⁵ <https://www.consumerfinance.gov/about-us/newsroom/cfpb-announces-first-no-action-letter-upstart-network/>

⁸⁶ <http://www.jsbarefoot.com/podcasts/2017/8/23/access-for-all-ciies-sanjay-jain-and-the-india-stack>

⁸⁷ The Aadhaar program has become the subject of litigation in India over privacy concerns. <https://lawandotherthings.com/2018/09/all-you-need-to-know-about-the-aadhaar-litigation/>

government-issued Aadhaar card.⁸⁸ Startups globally are also working on systems of “attestation” of identity⁸⁹ from known parties.⁹⁰ Among other things, these tools also hold promise to solve problems, including security concerns, raised by migration of refugees.⁹¹ They also create the potential to serve more people profitably through sheer improvements in the efficiency of doing so.

Bridging access gaps:

Many consumers are excluded from mainstream financial services by a dearth of onramps into the system from where they are situated today. A number of innovators are specifically trying to build better pathways. For example, many fintech lenders serve customers with impaired credit, using the low cost structure of online and mobile delivery, combined with the data-intensive underwriting discussed above, to offer more favorable pricing on short-term loans than is traditionally available through channels like payday loans or checking account overdrafts.⁹² Some startups lend to people with damaged credit and then reward them for paying on time.⁹³ Many also make a point of reporting the customer’s repayment performance to credit bureaus, in order to help such consumers reach the first rung of the financial access ladder by building credit records and credit scores.^{94 95}

Cryptocurrency and instant payments:

A seventh factor driving toward affordability and widened access is digital currency, such as Bitcoin⁹⁶ and Ethereum’s Ether.⁹⁷ While these are unlikely to become widespread payment tools for U.S. consumers in the near term, they have potential to foster more inclusive finance because of their ability to

⁸⁸ Aadhaar Card <https://uidai.gov.in/>

⁸⁹ An example is <https://itunes.apple.com/us/app/globalid-your-portable-identity/id1129853885?mt=8>

⁹⁰ <https://oneworldidentity.com/identity-leaders/>

⁹¹ http://www.huffingtonpost.com/apolitical/how-sixty-million-refugee_b_13202004.html

⁹² An example is <https://www.lendup.com/card>

⁹³ An example is <https://www.lendup.com/>

⁹⁴ An example is <https://www.lendup.com/>

⁹⁵ Mission Asset Fund is an example of a nonprofit that works with Latino borrowers by creating Latin American-derived “lending circles” and helping them build conventional credit scores <https://missionassetfund.org/>

⁹⁶ <https://bitcoin.org/>

⁹⁷ <https://blockgeeks.com/guides/what-is-ethereum/>

handle transactions nearly in real time, their potentially wide reach, and their low per-transaction costs. Because they move money on the internet rather than through traditional payment clearinghouses, they can execute transactions instantly and inexpensively.⁹⁸ They also enable micro-payments – profitable transfer of money in very small and non-standardized amounts, even less than a dollar (or a penny).

Numerous companies are working on new currencies and also new digital “payments rails.”⁹⁹

Governments worldwide are exploring adoption of some of these technologies,¹⁰⁰ and some are also considering issuance of fiat “e-currency”^{101 102} that would supplement their paper and metal currencies.

The emergence of “stable coins” – crypto instruments backed by traditional currency on a one-to-one basis of value – has addressed many of concerns about the high volatility of cryptocurrencies’ values. Separating the market for investing in these currencies from the opportunity to use them as stable, reliable payment vehicles may open the door to much wider use in the payments process. In 2019, former CFTC Chairman, Christopher Giancarlo, teamed up with his agency’s former head of innovation to write a Wall Street Journal op ed calling on the United States to begin issuing a digital dollar.¹⁰³

These innovations are all under study by organizations like the United Nations and World Bank.¹⁰⁴

Innovators are already using this technology to offer very low cost (or free) international payments that compete with high-cost remittance services.¹⁰⁵ Furthermore, instant payments would remove a key difficulty faced by many underbanked consumers in the U.S., namely the need to cash income checks (doing so through check-cashing companies is expensive) and then to travel around by car or public transit physically paying bills in cash, since cash is the only form of money that can normally be

⁹⁸ Examples are <https://www.circle.com/> , <https://venmo.com/> , and <https://www.zellepay.com/>

⁹⁹ An example is <https://ripple.com/>

¹⁰⁰ <https://www.imf.org/external/pubs/ft/sdn/2016/sdn1603.pdf>

¹⁰¹ An example is <https://www.ecurrency.net/>

¹⁰² <https://fortune.com/2019/11/01/china-digital-currency-libra-wakeup-call-us/>

¹⁰³ <https://www.wsj.com/articles/we-sent-a-man-to-the-moon-we-can-send-the-dollar-to-cyberspace-11571179923>

¹⁰⁴ <https://www.omidyar.com/investees/ecurrency-mint>

¹⁰⁵ <http://www.maxkeiser.com/2017/07/remittance-cash-transfer-blockchain-ethereum/>

relied on to be credited immediately upon receipt. This is crucial for consumers who have no savings cushion and must precision-time their billpaying in a tight cadence coordinated with receiving income, which in many households is multi-source and volatile, as discussed in Paper 2 in this series.¹⁰⁶ While a faster payment system would also generate some risks to consumers (discussed in Paper 5), it would hold tremendous potential to make the financial services system more inclusive.

Cost reductions through blockchain and DLT:

An eighth factor is that blockchain and distributed ledger technology, over and above digital currency, holds promises for reducing the cost structure of “making” financial products, in much the same way mobile technology is reducing the cost of delivering them. Bank IT systems are notoriously old and siloed,¹⁰⁷ often because they accumulated over years of mergers and acquisitions without full integration. They are expensive to maintain and prone to errors and breakdowns that layer on additional costs. Some use programming languages no longer taught in computer schools. As long ago as 2010, a McKinsey & Co. study described banks as “struggling with outdated technology,” reporting that the industry was trying “to hot-wire aging systems to improve their performance, but that’s becoming an uphill struggle.”¹⁰⁸ For many banks, this situation is improving only slowly and for some, it has deteriorated further since then,¹⁰⁹ with the vast majority of IT budgets being devoted to security and maintenance.¹¹⁰

Figure 10

¹⁰⁶ Crypto-currencies have also led to development of Initial Coin Offerings, or ICO’s, which will be discussed in Paper 5 on risks arising from technology

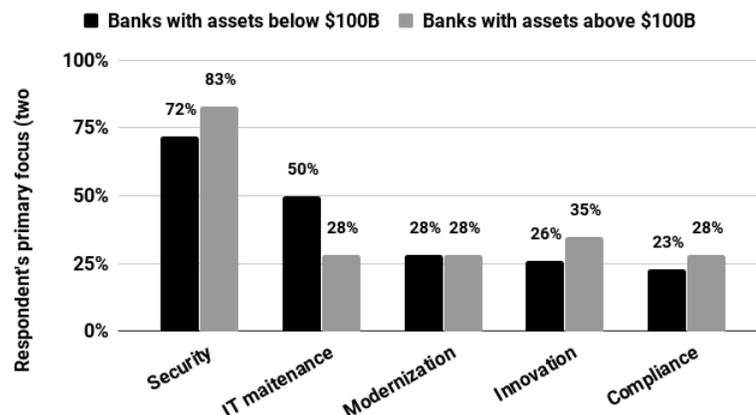
¹⁰⁷ <https://www.ft.com/content/90360dbe-15cb-11e5-a58d-00144feabdc0>

¹⁰⁸ <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/overhauling-banks-it-systems>

¹⁰⁹ <https://www.fn london.com/articles/banks-face-spiraling-costs-from-archaic-it-20170912>

¹¹⁰ <https://www.ciodive.com/news/with-multibillion-dollar-tech-budgets-large-banks-eclipsing-competitors-i/552331/>

Largest area of technology investment across banks or departments



Source: UBS data as cited by CIODive

Large banks worldwide are exploring use of DLT-based solutions to help with this problem, motivated by the potential that these technologies could dramatically reduce the cost of running a bank.¹¹¹ In addition, blockchain processes in areas like account settlement can reduce both legal complexity and time lags, because trust and transparency among all the parties can be built into the technology itself, with everyone able to monitor transactions and movements of money (and even goods) on the shared blockchain in real time. This in turn can reduce settlement risk, as well as the capital that traditionally must be maintained to address it.¹¹²

Reducing regulatory costs:

Finally, affordability is likely to expand as policymakers use these same technology tools to reduce regulatory costs which, as discussed in Paper 2 of this series, account for a substantial share of financial company operating costs. Regtech solutions to these high costs, as well as for other problems, are the subject of Paper 4.

¹¹¹ <https://www.reuters.com/article/us-blockchain-banks/six-big-banks-join-blockchain-digital-cash-settlement-project-idUSKCN1BB0UA>

¹¹² An example of a DLT solutions startup is www.digitalasset.com/about

These developments – low-cost and ubiquitous mobile delivery channels, smarter underwriting, new ways to build credit scores, instant and cheap money transmission, automated identity verification, slashing of “back office” and regulatory costs, and more – have the potential to deeply restructure both the affordability and accessibility of financial services, bringing vastly improved options to many millions more people.

Solving for Better Consumer Protection and Financial Health

In addition to solving for inclusiveness, new fintech can also bring major progress against the other age-old problem in consumer finance, namely how to protect consumers from harm. As discussed in Paper 2, serious, widespread harm to consumers has persisted despite, in the U.S., a half-century of rising consumer financial protection law and regulation. Many kinds of difficulty have in fact persisted for centuries, in cultures throughout the world. The emerging solutions described in this section will help people at every level of income and financial sophistication, but will especially benefit those who are most vulnerable and who traditionally have had the fewest and least desirable options.

As discussed earlier, many problems with money management arise from the interplay between product complexity and the consumer’s own limitations, such as low financial literacy, inattention to his or her finances, or the temptation to overspend. Innovators are seeking to solve both halves of this equation, making products simpler and more transparent, while also equipping consumers with easy, and even enjoyable ways to manage their money better.

This section summarizes major types of innovation underway in consumer financial products and services that can promote financial health, organized around the consumer problems that these innovators are trying to solve.¹¹³ As noted earlier, some innovators are outspokenly mission-driven – many startup founders were specifically motivated by frustration with the traditional system and a desire to make finance more fair and inclusive. Others are business-driven. However, nearly all of them, at both

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nonbanks and banks, have identified some combination of problems with traditional banking and finance and are seeking to fix them.

Most are aiming not for the wealthy customer but for a broad-spectrum market, including the vast consumer population that has been traditionally considered “unbanked,” “underbanked,” or “underserved.”¹¹⁴ As discussed in Paper 2, that market contains tens of millions of people in the United States and hundreds of millions around the world. Tech innovators see their needs as an opportunity ripe for rapid growth and scale, as technology makes it possible to bring them superior, more affordable products, profitably.

Most of the categories of problems summarized below overlap, with individual innovators employing multiple problem-solving strategies (as well as the cost-reducing tools discussed in the prior section). Again, footnotes in this section offer some examples intended to add concreteness, but not endorsement.

Solving for unfairness and discrimination

As will be discussed in Paper 5, there is substantial risk that new technologies will introduce additional bias and unfairness into the financial system. If regulated well, however, these innovations can also drive down unfair activities and discrimination, not only because regulators will be better positioned to detect it, but also because innovators will be better equipped to self-assess their activities and avoid unintended mistakes in this realm. Again, many fintech innovators are motivated by the goal of reaching the very large market of people who have been traditionally underserved and offering them markedly better products and pricing. Success in this will help squeeze bias out of the system over time, through the forces of competition.

Solving for product complexity, opacity, and harmful design:

U.S. Senator Elizabeth Warren, who was the chief architect of the CFPB, has excoriated the financial industry for products designed with what she calls “tricks and traps.”¹¹⁵ Deceptive products are

¹¹⁴ <https://www.experian.com/blogs/ask-experian/research/the-decline-of-the-unbanked-and-underbanked/>

¹¹⁵ http://www.huffingtonpost.com/elizabeth-warren/cfpb-anniversary-consumer-protection_b_1695547.html

illegal under U.S. law as discussed in Paper 1, but the fact remains that consumers experience widespread confusion about financial product terms, as described in Paper 2. Much of this is fueled by the complexity and opacity of traditional products. Some financial providers intentionally exploit this confusion, (especially for more vulnerable customers as discussed below). Others have no ill-intent, but nevertheless may benefit from the asymmetrical knowledge advantage they have over their customers when the latter make suboptimal choices.

Many innovators have set out specifically to fix this problem by trying aggressively to make their products simple and transparent. Some eschew charging the kinds of fees that typically attach to financial products,¹¹⁶ recognizing that fees are a particular source of consumer confusion about the real cost of using services like loans and checking accounts where the topline pricing is presented as an interest rate. Many innovators offer monoline, standalone products that eliminate the complexity of choosing among the tradeoffs embedded in bundled services (which may involve product cross-subsidization), as often happens with banks.

Like other technology firms, fintech innovators also strive to give their customers an extremely easy and enjoyable user experience (“UX”)¹¹⁷ – that is, they try to make their products very easy to use. They design the customer interface to be intuitive and interactive, and often offer easy interactive tools like “sliders” the customer can manipulate on a phone or computer screen to evaluate variable options, such as changing the length of a loan in ways that would impact monthly payment and total cost of the financing. Many innovators enjoy a design advantage because they build their products as “mobile-first” tools, rather than starting with legacy banking products and trying to re-tailor them for the mobile channel. Most employ new concepts like “human-centered design” that aim to delight the customer.¹¹⁸ This often resonates especially with millennial consumers.

Solving for low financial literacy and consumer inattention

¹¹⁶ Examples are <https://www.simple.com/>, <https://www.affirm.com/>, and <https://www.petalcard.com/>

¹¹⁷ <https://thefinancialbrand.com/62677/user-experience-ux-design-trends-banking/>

¹¹⁸ <https://www.ideo.com/post/design-kit>

The problem of complex and opaque financial products is mirrored, on the consumer side, by widespread problems with low financial literacy and sometimes, a sheer lack of focus on learning about and tending to financial tasks. Financial consumers are often harmed by the financial products they choose and use, because they simply don't understand them.

The traditional solution to this has been twofold: to require providers to issue standardized product disclosures and to expand financial literacy education. Unfortunately, as detailed in Paper 2, neither strategy has been effective.

While high financial literacy is desirable and worthy as a goal, new technology is increasingly able to protect people whether they fully understand a product's terms, or not. Innovators are attacking this problem with a wide array of solutions, many of which leverage the relatively new science of behavioral economics in order to match financial activities with how people actually make decisions and handle tasks.

Some new solutions focus squarely on improving consumer education. Classroom curricula are being supplanted by phone-based, interactive guidance that provides information, comparisons and advice in real time, at the moment the consumer is motivated to understand it. The CFPB has developed online tools like these,¹¹⁹ and numerous apps aim to provide similar education.¹²⁰

Other innovators are finding new ways to get people actively and even emotionally engaged – to catch their interest. For example, some incent saving through lottery-style techniques that draw customers into more active attention to their financial accounts in hopes of finding rewards.¹²¹ Others use humor and playfulness to engage customers actively in the tasks to be done and to build knowledge.¹²² One

¹¹⁹ <http://www.consumerfinancialserviceslawmonitor.com/2015/01/cfpb-introduces-mortgage-interest-rate-checker-tool/>

<https://www.pcmag.com/article/356256/nerdwallets-tim-chen-on-banking-bots-and-bitcoin>

¹²⁰

¹²¹ An example is www.npr.org/2014/01/06/.../save-to-win-makes-saving-as-much-fun-as-gambling

¹²² Ex <http://fi.11fs.com/184>amples are <https://digit.co/> and <https://www.simple.com/>

increasingly popular savings app sends customers a humorous daily text, reporting how much money the person has saved that day and adding in some entertainment. Another company maintains a “Dog Wall of Shame” featuring pictures of customers’ dogs who ate the payment card.¹²³ Many startups are also dog-friendly in the workplace.¹²⁴

This casual and “fun” style is difficult for banks to achieve but highly attractive to millennials who, again, are the largest generation of consumers. Many fintech founders believe this factor enables them to build deep customer loyalty, despite rarely or never seeing customers face-to-face.¹²⁵ Many fintech founders are millennials, themselves, some in their twenties,¹²⁶ and easily engage with this growing market.

While some innovators are trying to increase customer engagement, others are taking the opposite tack by trying to obviate the need for it. Harvard Kennedy School Professor Brigitte Madrian’s research on financial decision-making has found powerful effects when products like retirement plans are designed to default to automatic saving and retirement, rather than requiring people to opt in and/or to choose among complex options.¹²⁷ Similarly, the savings app described above enables consumers to, in effect, turn their savings chore over to the fintech, which analyzes their cash flows and then sets aside some savings each day. The founder has said people should not have to struggle with savings. They should set it up to be done for them.¹²⁸ This principle of effortlessness permeates many high-tech innovations.

The voice technology discussed earlier as a way to expand inclusion through cost-reduction also plays a role here in fostering financial health. “Smart assistants” like Amazon’s Alexa, Google Home and Siri are rapidly developing language facility, knowledge, and AI-driven learning capability. These are

¹²³ <http://www.jsbarefoot.com/podcasts/2016/4/18/joybarefootcom>

¹²⁴ <http://www.jsbarefoot.com/podcasts/2016/5/2/effortless-investing-jon-stein-of-betterment>

¹²⁵ <http://nymag.com/daily/intelligencer/2012/02/millennials-just-wanna-laugh.html>

¹²⁶ <http://www.jsbarefoot.com/podcasts/2017/3/9/a-millennial-building-for-millennials-ollie-perdue-of-loot>

¹²⁷ https://www.aeaweb.org/annual_mtg_papers/2008/2008_265.pdf and <https://sites.hks.harvard.edu/fs/bmadria/Research.htm>

¹²⁸ <https://www.jsbarefoot.com/podcasts/2016/2/25/effortless-saving-digit-ceo-ethan-bloch>

beginning to move into finance,¹²⁹ not only to handle scheduling and tasks, but to offer customized advice. Importantly, these bots will be able to take the initiative to guide consumers, warning against mistakes and overspending before these happen. This same kind of guidance will also be offered through text,¹³⁰ but conversational voice-based assistance can be especially effective in answering questions and simplifying information. Voice- and text-based tools can already answer complex questions in natural language, such as what-if scenarios for investors.¹³¹

Furthermore, as discussed above, converging technologies could make it possible for a trustable app simply to screen out inferior products and providers, such as ones that have been found guilty of predatory practices, have high levels of consumer complaints, have low consumer satisfaction ratings, and/or fail to meet widely agreed standards of “fairness.” Such automated protection would reduce the need for consumers to master complex financial education material.

One can imagine consumers potentially delegating their money management tasks fully to a smart, voice-interface robo-assistant that understands finances better than they do, can search all the information that exists, and can be trusted to optimize results against the person’s financial and life goals. Voice interfaces can cut through layers of information and give consumers easy, instant answers. Suppose a consumer wants to check his account balance. He could log into his bank, click through a menu of options and pull up the link with the information. Or he could sit in bed and just ask a question of the robo-assistant. The assistant could also answer a question like, “what is compound interest?” or “am I saving enough for retirement?” without the need to navigate search tools and sites.

As noted in an earlier paper, it’s also possible to envision the equivalent of what medicine calls a “smart membrane,” a protective filter that lets in good things but keeps out bad ones, automatically shielding consumers from scams or from products and providers that have abusive terms or high levels of

¹²⁹ An example is <https://www.capitalone.com/applications/alexa/>

¹³⁰ An example is <https://www.varomoney.com/>

¹³¹ An example is <https://www.forbes.com/sites/laurashin/2015/.../kensho-the-financial-answer-machine/>

complaints as compiled by the CFPB¹³² or on user rating sites designed like Open Table and Yelp. As discussed below, some innovators are beginning to develop such tools customized to assist elderly or mentally impaired consumers.¹³³

Mobile access also helps solve cultural and emotional barriers that deter some consumers from using bank branches, such as discomfort over “being judged” or asking elementary questions. University of Pennsylvania Professor Lisa Servon argues in her book, *The Unbanking of America*,¹³⁴ that these factors help explain why many people actually prefer nonbanks like check cashing services and payday lenders despite those companies’ relatively high pricing, because such providers often offer a welcoming and unthreatening environment compared to a bank branch. The same logic can apply to mobile services, especially for millennial consumers who may prefer mobile offerings. Again, lower-income people overwhelmingly have cell phones, and are sophisticated in using them.¹³⁵

Solving the difficulties of budgeting, billpaying, and money management:

A problem related to the complexity of financial products is the fact that household budgeting has traditionally been complex and burdensome. A 2013 Gallup survey found two-thirds of people didn’t do it (for those with less than a high school education, only 26 percent did).¹³⁶ Billpaying is complicated too. For many people, bills arrive throughout the month at different times, from different sources, and in different forms, sometimes a mix of paper and electronic presentment. People struggle to keep up with their financial tasks. Al Ko, the chief executive of Mint.com, said in 2017 that Americans pay \$77 billion annually just in credit card *late fees* – i.e., for not even sending in a small minimum payment by the deadline.¹³⁷ Very often, this is not about lack of money. It’s about lack of money management.

¹³² <https://www.consumerfinance.gov/complaint>

¹³³ <http://fi.11fs.com/184>

¹³⁴ <https://publicpolicy.wharton.upenn.edu/live/news/1686-the-unbanking-of-america-book-release-and-talk>

¹³⁵ <https://www.fdic.gov/householdsurvey/>

¹³⁶ <http://www.gallup.com/poll/162872/one-three-americans-prepare-detailed-household-budget.aspx>

¹³⁷ <http://www.jsbarefoot.com/podcasts/2017/6/13/making-it-easy-intuits-al-ko>

Meanwhile cash on hand can be hard to track if consumers are using more than one bank account and/or prepaid card. The math can also be difficult -- understanding loan interest rates, savings yields, amortization rates, available balances and the like. It can be hard to know how much to save, and where and how best to do so. It's also hard to know exactly when income or payments will be credited. As noted in Paper 2 in this series, many people face complex timing problems due to volatile incomes and expense flows.

In short, managing money has always required time and effort, which feeds into consumer inattention that in turn can lead to excessive spending or borrowing and to under-saving for the future, often without people even realizing that they are at risk.

Again, numerous innovators are attacking all these problems.¹³⁸ One app lets people set up an arrangement through which the startup analyzes their bank account data, assesses cashflow patterns, and then begins to save for the person each day.¹³⁹ The amounts vary -- maybe \$17 one day and \$33 the next and \$8 the next. The money is simply set aside in a different account, remaining available if the consumer needs it. This effortlessness enables many people to save more than they thought they could. The same is true for robo-advising that makes investment management easy, as well as affordable.¹⁴⁰

Solving for income and expense volatility:

Many consumers are harmed by reliance on high-cost, short-term payday-type loans and bank overdraft services that have traditionally been the only financial products available to cover immediate needs sparked by spiking expenses or shortfalls of income. While these services can work well for people who tap them sparingly, large numbers of households use them extensively in ways that snowball,

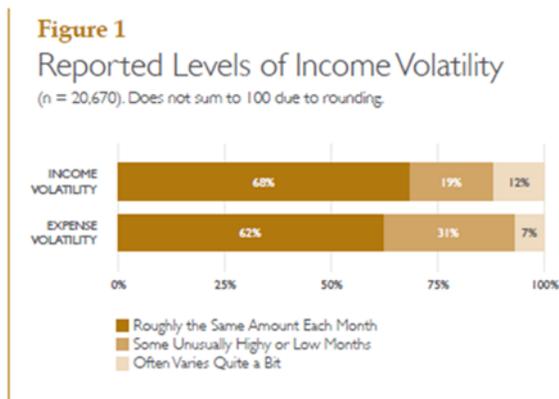
¹³⁸ Examples are <https://www.varomoney.com/>, <https://www.simple.com/>

¹³⁹ <https://digit.com>

¹⁴⁰ Examples are <https://www.betterment.com/>, <https://www.wealthfront.com/>, <https://www.sofi.com/>, <https://www.acorns.com/> and <https://www.mint.com/>

creating mounting debt they cannot escape and ultimately exacerbating rather than ameliorating their financial difficulties.¹⁴¹

Figure 11



Source: Epic

As discussed in more depth in Paper 2, a great many consumers who use these services have sufficient annual income to pay all their bills, but are buffeted from month to month by unpredictable volatility in income and expenses.¹⁴² Since many have little or no savings cushion, they solve these timing challenges by resorting to products that are among the highest-cost financial services.

Innovators are moving to address this problem through affordable “smoothing” solutions. Some startups work with employers to allow people to borrow their own money – income that is already earned -- before the next regularly-scheduled payday.¹⁴³ Others create a flexible fund through which consumers save easily when they have extra funds and then dip into that reserve when income is short.¹⁴⁴ Effortless

¹⁴¹ <http://www.aspenepic.org/issue-brief-experience-volatility-low-moderate-income-households-results-national-survey/>

¹⁴² www.usfinancialdiaries.org/

¹⁴³ An example is <http://www.earnin.com/>

¹⁴⁴ Examples are <https://even.com/> and <https://www.activehours.com>, now called EarnIn. <https://techcrunch.com/2017/09/21/activehours-raises-39-million-for-its-new-take-on-cash-advances/>

savings tools can help people build enough resources to smooth out their own money flows. Some small business lenders, too, now tailor repayment schedules to customers' cashflow,¹⁴⁵ which can be tracked electronically (thanks in part to the Square reader, as discussed earlier).¹⁴⁶ Some consumer finance innovators, too, are challenging the whole tradition of structuring long term loans to have equal monthly payments, viewing it as a relic of the analog age when computation was burdensome. Today, with cheap, massive computer power and vastly more data readily available about people's financial lives and patterns, it is increasingly possible to tailor payments to fit individual situations, without sacrificing loan quality and without requiring excessive risk premiums.

Solving for the difficulty of switching or combining financial service providers:

Globally, many policymakers emphasize the potential for fintech to enhance consumer choice through "open banking" and bank account portability. In December 2019, the UK Financial Conduct Authority issued a call for input on efforts to shift the system to "open finance."¹⁴⁷

The term open banking is used more in Europe than the U.S., although it is emerging everywhere. Its champions argue that consumers should be allowed to give permission to fintechs to access their bank account information via an API, so that the company can perform services for the customer, such as help with saving and money management, or so that a lender can evaluate a loan applicant's cash-flow to evaluate the person's creditworthiness – an option especially helpful for consumers who lack credit scores. Such access is now mandatory in many places, most notably in the UK which has adopted the Second Payment Directive, or PSD2, to facilitate this shift.¹⁴⁸

¹⁴⁵ Examples are <https://www.kabbage.com/> and <https://www.paypal.com/us/webapps/mpp/merchant-working-capital>

¹⁴⁶ <http://fortune.com/2016/11/07/square-capital-1-billion/>

¹⁴⁷ <https://www.fca.org.uk/news/press-releases/fca-asks-proposals-how-open-finance-could-transform-financial-services>

¹⁴⁸ <https://www.wired.co.uk/article/open-banking-cma-psd2-explained>

A related issue is bank account portability, allowing people to move their accounts to another financial provider, in fact, much as one can move a cell phone number and its related history to a new mobile phone carrier.

In the U.S., these issues are emerging as policy debates. The most contentious topic, sometimes referred to as “data aggregation,” is whether and how banks should be required to allow customers to permit this kind of access. Some banks have argued against it and/or created practical barriers to permitting such access, citing concerns such as risk that customer data could become insecure in these scenarios. The CFPB has authority to issue regulations on these topics under Section 1033 of the Dodd-Frank financial reform law, and has put forth a set of principles on the topic.¹⁴⁹

Paper 5 discusses these issues in terms of their potential to introduce systemic instability. Nevertheless, many advocates see major potential benefits to consumers as it becomes easier for them to bring a new technology provider into their processes for managing money and payments, or to change to a provider that will serve them better.

Protecting vulnerable groups:

While many fintechs have initially targeted their efforts to millennial customers, an increasing number are specializing in tools for other vulnerable groups, including the elderly,¹⁵⁰ non-English speakers, people with mental impairment, and people seeking out credit counseling to address¹⁵¹ financial difficulties. For example, in April 2017, the Financial Health Network’s¹⁵² Financial Solutions Lab teamed up with AARP to develop fintech solutions tailored to seniors.¹⁵³

¹⁴⁹ <https://www.consumerfinance.com/2017/10/19/cfpb-releases-consumer-protection-principles-for-consumer-authorized-sharing-of-financial-information/>

¹⁵⁰ An example is <https://unitedincome.com/>

¹⁵¹ <https://clark.com/scams-rip-offs/top-10-financial-scams-targeting-senior-citizens/>

¹⁵² At that time, the network was called the Center for Financial Services Innovation, or CFSI.

¹⁵³ <http://finlab.cfsinnovation.com/insights/04-2017/lets-bring-fintech-to-the-other-111-million/>

In the UK, the Financial Conduct Authority ran its third problem-solving “tech sprint” on how to improve financial services for people with mental health difficulties.¹⁵⁴ Other innovations are emerging to help adults monitor the finances of their aging parents for indicators of scams or elder-abuse.¹⁵⁵ A common theme is the ability of new technology to enable people to permit a trusted party to watch over their accounts or assist with complex tasks, electronically and where necessary, at a distance.

Older consumers and disabled people can also increasingly link to financial helpers through apps and through live video connections.

In the U.S., some predatory products and sales tactics specifically target people for whom English is a second language. Many U.S. banks have been reluctant to offer services geared to such customers, due to regulatory guidance that a financial product should be serviced for its full lifecycle in whatever language it was sold in – a standard that creates extensively logistical complexity. Some providers hope that new smart translation technologies will enable more such flexibility with language diversity.

(In addition, the regtech solutions discussed in the next paper will enhance regulators’ ability to protect vulnerable groups with better tools to prevent discrimination and unfair practices.)

Solving the shopping problem:

Financial services are difficult to evaluate and compare, especially since many contain fees and terms that are complex, and sometimes even hard to locate in disclosures and product agreements. In 2011, for example, The Pew Charitable Trusts studied checking account disclosures at major banks and found that their median length was 111 pages.¹⁵⁶ This kind of complexity¹⁵⁷ has always impeded the

¹⁵⁴ <https://www.fca.org.uk/events/techsprints/financial-services-and-mental-health-techsprint>

¹⁵⁵ A firm in CFSI’s Financial Solutions Lab, Eversafe, enables monitoring of seniors’ financial activity to guard against abuse like identity theft <http://finlab.cfsinnovation.com/challenges/2017/eversafe/>

¹⁵⁶ <http://www.pewtrusts.org/en/research-and-analysis/reports/0001/01/01/checking-accounts-long-on-words-short-on-protections-the-need-for-a-disclosure-box>

¹⁵⁷ Some of this complexity has arisen due to litigation, as industry attorneys have sought to cover more and more potential risks in these agreements. Some of that, in turn, arises from the lengthy array of consumer protection regulations described in Paper 1 of this series.

efficiency of consumer financial markets, because the baseline knowledge of the buyer and seller is highly asymmetric. As discussed in Paper 2 in this series, extensive research indicates that those problems cannot be overcome through disclosure.¹⁵⁸

Innovators are addressing this issue by making it much easier for consumers to compare products in terms of both general terms and quality, and of specific fit with individual needs. This trend is becoming increasingly robust as big data enables more and more aggregation of information. These include aggregation of consumer complaints (the CFPB has established a database that has captured more than a million consumer complaints) and online product and reputation reviews using models like those employed by Amazon, Yelp, and Open Table. These kinds of search-and-compare tools are also increasingly being customized, so that a consumer's own goals and situation can be factored into product recommendations. Increasingly, also, they can be delivered through voice-based advice for those who would like it.¹⁵⁹ (Critics fear, meanwhile, that such easy money management may undercut the drive to increase financial literacy, an issue that will be discussed in Paper 5.)

Solving the “how am I doing?” problem:

Another struggle for most consumers is understanding their financial position. As discussed in Paper 2, the CFPB and organizations like the Financial Health Network have sought to define a qualitative framework of financial wellbeing and health, and FinHealth Network has also launched a quantitative rating of overall consumer financial wellbeing, called the U.S. Financial Health Pulse,¹⁶⁰ which can monitor broad-based trends. However, there are no easy ways for individuals to evaluate their own situations in this complex field, unless they can afford a personal financial or wealth advisor. The

¹⁵⁸ <http://press.princeton.edu/titles/10267.html>

¹⁵⁹ An example is <https://www.nerdwallet.com/blog/credit-cards/how-to-pick-the-best-credit-card-for-you-4-easy-steps/>

¹⁶⁰ <https://finhealthnetwork.org/programs-and-events/u-s-financial-health-pulse/>

challenge is especially daunting because short-term financial choices often become the drivers of long-term outcomes, and problems often arise when it is too late to fix them.¹⁶¹

In the health and fitness sector, people can apply widely understood benchmarks, such as for healthy blood pressure, cholesterol, weight, body mass index, and walking a certain number of steps. As discussed earlier, similar logic can be applied to creating financial benchmarks, which could in turn be built into smart personal assistants that proactively help people stay on track.

There is also movement in the industry for businesses to assess their own customers' financial health and try to align services to enhance rather than detract from it.¹⁶² For example, in 2017, Evenest Yodlee, a major data aggregator, launched a service enabling its clients – banks and fintechs – to help their customers track financial health using predictive analytics.¹⁶³

Protecting privacy:

Concern about privacy has escalated in recent years, globally and in the U.S., The European Union,¹⁶⁴ and the State of California,¹⁶⁵ among others, have passed sweeping data privacy laws, and activity in the U.S. Congress has been ramping up, particularly in the wake of controversy about the activity of big tech firms like Facebook. It is an evolving situation, making it impossible to predict precisely how policy will take shape. Nevertheless, it seems inevitable that new privacy law and regulation lies ahead.

It is also clear that fintech (and other) innovation will create technology that can help with privacy protection.

¹⁶¹ <http://profit.ndtv.com/news/your-money/article-7-ratios-which-will-reveal-your-current-financial-health-327196>

¹⁶² An example is <https://www.yodlee.com/solutions/industry-solutions/personal-financial-wellness/>

¹⁶³ https://www.yodlee.com/solutions/industry-solutions/personal-financial-wellness/?utm_source=prnewswire&utm_medium=presswom&utm_campaign=17Q2_PR_Press

¹⁶⁴ <https://www.wired.co.uk/article/what-is-gdpr-uk-eu-legislation-compliance-summary-fines-2018>

¹⁶⁵ <https://www.npr.org/2019/12/30/791190150/california-rings-in-the-new-year-with-a-new-data-privacy-law>

For example, extensive work is underway on creation of digital identity tools to supplant or supplement analog papers and identification numbers. As noted in the previous section, this new technology can expand financial inclusion by enabling more people to access the financial system. It also has the potential to strengthen privacy protection by reducing vulnerability to identity theft – making identity information less hackable.

These identity developments are converging with another set of innovations called, “Privacy-Enhancing Technologies,” or PET’s, that can enable individuals and businesses to prove their identities without permitting third parties to see the complete underlying information about them.

Suppose, for example, that a person needs to demonstrate age eligibility to purchase alcohol. The seller has no need to know the individual’s actual birthdate; it can suffice to be able to consult a trustable and instant source that verifies that the customer is of age to make the purchase. This “zero-knowledge proof” technique is being explored in a number of areas and creates the potential for consumers to establish tiers of access to their private information, so that they can control what entities can access what data, under what circumstances, and for what reasons.

The same is true for other PET’s. “Homomorphic encryption” has the potential to tightly protect privacy even as pattern data on financial transactions is being shared among financial companies and with governments to detect and control financial crime.¹⁶⁶ Similarly, differential privacy techniques can help prevent loss of privacy while data is analyzed.¹⁶⁷ (These topics are discussed further in Paper 4, on Regtech.)

¹⁶⁶ <https://www.forbes.com/sites/bernardmarr/2019/11/15/what-is-homomorphic-encryption-and-why-is-it-so-transformative/#62e09e587e93>. An example of a company working with this technique is Enveil, <https://www.enveil.com/>. As noted in Paper 4, the UK Financial Conduct Authority has also explored this technology. <https://www.fca.org.uk/>

¹⁶⁷ <https://towardsdatascience.com/understanding-differential-privacy-85ce191e198a>. An example of a company working with this technology is Imuta <https://www.immuta.com/>

While privacy law seems bound to become increasingly complex, some of the daunting issues involved can be ameliorated through technology developments.

Creating trustable businesses:

Big data is building a world in which businesses will know more than ever about consumers -- and consumers, in turn, will know more than ever about them. The latter development may foster new business and market models centered on competing for people's trust. Since trust is hard to win and easy to lose, these trends would incent companies to build products and cultures, and even brands, around failsafe trustworthiness.¹⁶⁸

At its heart, trustworthiness is about building full alignment between the wellbeing of providers and consumers. As a business proposition, it requires overcoming consumers' widespread cynicism about the financial industry and establishing the credibility of a differentiated approach that can win and keep customers. Creating that credibility would require companies to eschew many practices that have historically added to profits in situations where, as discussed earlier, consumers cannot detect or don't understand the product terms.

A trust-based competitive model would have no "hidden" fees, no surprise penalties, no loopholes in promised protections, no over-promising, no teaser designs, no obfuscating language, and no products that are unsuitable for the customer. Providers using this model would avoid products and practices whose profitability depends on the consumer not understanding them – situations where consumers would not buy the service if they did understand it. A significant share of financial industry profit arises from these situations, intentionally or not.

In other words, a new model would provide services that enhance the customer's financial health, and don't detract from it.

¹⁶⁸ On a panel at the Financial Health Network Emerge Conference in 2018, Petal CEO Jason Gross compared this strategy to the brand loyalty enjoyed by the salad takeout company Sweetgreen. He noted that, as their customer, he had no way to verify that their claims of their food's freshness and wholesomeness were true, but that it seemed likely that they could be trusted because, if they were discovered to have misled their customers on those claims, it would destroy their entire brand.

Many startup innovators are aiming for precisely this model. They are betting that new technology will enable them to profitably serve new markets, and to serve old markets in better ways, and that rising market transparency will reward this. Their strategy rests on a belief that, even as they leave some traditional sources of profit on the table, they will more than make it up by attracting customers to a superior product.¹⁶⁹ Their bet is that, thanks to technology, they can make this approach competitively successful and even possibly, over time, dominant.

This paper has described all the major obstacles to widespread consumer financial inclusion and health -- from product complexity and predatory practices to financial illiteracy and consumer boredom, and from slow payment systems to the high historic costs and complexity of producing, servicing, and delivering financial services. It has described how innovators are already using new technology to eliminate these problems from their customers' lives. There is no source of consumer and small business financial difficulty, other than inadequate funds, that is not being targeted by fintech innovation.

Competitive and regulatory forces will shape a new system over the next decade, in which incumbent providers, successful startups, and big tech firms will compete with each other, and will also partner with and learn from each other, as they collectively remake consumers' expectations.

While the changes ahead are promising, virtually every one of them will generate new problems and risks, even as they ameliorate old ones. These challenges will be discussed in Paper 5 in the series.

Meanwhile, the next paper in the Regulation Innovation series will shift our focus from how technology is changing finance, to how it is changing financial regulation. Digitizing the regulatory system to match the digitization of finance will be critical both to enabling a new and better generation of financial services and to preventing novel risks engendered by the very same technology, which, as with

¹⁶⁹ An example is the credit card startup, Petal. The firm actively encourages customers to pay their full balance each month, even though profits in the card industry have traditionally relied heavily on the interest paid by consumers carrying balances over. Petal thinks it can win competitively by eschewing that income and positioning itself to attract high customer trust. <https://www.jsbarefoot.com/podcasts/2017/9/12/a-healthy-credit-card-jason-gross-ceo-of-petal>

fintech, will be causing problems even as it solves them. Paper 4 will explore the need for, and strategies to transition to, digitally-native “regtech.”

Acknowledgments

I want to express my gratitude to Brigitte Madrian, Dean and Marriott Distinguished Professor in the Brigham Young University Marriott School of Business, for her mentorship in her previous role as Aetna Professor of Public Policy and Corporate Management at the Harvard Kennedy School. I’m also profoundly indebted to Amrita Vir for her invaluable contribution to this project as my research assistant at the Harvard Kennedy School.