

FinTech Trends in the United States: Implications for Household Finance

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Abstract

The modern financial technology (“FinTech”) revolution has two features that distinguish it from previous eras of innovation: (1) Consumers have greater access to financial information and applications using smartphones on high-speed networks; and (2) businesses benefit from dramatically lower costs, improved performance, and enhanced options in data storage, computation, and application development. The once monolithic and proprietary financial services industry is being challenged under the zeitgeist of decentralization, disintermediation, and open protocols. Consequently, households in the United States are witnessing the emergence of new options for investment, credit, insurance, and payments. We illustrate how several influential FinTech trends may help address biases and constraints that hamper households in smoothing intertemporal consumption.

Keywords: FinTech, insurance, payments, credit, blockchain, AI, disintermediation

I. Introduction

Advances in financial technology (FinTech) are reshaping the financial services landscape in the United States—both for providers and consumers. Many of these innovations are aimed at addressing the complexity and constraints that households face when making financial decisions. Rather than viewing FinTech trends in the United States through the lens of the many anecdotal stories about the growth and impact of FinTech, we tie the history of FinTech innovation together with how FinTech innovations may help address issues highlighted in the household finance literature. The stakes are not small, as sub-optimal decision-making by households and incomplete markets have the potential to not only lead to poorer outcomes at the consumer level, but also to broader market distortions.¹

We begin with the premise that individuals are risk averse and seek to smooth consumption over time. They accomplish this through borrowing and saving, diversifying investments, diversifying sources of labor income, and hedging and insuring risks. The theoretical underpinnings for this behavior were first established by the Permanent Income Hypothesis of Friedman (1957) and the Life-Cycle Income Hypothesis of Modigliani and Brumberg

¹ See, for example, Zingales (2015).

(1954). However, there is a large body of empirical literature that describes how actual household behavior diverges from what might be expected based on these simple models.

Campbell (2006) provides a review of the empirical regularities in the household finance literature. Households do not sufficiently diversify their investment portfolios: They have limited participation in equity markets (especially among low-income households), a “home bias” (i.e., lack of global diversification), and overly large holdings in ESOs or equity of their employer. Numerous papers estimate that a significant percentage of households have insufficient savings to cover retirement expenses.² Additionally, Amromin et al. (2007) and Choi et al. (2011) conclude that many households are not optimally exploiting tax incentives for retirement savings.

Beshears et al. (2018) review possible psychological mechanisms for these observations such as “present bias” and “mental accounting.” However, there are also numerous rational explanations for why households may not appear to smooth consumption. For example, they are subject to complex taxation while lacking financial tools and education; face borrowing and short-sale constraints; possess non-tradable assets (human capital); and hold a significant fraction of wealth in illiquid assets (homes). Furthermore, markets are incomplete so that households cannot hedge or insure against all possible future contingencies.

The modern FinTech revolution is creating new options and ease of access to help households navigate the complexity and constraints they face in many facets of their financial lifecycle. FinTech start-ups are leveraging the ubiquity of mobile device ownership and use, improvements in financial data aggregation through APIs, advances in software and application development, and breakthroughs in big data analytics and processing (including AI/ML)—innovating new products and platforms that expand financial product choice and improve access to financial information for decision making. These new product and service business models are being developed for both direct business to consumer (B2C) and for enterprises to improve their offering to consumers (B2B2C).

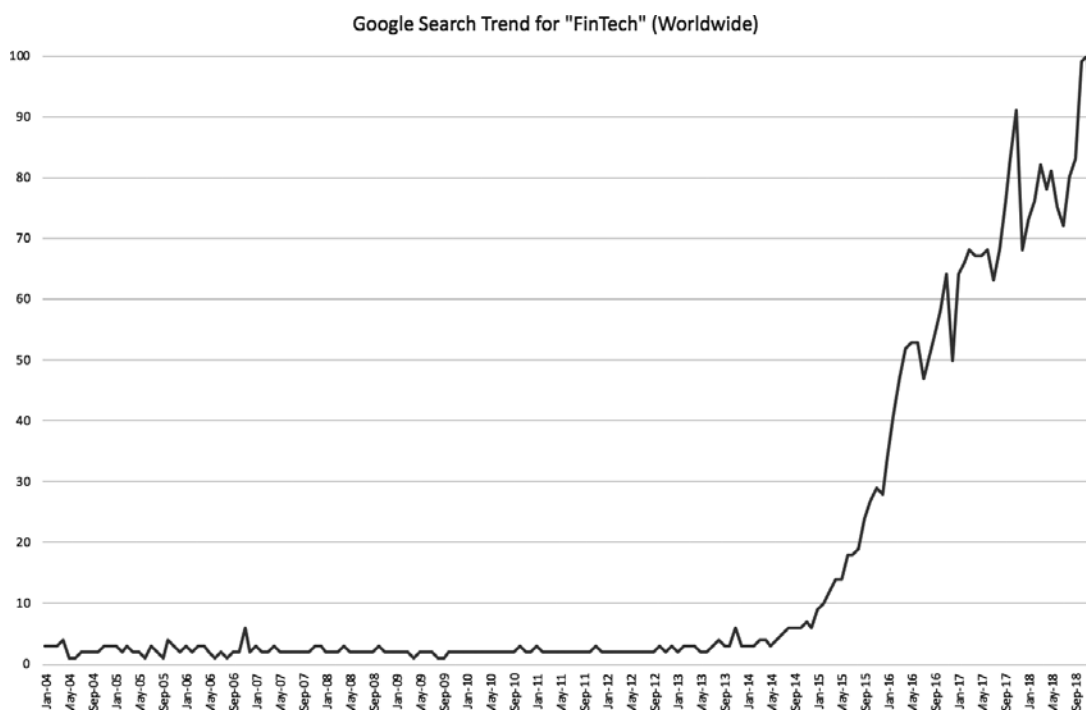
In Section II we provide a brief historical background about the technological side of FinTech evolution and highlight how the modern FinTech revolution compares to earlier waves of innovation. In Section III we explain how FinTech helps address the economic needs of households and individuals. We break that discussion into the following four themes: saving and investment, financing, insurance, and payments. Finally, Section IV summarizes the remaining challenges that FinTech may help ameliorate in the future.

II. Historical Background

The term “FinTech,” a combination of the words “financial” and “technology,” refers to financial solutions that leverage emerging technology, especially information technology. Although the term has gained prominence recently (Figure 1), there is a long history of transformational economic contributions that have emerged from the intersection of finance

² For example, Scholz et al. (2006), Herd and Rohwedder (2011), VanDerhei and Copeland (2010).

Figure 1. Worldwide Google Search Trend for “FinTech” from 2004 to 2018



Note: Google normalizes search trends to a score from zero to 100

Source: Google Trends - <https://trends.google.com/trends/>

and technology.

Telecommunications and information technology have been closely intertwined with finance since the late 1800s with the development of long-distance payment technologies such as wire transfers, which originally relied on telegraphic systems. Over the course of many decades, transcontinental and transoceanic cables were gradually replaced with wireless communications such as radio and microwave transmissions combined with satellite technology. Concurrent advances in information technology paved the way for efficient storage, manipulation, and retrieval of electronic representations of financial information. These developments led to the birth of credit cards and automated teller machines (ATMs) during the 1950s and 1960s, which provide consumers with near-instantaneous access to credit and the ability to perform financial transactions without direct human interaction.

The period from the 1970s to the 1990s saw the proliferation of several groundbreaking technologies such as relational databases, network protocols such as TCP/IP, routing technologies, networking technologies like Ethernet, personal computers with graphical user interfaces (GUIs), and software applications such as web browsers. Each of these technologies was essential for the development of online internet banking and brokerage. In addition to these consumer-facing FinTech applications, numerous backend advancements occurred in the areas of trade execution, risk management, and payment processing.

The earlier waves of FinTech development were largely characterized by technological adoption and integration by larger, regulated financial institutions developing proprietary technology stacks. By 2008 the financial crisis had resulted in numerous bankruptcies and emergency rescues of large financial institutions (e.g., Lehman Brothers, Washington Mutual, Wachovia, etc.). The pressure on financial sector profitability during the recession led to retrenchment in cost structures—reducing the pace of product and service innovation among large institutions. Moreover, post-crisis balance sheet reduction and increased costs imposed on financial institutions due to regulatory reform such as the Dodd-Frank Act contributed to a relatively constrained supply and less advantageous pricing of certain financial products and services. These outcomes arguably marked a shift in FinTech evolution toward decentralization and rapid growth in FinTech start-ups as Americans came to distrust traditional financial institutions.³

The post-crisis environment saw the confluence of numerous technological trends that further contributed to the modern FinTech revolution. On the hardware side there have been dramatic cost reductions in data storage and computation. The software side has seen advancements in operating system virtualization (containerization), open APIs, and greater momentum for the open source movement. These developments have improved the cost-effectiveness of decentralized and distributed hosting and computer processing—pushing many financial services into the cloud. At the same time, the proliferation of smartphones, high-speed mobile networks, and wi-fi access points have allowed consumers to access financial services on-the-go without being tied to a dedicated landline connection.

As consumers, devices, and services have become increasingly interconnected, financial companies are witnessing an explosion in the size of data sets. This so-called “big data” phenomenon has presented both opportunities and challenges. Vast amounts of structured and unstructured data have increased the cost and complexity of timely retrieval, processing, and visualization of information. Yet, greater breadth and depth of information allows for improved statistical power when these data are fit with predictive and prescriptive models. The push to extract insights from big data has led to improvements in machine learning and AI software libraries.⁴

Since the financial crisis the advent of cryptoassets is arguably the most novel and potentially transformative technology. With the launch of its network in 2009, bitcoin became the first currency to overcome the double-spending problem without having a trusted third-party. For the first time, individuals could send and receive payments on a peer-to-peer network without the need for a financial intermediary to validate the transaction or a central bank to establish the currency’s validity. These dual themes of disintermediation and decentralization have become cornerstones of the modern FinTech revolution.

Bitcoin transactions are recorded on a publicly distributed ledger called the blockchain,

³ In 2004 a Gallup survey showed that 53 percent of Americans had “a great deal” of confidence in banks. By 2012 this figure had dropped to 21 percent. See <https://news.gallup.com/poll/192719/americans-confidence-banks-languishing-below.aspx>

⁴ Notable use cases in FinTech of machine learning applied to big data include fraud detection and prevention, algorithmic trading, and risk management for loan underwriting.

and because the bitcoin source code is open source, hundreds of cryptoassets have been invented that leverage bitcoin's codebase and blockchain design. The openness and peer-to-peer nature of cryptoassets symbolize the democratization of modern FinTech, whereby products and services are becoming more directly accessible by households.

These technological developments since the financial crisis have spawned explosive growth in the number of FinTech start-ups and the amount of venture capital investments. For example, in the first quarter of 2010 venture investment in FinTech companies in the US totaled about \$200 million, but by 2018 Q2 this figure had jumped to over \$3 billion.⁵ According to the EY Fintech Adoption Index, Fintech adoption by consumers in the US nearly doubled from 17 percent in 2015 to 33 percent in 2017.⁶

This historical background focuses relatively more on technological factors to the provision of FinTech. However, equally important are the demand-side drivers that have shaped this newest wave of FinTech development. In the next section we discuss how FinTech addresses the economic needs of households in the areas of saving and investment, access to financing, insurance, and payments.

III. Financial Categories

While FinTech innovations hold potential to promote greater economic efficiency for both enterprises and households, we focus our discussion primarily on the impact of FinTech in improving the economic welfare of households. This focus is motivated, in part, by the sheer volume of intriguing puzzles that emerge from the empirical financial behavior of households compared to expectations based on standard models of household decision-making. Examples of these puzzles include under-saving for retirement, under-diversifying investments, and overpaying for investment expenses and borrowing costs.

There are two primary interpretations of these puzzles: (1) households are making sub-optimal decisions, or (2) households have behavioral biases that differ from standard preferences. We argue that the potential for welfare gains from FinTech remain regardless of the interpretive stance, as many of the innovations benefit households in either expressing preferences or improving choice efficiency.

III-1. Savings and Investment

The financial services industry plays a critical role in providing households with a diverse set of savings and investment alternatives. Directly or indirectly, households in the United States have been the beneficiaries of many innovations in domestic capital markets, including development of among the deepest and most liquid equity, bond, and derivatives markets in the world—providing them with a rich set of instruments for investing and hedg-

⁵ (July 31, 2018) The Pulse of Fintech 2018: Biannual Global Analysis of Investment in Fintech, KPMG.

⁶ They define a FinTech user as a digitally active consumer who regularly uses two or more FinTech services in the last six months.

ing. Advancements in the mutual fund and exchange traded funds industries further improved efficient diversification of household investment portfolios, whether through employer-sponsored or individual retirement accounts.

Notwithstanding the depth and breadth of savings instruments and vehicles in the United States, many studies and surveys have highlighted an impending “retirement crisis.” Retirement security in the U.S. is based on the three-legged stool of Social Security, an employer-sponsored pension such as defined benefit (DB) or defined contribution (DC), and personal savings. Using an analysis of the 2013 Survey of Consumer Finances data, the U.S. GAO (GAO-15-419, 2015) found that among all households age 55 or older, nearly one-third had no DB plan or retirement savings. Gomes, Hoyem, Hu, and Ravina (2018), using simulations on a large panel dataset of more than 300,000 U.S. workers with 401(k) accounts, find that $\frac{3}{4}$ of workers in the dataset are not saving enough for retirement. This range is consistent with survey findings in a Federal Reserve report (2018) on the economic well-being of U.S. households in 2017, where less than $\frac{2}{5}$ of non-retired adults think that their retirement savings are on track, and one quarter have no retirement savings or pension. Further, they find that $\frac{3}{5}$ of non-retirees with self-directed retirement savings have little or no comfort managing their investments.

Beyond this potential risk of under-saving for retirement, Beshears et al. (2018) find from the 2016 SCF data that the typical U.S. household appears to have most of its voluntary wealth in illiquid assets. The authors discuss other puzzles in household asset allocation decisions, including low rates of stock market participation, under-diversification, trading performance problems, and investment in expensive mutual funds. The authors suggest several potential rational explanations and psychological mechanisms for these observations, but regardless of whether the observed behaviors are rational or irrational, they present challenges to retirement preparedness for households.

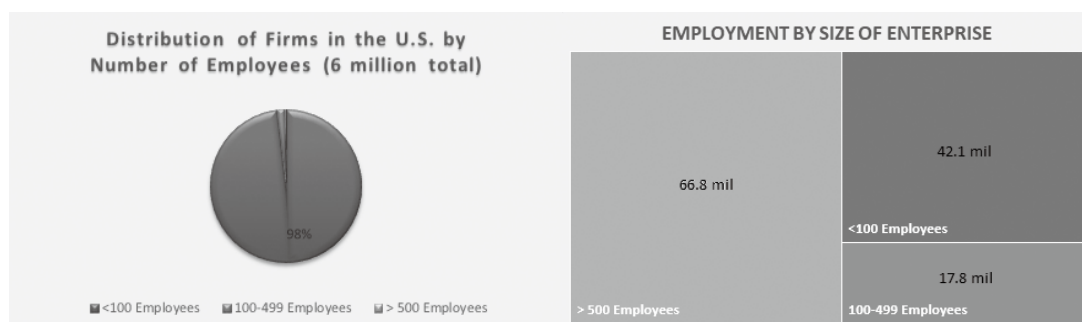
To the extent that some of these household savings and investment challenges are a manifestation of underlying structural labor market changes (e.g., variable income due to greater participation in the “gig” economy), while FinTech offers no solution to the underlying forces, it does offer potential solutions to support household financial health. In other cases, such as when client acquisition and service costs are a barrier to incumbent banks providing service, household biases or lack of financial literacy impede efficient decisions (e.g., regarding participation or implementation of investments), or constraints prevent households from optimizing financial life cycle decisions, FinTech developments may offer more direct benefits. We break our discussion into how FinTechs help households in four issues: (1) limited access to workplace retirement plans, (2) under-participation and under-diversification in risky assets, (3) concentrated illiquid asset holdings—particularly through home ownership, and (4) inefficiencies and lack of access to transaction accounts.

III-1-1. Limited access to workplace retirement plans

Small businesses are an important anchor of the U.S. economy. According to the U.S. Census Bureau, 98 percent of firms in the U.S. have fewer than 100 workers, and firms with

fewer than 500 workers employ nearly half the entire private sector workforce (Figure 2). According to the AARP, in 2013 approximately 32 million workers in small businesses (having fewer than 100 employees) lacked access to an employer-sponsored retirement plan, compared to approximately 23 million workers lacking access for businesses with over 100 employees.

Figure 2. Breakdown of Employment by Size of Business Enterprise



Source: US Census Bureau, Statistics of US Businesses (2016)

The top reasons small- and medium-sized businesses do not offer retirement plans include perceived high expense, administrative burden, and lack of employee interest according to a 2017 survey by the Pew Charitable Trust. BrightScope found that large 401(k) plans typically have fees below one percent (while the largest plan fees are under 0.5 percent), whereas average fees for small plans are 1.5 to 2 percent (with some plans paying over two percent per year in fees). The Bipartisan Policy Center (2016) suggests improving access to workplace retirement plans—especially for small businesses—as one of its key policy recommendations to improve retirement readiness in the U.S.

FinTech Entry

Numerous FinTech startups including Betterment, ForUsAll, Guideline, Honest Dollar, Bloom, Human Interest, Vestwell, and others were formed to create technology platforms simplifying access, reducing administrative complexity, and offering a lower-cost retirement savings plan for small and medium sized businesses (e.g., 10s of basis points of fees per year). Beyond addressing many of the barriers to smaller businesses adopting a 401k plan for employees, some of the FinTech platforms were early adopters of plan design features that help overcome employee behaviors that might otherwise reduce their participation. Even for employers that offer retirement savings plans, evidence suggests that many employees procrastinate enrollment or under-save relative to future retirement needs. Goda, Levy, Manchester, Sojourner and Tasoff (2015) show that present bias (the tendency to underweight the utility of future consumption relative to present consumption) and exponential growth bias (the tendency to underestimate the effect of return compounding) are linked to these behavioral challenges. To address this, Forusall, integrates auto-enrollment and au-

to-escalation (increasing the employee contribution percentage automatically over time) features into their platform for smaller businesses.

Notwithstanding the gap filled by these new FinTech entrants into the small business retirement market, assets under management is estimated to be in the single digit billions of dollars, compared to \$8.1 trillion all employer-based DC retirement plans (of which \$5.6 trillion is in 401(k) plan assets as of Sept 2018 (Investment Company Institute). Incumbent financial service players also see the need and opportunity in this space, so incumbent offerings include Vanguard' Retirement Plan Access service and Goldman Sachs' Honest Dollar (a FinTech it acquired in 2016). Given the substantial number of small businesses in the U.S. and the unique challenges of scaling customers in this segment, penetration will take time. However, the potential for lower cost, technology-leveraged solutions to transform the savings outcomes for millions of previously-underserved American households through employer-sponsored plans has important social welfare implications.

III-1-2. Under-participation and under-diversification in risky assets

Several studies have highlighted two important puzzles regarding the investment behavior of households: apparent under-participation in risky investments (especially equities), and under-diversification of investments. In theory, if the equity risk premium is positive, all households benefit from holding some non-zero allocation to equities. Several theories have been advanced to explain this participation puzzle, including high fixed costs of participation (including both financial costs as well as information costs) and non-standard preferences. For those who do invest in the market, Campbell (2006) summarizes the stylized facts regarding investors' tendency toward under-diversification, including concentrated direct stock portfolios, local country or home bias, and concentrated holdings in employer stock. Dimmock, Kouwenberg, Mitchell and Peijnenburg (2018) find that most individuals (in one survey) exhibit probability weighting (i.e., overweighting low probability events) and associate this with a lower likelihood of stock market participation and portfolio under-diversification. Clearly, for many households the barriers to effective investing are high.

FinTech Entry

An important development during the 2000's was the explosive growth in the exchange traded fund ("ETF") industry. The management fees on core ETFs were introduced at a fraction of the fees charged on actively managed mutual funds, and the empirical evidence of active manager underperformance and tax inefficiency of most mutual funds also supported dramatic growth in the ETF industry. By 2007, the index ETF industry had grown to over 600 registered ETFs and \$600 billion in assets covering U.S. equity, international equity, fixed income, and other asset class exposures (2008 ICI Fact Book). In 2008, Wealthfront and Betterment launched, initiating the so-called "robo-advisory" revolution; these early entrants took advantage of the low-cost, broadly diversified universe of ETFs to provide online automated portfolio investing services at a substantially lower cost and lower starting account sizes than traditional financial advisors. Personal Capital estimates the total fees (i.e.,

advisory fee and average fund fee) for managed accounts at a range of large financial institutions to be between 1.3 percent to 3.5 percent; by comparison, fees for a similarly sized account at Betterment would range from 0.38 percent to 0.53 percent depending on the level of financial advisor support desired by the investor (Betterment website).

Dozens of variations of robo-advisor businesses have since formed. Most of them share common features such as streamlined account sign-ups; simple online questionnaires to quantify investor risk tolerance, time horizon, and/or financial goals; and algorithms to create a diversified investment portfolio. Many robo-advisor platforms have integrated tax loss harvesting and other approaches to enhance the after-tax return of client portfolios. Their portfolio construction algorithms are sometimes referred to as applications of “AI” to investing, though most of the algorithms are based on decades-old approaches used by incumbent financial institutions. The novelty is rather in bringing easier access to these asset allocation techniques to retail investors through simple web-based or mobile applications and at lower cost.

The competitive landscape has evolved rapidly over the last decade. Noteworthy developments include the competitive response from large financial services incumbents and realignment of several FinTech challengers:

A Online financial service companies

Witnessing the early success of the new FinTech robo-advisors in gathering clients and assets, incumbents responded with their own robo-advisory offerings. Two of the largest incumbent online financial services businesses, Charles Schwab and Vanguard, launched their own variations on the robo-advisory model in 2015. Schwab’s Intelligent Portfolios feature no management fees, and Vanguard’s Personal Advisor Services are competitively priced with FinTech challengers at 30bps (and include an advisor). Backend Benchmarking’s 3rd Quarter 2018 Robo Report estimates Schwab’s robo-advisory AUM at \$33 billion across 223,000 accounts and Vanguard’s service at \$112 billion across an undisclosed number of accounts. These incumbent assets under robo-advisory management now dwarf the largest FinTech robos (Betterment estimated at \$14 billion and Wealthfront at \$11 billion); however, Betterment and Wealthfront have a much larger base of clients (362K and 217K, respectively), suggesting that Betterment and Wealthfront appeal to a different investor demographic.

B Large financial institutions

Large financial institutions have responded in several ways—including partnerships, acquisitions, and organic build. Large banks such as Wells Fargo and UBS partnered with SigFig, an early entrant into the B2C robo-advisor market, which has since pivoted to focus on providing technology to financial institutions. Major asset management firms have also entered the space, with BlackRock acquiring robo-advisor FutureAdvisor in 2015 and Invesco acquiring JemStep in 2016. Finally, two major investment banks organically built their own robo-advisors: Morgan Stanley announced its own Access Investing robo-adviso-

ry service priced at 35bps at the end of 2017, and JP Morgan is launching its organically developed “You Invest” robo-advisor service in 2019.

C Evolution of FinTech robo-advisory services

To differentiate and nurture new client acquisition and revenue sources, the early FinTech robo-advisors have added a variety of new services and features. For example, Betterment diversified away from B2C businesses to also include a white label offering of its robo-advisory platform advisors. In Dec 2018, Wealthfront launched free financial planning software for households, and Acorns (a micro-investing robo-advisor with nearly 1.9 million clients and \$800 million of assets) started a checking plus debit card service for its users.

In summary, the robo-advisory revolution has spread beyond FinTechs to include major incumbents across online financial services, asset managers, and banks. Further, such high levels of competition involving varied financial service businesses has led to a wide range of pricing models, service models (e.g., fully digital to humans leveraged by technology), and additional services (e.g., free financial planning). It remains unclear whether the FinTech robo-advisors will survive on a standalone basis and whether they will continue to play a central role as their clients become older, wealthier, and have greater financial complexity. What is clear is that they started a revolution that unleashed a competitive response leading to improved costs and service choice for U.S. households in saving and investing with improved diversification potential.

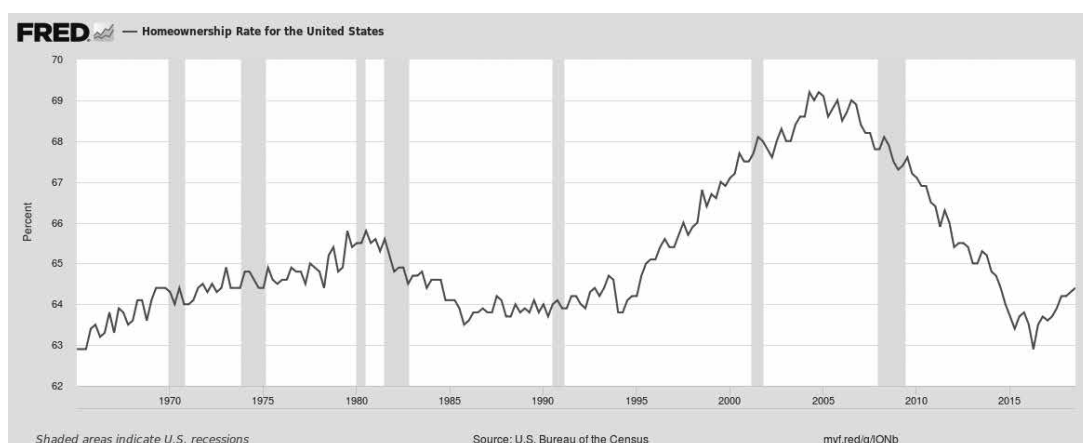
III-1-3. Creating liquidity from concentrated illiquid asset holdings (home equity)

Promoting homeownership has been a key part of U.S. government policy for decades. This has been accomplished through a variety of policy mechanisms including federal tax deductibility of mortgage interest payments; tax exclusions on home sales; home mortgage loan programs through the Federal Housing Administration and government-sponsored entities such as Freddie Mac, Fannie Mae, and Federal Home Loan banks; and The Community Reinvestment Act. Homeownership rates peaked a few years before the Great Financial Crisis and is now near its long-term average in the mid-60 percent range (Figure 3).

For the average household, net housing wealth (i.e., home value less any debts on the home) makes up the largest percentage of household assets. In 2016, the conditional mean net housing value was \$197,500 which represented between 32 to 39 percent of household assets depending on race/ethnicity (Survey of Consumer Finance); in addition, growing divergence between mean and median net worth in the survey suggests substantial heterogeneity in housing assets as a percent of total assets, and there are likely many households with higher concentrations in the ratio of home value to total assets.

Owning a home does introduce price risk to the household balance sheet (e.g., in the event of a move); however, unlike financial assets on the household balance sheet, primary residence homes have unique features for households as homeownership provides both a hedge against rising housing costs (Sinai and Souleles, 2005) and serves as a consumption good. High levels of holdings of illiquid homeownership relative to liquid assets can also

Figure 3. Homeownership Rates in the United States



pose real challenges to household consumption smoothing. Kaplan, Violante, and Weidner (2014) find that between 25 to 40 percent of U.S. households fully spend their disposable income each period; further, they find that two-thirds of that population are wealthy—holding little liquid wealth in cash accounts despite holding large amounts of illiquid assets (such as home and retirement accounts).

Historically, except for outright sale of the home, there has been a limited range of alternatives for households to extract liquid value from home equity. Home equity conversion mortgages (otherwise known as reverse mortgages) allow homeowners over 62 years of age to extract a lump sum or receive regular payments in exchange for the obligation to repay the debt when the homeowner leaves the home; however, this may not be available or suitable to homeowners under 62 and/or those who expect to move sooner—as reverse mortgages can have high origination costs, caps on the size of the equity extraction, and high equity percentage requirements. Alternatively, home equity lines of credit (HELOCs) allow homeowners to borrow against home equity, but have interest payments, minimum credit requirements, and can include extensive paperwork with approval timelines of multiple weeks. Thus, the challenge for the average household is that throughout the life cycle of purchasing or owning the largest non-financial asset they hold, they have been constrained to debt-based solutions.

FinTech Entry

Unison is an early pioneer in a relatively new concept—home equity financing. Unison matches institutional investment capital with homeowners seeking debt-free access to home equity. Through an equity investment of up to 20 percent of a home's value, Unison's investors share in the gains or losses when either the home is sold or 30 years from the investment, whichever is earlier. Unison will invest at the point of home purchase or after the home is already owned. Newer entrants to the market include Point (2015), Patch Homes (2016), and Hometap (2017), all with variations on the equity participation structure.

Given the underwriting inefficiencies of traditional HELOCs, Figure launched in 2018 to bring greater efficiency to the home equity loan market through a digitized process and blockchain technology. Figure has a fast, online pre-qualification process and features a smartphone-based eNotary service for identify verification—bringing the time to funding to within a week. Figure has also recently announced its Home Advantage product, where Figure will purchase a home from the owner and lease it back to the owner. The homeowner receives up to 90 percent of the home’s value in a lump sum, and Figure covers the property taxes, insurance, and other home maintenance costs during the lease-back.

These financing innovations provide new options for households to tap home value to reduce their debt burden (e.g., by selling equity participation at the point of home purchase or selling home equity to reduce existing debt); manage large, unexpected shocks to income or expense; or redeploy illiquid home equity to fund retirement. For households participating in homeownership, these FinTech challengers are introducing new opportunities to smooth consumption throughout the lifecycle of owning the home.

III-1-4. Improving efficiency and access to transaction accounts

For many households transaction accounts (including checking/savings accounts and prepaid debit cards) play an important role as the most liquid place to store value for consumption activity and precautionary savings.⁷ Precautionary saving is a form of self-insurance to cover unexpected income or expense shocks.⁸ Banks typically charge fees when a customer’s account results in an overdraft (an insufficient balance to cover withdrawals). These overdraft charges have risen from a median of \$18 in 2000 to \$30 in 2018 and generated revenue of over \$34 billion in 2018 (Moebs Services).

In addition to overdraft fees, banks often charge miscellaneous fees such as monthly maintenance fees, minimum balance fees, foreign transaction fees, and paper statement fees. Despite so many types of fees, customers at many of the largest brick-and-mortar banks only receive 0.1 percent APY or less on deposits. FinTechs are aiming to improve the economic efficiency of transaction accounts and households’ understanding of precautionary savings.

FinTech Entry

Post the Great Financial Crisis—when trust in large, brick-and-mortar retail banks declined—new FinTech digital or “neobanks” entered the market, including early entrants

⁷ Of the respondents to the 2016 Survey of Consumer Finances, 98 percent hold one or more transaction accounts, with a median account value of \$4,500.

⁸ A 2015 survey by the Pew Charitable Trust found that 78 percent of respondents would use transaction accounts for unexpected expenses, but that 41 percent of households do not have enough liquid savings to cover a \$2,000 emergency expense. The survey also found that 60 percent of households responding had experienced a financial shock in the past year, and that \$2,000 was the median cost of those household’s most expensive shock. A separate study by Pew found that 39 million adults incurred at least one overdraft fee on their bank account in the preceding year and a survey showed that 55 percent of respondents see overdrafts as a means to ensure payments process when unsure about their account balances, and 32 percent see overdrafts as a way to temporarily borrow money.

Simple (2009) and Moven (2011). Simple had no branches, but offered simple, intuitive on-line banking applications with basic checking and transaction functions, but without account fees, overdraft charges, debit card fees, or ATM fees. It operated as a user-friendly interface (e.g., with natural language querying of transactions), but sat atop the core bank account and card services of regulated, partner banks. Therefore, its profit model included sharing of its partner banks' interest margin and interchange fees on debit card transactions. Moven provided tracking of spending by category to help visualize real-time spending and account balances with their mobile devices. Simple was sold to the Spanish Bank BBVA in 2014, and Moven continues to operate as a financial wellness mobile banking application, while also providing digital banking technology to large bank partners.

Neobanks appear to have gained more momentum outside the U.S. For example, in the U.K., neobanks such as Atom, Monzo, Starling, and Tandem have received full bank charters and partnered with other FinTech providers. . One substantial challenge for U.S. FinTechs is banking regulation. Without easier qualification for a full national bank charter, neobanks (and other FinTechs in the marketplace lending industry) must contend with a patchwork of individual licensing in each state of intended operation.

On July 31, 2018, the Office of the Comptroller of the Currency (U.S. Treasury's banking regulator) announced that it would start accepting applications from "non-depository" FinTech companies that engage in certain core banking activities (e.g., checking and lending) for a special purpose national bank charter. However, even this limited-scope license designed to promote innovation in consumer-facing banking is being challenged by the Conference of State Bank Supervisors, and direct access to the payment system is subject to the Federal Reserve's willingness to grant this. As a result, neobanks have followed the path of Simple and have entered into partnerships with other regulated financial institutions that can provide many of the core banking functions—introducing the business challenges of key-provider dependency and shared economics.

More recently a second wave of FinTech challengers have emerged. These include Varo Money, which offers an FDIC-insured bank account through Bancorp Bank. Through a mobile-only application, in addition to many of the no-fee services offered by Simple, Varo uses machine learning to predict cash flows and offers loans, budgeting tools, automatic savings programs, and a substantially higher APY on its accounts. Similarly, Chime is another mobile-based neobank with zero fees and several automatic savings programs that allow for auto-saving deductions from the user's paycheck and auto-transfer of round-up values when using the Chime Visa debit card.⁹

A more recent trend is competitive entry by FinTech companies from other financial verticals and competitive response by large, incumbent banks. For example, SoFi, which started in marketplace student loan refinancing but has since moved into other marketplace loan categories and wealth management, added a SoFi Money account (leveraging regulated bank partnerships) and debit card options in 2018; and Acorns (an ETF investing app) intro-

⁹ Chime claims to have over one million bank accounts as of mid-2018.

duced a checking account (in partnership with a regulated bank) and debit card. Both SoFi and Acorns offer these services with no minimum balance fees, no ATM fees, and no overdraft fees. Also, incumbent financial institutions are making strategic acquisitions (e.g., Goldman Sachs' purchase of Claritymoney, BBVA's purchase of Simple, and JPMorgan Chase's acquisition of Wepay). Some banks are now building mobile-based applications involving personal financial management (including budgeting and savings nudges), investing, and AI and ML tools including chatbots and predictive information.

It is unclear at this point how regulations will evolve or whether this new wave of neobanks will succeed in commanding a large enough base of profitable customers to thrive. However, what is clear is that the FinTech neobanks have placed competitive pressure on legacy banks regarding their banking fee structures (e.g., overdraft, ATM, monthly charges), low APYs, poor transparency, and limited functionality (e.g., re-budgeting and automatic savings). The competition between FinTechs and incumbents is improving prospects for households to ameliorate their precautionary savings balances.

III-2. Financing

Access to external credit allows households to more efficiently smooth intertemporal consumption without having to sell productive assets or reduce human capital investment. Most U.S. households have access to a wide variety of credit types from both bank and non-bank financial institutions. Data from the 2016 Survey of Consumer Finances illustrate the prevalent use of credit, with credit cards being the most frequently used, but mortgage-related debt having the largest mean/median values (Table 1).

Table 1. Summary Statistics for Types of Household Debt

Household Debt

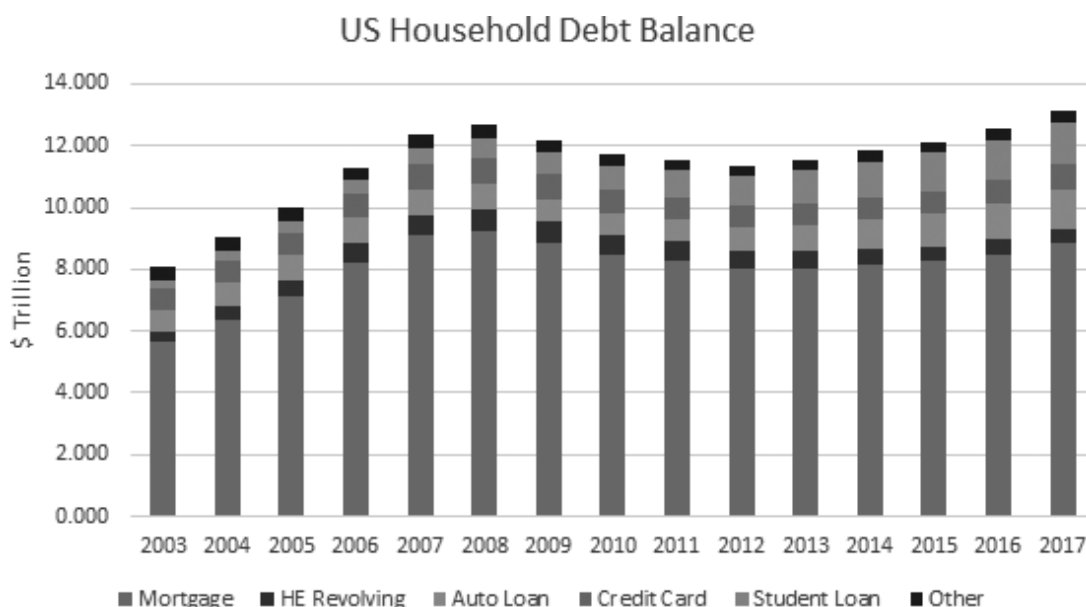
	% Who Hold	Median Debt (\$)	Mean Debt (\$)
Any debt	77	59,800	123,400
Primary residence debt	32	111,000	157,700
Education loan debt	22	19,000	34,200
Vehicle loan debt	34	12,800	17,200
Other installment debt	11	3,400	15,400
Credit card balances	44	2,300	5,700

Source: Federal Reserve, Survey of Consumer Finances (2016)

Data from the Federal Reserve Bank of New York shows the growth of the revolving and non-revolving consumer credit stock over time (Figure 4). While there was a period of aggregate household debt deleveraging following the Great Financial Crisis, the total bal-

ance has now grown past the pre-crisis level. Given the costs of purchasing a home and the ratio of cost relative to income for most households, mortgage debt constitutes more than 2/3 of the total U.S. household debt stock. While the balance of mortgage debt is still below pre-crisis levels, automobile loan balances have grown (\$800 billion/6 percent of total balances in 2008 to \$1.2 trillion/9 percent in 2017) along with student loan balances (\$600 billion/5 percent of total balance in 2008 to \$1.4 trillion/10 percent in 2017).¹⁰

Figure 4. Breakdown of US Household Debt Balances from 2003 to 2017



Source: Federal Reserve Bank of New York, Quarterly Report on Household Debt and Credit, Nov 2018

Despite the important role of credit in the household lifecycle model and its empirical prevalence and magnitude, there remain a substantial number of unanswered research questions and puzzles regarding consumer debt. One question relates to the impact of greater credit availability and credit options on household finance sustainability. In theory, if households are rational consumers of credit—balancing the risks and economic benefits throughout their life cycle—then by definition greater access and choice improves social welfare. However, surveys showing the extent to which many Americans struggle with the burden of their debt choices (CFSI, 2018 US Financial Health Pulse) and evidence of social/psychological drivers of excessive consumption (Kuchler and Pagel, 2018) suggest that there may be heterogeneous effects across households. Some households may assume larger ratios of debt to income, leaving them with greater vulnerability to shocks and future debt traps; however, disentangling cases where credit decisions may have been rational ex-ante, but through chance circumstances led to a debt spiral, are challenging to discern. Whether

¹⁰ However, notably, household debt-to-GDP has fallen from 100 percent in 2007 to 80 percent in 2017 (IMF).

households make sound decisions regarding the composition and level of credit they utilize is beyond the scope of this paper, and given the specificity and complexity of individual household situations, is only narrowly addressed by current FinTech innovation.

Another important question is whether households contract in an economically efficient manner. That is, given the variety of credit options, varying contractual features (e.g., repayment options), and pricing heterogeneity, do households make efficient choices? Ancillary questions relate to household decision-making efficiency in exercising refinancing options when available to reduce the cost of servicing existing debt of the household. This is an area where evidence appears to suggest inefficiency in household choice regarding borrowing decisions.

Zinman (2015), summarizing findings from a number of papers regarding mortgage borrowing decisions, purports that: (1) there is evidence of significant heterogeneity in mortgage APRs among borrowers with similar attributes, (2) evidence suggests departures from optimal mortgage refinancing, and (3) with regard to credit cards, Zinman summarizes conclusions in Stango & Zinman (2014), where they “estimate a residual APR interquartile range of several hundred basis points, even after controlling for borrower credit risk and other card attributes.” Weighing the empirical evidence, Zinman concludes that households appear to demonstrate choice efficiency in allocating debt across debt contracts they already hold (i.e., generally allocating debt to the lower cost contracts), but highly inefficiently when initially choosing from available contracts. He further concludes it is less clear whether households use debt in a way that improves their welfare, whether households optimally default on contracts, and cross-product choice efficiency (i.e., home equity credit vs. credit card utilization).

In a separate paper, Zinman (2014) argues that even if households are sub-optimal in their use of debt (e.g., overborrowing), an expanded universe of formal credit options is still welfare enhancing if they offer improvements in pricing and/or flexibility relative to what households would otherwise use. From an industrial organization perspective, there may be consumer benefits from the entry of new FinTech lending competitors if the competitive response from existing incumbents results in improved consumer options, greater transparency of information, more competitive pricing, reduced access frictions, etc.

In the following discussion we illustrate the role FinTech innovation plays in terms of household access and use of credit. First, we provide background on marketplace lending and its impact on household finance. Then, we highlight several noteworthy FinTech companies that aim to provide better access to financing with lower costs.

III-2-1. Background on marketplace lending

The emergence of marketplace lending presents a useful example of how FinTech innovation may improve access to credit and economic efficiency of financial intermediation. In its simplest form, marketplace lending refers to the matching of investors and borrowers using a technology-driven online platform. Marketplace lending is an alternative to traditional, regulated banks acting as intermediaries between depositors and borrowers and mediating

the transactions costs and risks of liquidity and maturity transformation between shorter-term deposits and longer-term loans. Marketplace lending platforms do not serve the same role as banks between depositors and lenders, as there is no transformation of the liquidity, maturity, and risk of the loans between marketplace lenders and investors. However, without a local branch network or capital requirements of a regulated bank, marketplace lenders compete with structural cost advantages that may allow them to offer lower-cost loans to borrowers or provide credit access to borrowers that would otherwise be unprofitable for banks to serve. A confluence of many factors created a fertile environment for the marketplace lending movement to grow. Some examples include advances in computational processing/storage and analytics, availability of data for underwriting, a retrenchment of consumer credit underwriting by banks and finance companies after the global financial crisis, and an environment of low alternative interest rates.

Prosper (founded in 2005) was the first major online peer-to-peer lending marketplace in the United States, but over the following decade, the marketplace lending category evolved in several ways. First, the number of marketplace lenders has dramatically expanded, while origination volumes have grown to \$35bil in 2016 (70% of this composed of consumer-related loans) according to the 2017 Americas Alternative Finance Industry Report; second, the marketplace lending model has grown from originating unsecured consumer loans to include a broad range of credit types/taxonomies, including small business loans, real estate loans, student loan refinancing, among others; third, as the size of originations continued scaling, the type of investors funding the loans has evolved away from individual investors to include sophisticated institutional investors and market tradable securitizations. David Perkins (Congressional Research Service, 2018) refers to several potential marketplace industry advantages over banks including a purported 61 percent lower cost for loan processing and servicing, though whether marketplace lenders have total cost advantages (including funding and marketing costs) is less clear.

In the following sub-sections, we present evidence about the economic impact of marketplace lending. We segment the discussion into the following loan categories: consumer unsecured loans, mortgages, and student loans.

III-2-2. Consumer unsecured loans

Given the rapid growth of originations and high profile of brands in this marketplace lending category, empirical research is emerging in this area. Overall, the empirical evidence on whether marketplace lending confers welfare advantages is still nascent. Citing data that about 77 percent of marketplace loans originated by the two largest platforms in 2017 were ostensibly used for debt consolidation, Adams (2018) analyzes the APR spread between these platforms' loans vs. credit card APR offers in similar credit score categories. He finds that marketplace loans have significantly lower APRs than credit cards (in some cases, multiple hundreds of basis points) through time. Eid and Yang (2018) find marketplace lending improves access to credit in areas lacking access to mainstream banking and show evidence suggesting the growth of marketplace lending may benefit an individual's subsequent credit

position. Similarly, Balyuk (2018) documents potential reductions in credit rationing from existing lenders to individuals who subsequently borrow through a marketplace lending platform and asserts that the credit increase is larger for borrowers who are likely otherwise more credit constrained. However, using data from multiple marketplace lenders reported to a credit bureau, Di Maggio and Yao (2018) find that borrowers' credit outcomes improve in the first six months after origination, but exhibit higher indebtedness and are more likely to be delinquent in subsequent months.

One area that has received much attention in the popular press is the use of alternative data and machine learning by FinTech companies. Examples of such alternative data that are not used in traditional credit scores include electronic banking transaction records, online website behavior, mobile and social media data, occupational and education details, etc. In theory, these alternative data and new algorithmic approaches could be used to reduce costs of underwriting loans and facilitate more competitive loan pricing. Further, it could improve credit access (e.g., through generating alternative credit scores for potential borrowers with little credit history, or re-rating the risk of some borrowers versus their credit bureau ratings).

Jagtiani and Lemieux (2018) find that for one lending platform, internal proprietary ratings grades have seen a dramatic reduction in correlation to FICO scores (from 80 percent in 2007 to 35 percent in 2015), suggesting increased use of alternative data by the platform; further, they assert (based on a limited origination window) that the ratings grades by the platform are more efficacious in predicting default probability than FICO scores and that there is evidence of improved consumer access to credit.

However, from the perspective of investors in marketplace loans, there may be an incentive for platforms to reduce the potential benefits of sharing alternative data. Given the heterogeneity of marketplace loan investors (i.e., sophisticated active institutional investors, passive institutional investors, and retail investors), Vallee and Zeng (2018) find that sophisticated investors screen loans in a way that confer economically meaningful performance advantages and introduce adverse selection in a way that could lead to lower platform volumes; therefore, to maximize volumes, they argue that platforms manage this risk by choosing only intermediate levels of loan pre-screening and data provision to investors. This would effectively raise the potential returns for unsophisticated investors and reduce the potential returns for sophisticated investors using alternative data for their investing decisions.

In summary, emerging evidence suggests that marketplace lending in the unsecured consumer loan space offers households greater choice, confers lower cost refinancing alternatives for debt consolidators, and improves access for some households. Other evidence (e.g., longer-term impact on the welfare of borrowers) is less clear at this juncture. Further, these lending platforms expanded in a low interest rate environment, and the credit portfolios they create have been untested through a full market cycle; so, we yet have much to learn about this innovative area of credit creation.

III-2-3. Mortgages

Mortgage debt represents the largest percentage of the outstanding household debt stock. According to the U.S. Census Bureau, homeownership rates in the U.S. have remained over 60 percent from 1960 to 2015 (peaking at 69 percent in 2004 but remaining at 64 percent in 2015). Further, 64 percent of owner-occupied homes have a mortgage.

In its 2011 Global Financial Stability Report, the IMF compares features of the U.S. mortgage market in an international context. The study finds the U.S. mortgage market unusual in the prevalence of 30-year fixed rate mortgage (FRMs) funded through mortgage-backed securitization; in markets outside the U.S., it found the practice of fixing mortgage rates greater than five years rare and the percent of loans funded through securitizations significantly lower than in the U.S. The same study also found that government participation in housing finance markets in the U.S. is among the highest of advanced economies. Indeed, government sponsored agencies play a substantial role in securitizations (Fannie Mae, Freddie Mac, and Ginnie Mae) and insurance (Federal Housing Administration) in the U.S. mortgage market. Further, U.S. tax policy allowing full deductibility of primary residence mortgage interest payments (without imputed rent) is unusual in a global context.

Given the size and uniqueness of the U.S. mortgage market and that borrowing for a home is one of the most consequential financial decisions many households will make, it is important to understand household choice efficiency in this area. The history of evidence suggests that there is economically substantive inefficiency in the way households use mortgage debt. Campbell (2013) reviews evidence that mortgage borrowers fail to understand terms of their mortgages, pay excessive fees to mortgage brokers, and miss opportunities to refinance their mortgage. Agarwal et al. (2016) estimate that 57 percent of borrowers sub-optimally refinance (most choosing a sub-optimal rate, and the others sub-optimally delaying refinance or both delaying and choosing a sub-optimal rate).

Prior to the entry of FinTechs into the mortgage space, the processing of mortgage loan applications was typically a manual and lengthy process. According to the Ellie Mae Millennial Tracker, over the period January 2014 to December 2017, closing a loan took an average of 45 days from start to finish. Several early FinTech entrants focused on transforming the mortgage loan application process and borrower experience. There have been three primary trends in this area: new direct lenders, digital platforms for incumbents, and the emergence of digital offerings by non-bank incumbents.

(1) New direct lenders (B2C lenders)

Better Mortgage, Lenda, and SoFi are examples of entrants who sought to streamline and digitize the process of mortgage loans and loan refinance. Eliminating loan origination fees and leveraging technology throughout the loan process, these companies originate loans which are then ultimately sold in the secondary market. These platforms primarily provide automated electronic support, but human loan officers are used when the borrower needs additional help. While data regarding average time-to-loan closure is difficult to obtain and verify, anecdotal evidence suggests that these firms can shorten loan closure times relative

to traditional bank lending channels. Nevertheless, business closures of other direct lending competitors (e.g., Clara Lending) illustrate the challenges of competing and scaling in the B2C mortgage space.

(2) Digital platforms for incumbents

Another set of FinTech companies (e.g., Blend, Roostify, and Maxwell) are focused on building digital loan application infrastructure that can be used by incumbent bank and non-bank lenders. These B2B2C challengers focus on building the technology stack to improve the efficiency and competitiveness of existing lenders, rather than attempting to build the loan origination processes, financing and capital markets capability, and retail borrower acquisition required of the direct lending model.

(3) Emergence of digital offerings by non-bank incumbents

There have been large structural shifts in the composition of mortgage loan originations through the Great Financial Crisis. The share of mortgage originations by non-bank lenders fell to under 10 percent of originations in the depth of the crisis but are now over 50 percent of the market. The top non-bank mortgage lenders (both purchase loans and refinance loans) have grown from 8 percent of the total \$1.6 trillion in 2010 originations to 32 percent of the total \$2.1 trillion in 2016 originations (Oliver Wyman). Quicken Loans was the largest originator of mortgages in the first quarter of 2018, bypassing large bank lenders such as Wells Fargo and JPMorgan Chase. Quicken Loans, an earlier pioneer in using online approaches to client acquisition, was formed through Intuit Inc.'s purchase of Rock Financial Corp and was spun-out of Intuit in 2002. In 2016 the company launched Rocket Mortgage as a digitized mortgage option versus speaking with a loan officer. Quicken Loans reported to have funded 7 percent of its origination volume through the Rocket Mortgage digitized process in 2016 (Housing Wire) and claims that 98 percent of the company's volume in the first quarter of 2018 accessed the Rocket Mortgage platform directly or indirectly.

Fuster et al. (2018) analyze data from "FinTech lenders" in the U.S. mortgage market and document ways in which technological innovation has improved financial intermediation efficiency in the markets. They document shorter processing times (10 days), improved peak volume processing efficiency, and increased propensity to refinance versus traditional lenders; they further show evidence that this occurs without increased loan risk and conclude that technological innovations are improving efficiency of the U.S. mortgage market. While their sample time period and sample of "FinTech lenders" (e.g., Quicken Loans) risks conflating a full digital process with an online leveraged human process, their paper potentially provides some early empirical evidence that technology-leveraged mortgage lending processes can help address some of the challenges households face with mortgage credit. Reduced loan application frictions and improved transparency of information (e.g., fees) may help households reduce the frustrations and search costs in securing or refinancing a mortgage.

III-2-4. Student Loans

A normative interpretation of life cycle models of consumption predicts that asset-constrained agents who perceive a high return to human capital development through education should willingly take on student loan debt, effectively consuming more in the present by borrowing against increased future expected income from human capital. However, in *Capitalism and Freedom* (1962), Friedman notes the possibility of under-investment in human capital due to capital market imperfections; he distinguishes between the security of debt against physical capital (e.g., with a claim on the physical asset) versus debt against human capital (where the “asset” cannot be bought or sold).

Indeed, U.S. government involvement in lending has a long history, starting in 1958 under the National Defense Education Act.¹¹ This was done through the provision of low-interest federal loans to talented students who might otherwise have difficulty affording undergraduate and graduate education. This government policy supporting higher education was expanded through the Higher Education Act of 1965, which led to U.S. government subsidies and guarantees for student loans issued by private lenders. The government re-started direct lending in 1993, while continuing the guaranteed student loan program. Finally, in 2010, legislation eliminated the guaranteed student loan program and required all new federal loans to be direct loans. As a result, the U.S. government now originates and services approximately 90 percent of all student loans.¹²

In the Feb 2018 FEDS Notes of The Federal Reserve, Feiveson, Mezza, and Sommer argue that the direct effect of the \$1.3 trillion stock of student loan debt on aggregate consumption growth is likely small. However, in citing evidence that college graduates have substantially higher incomes than high school graduates, they also note the “substantial heterogeneity” in returns to education; further, they cite research showing that income for certificate students graduating from for-profit colleges cannot be shown to be statistically different from incomes of non-college graduates.

According to the Pew Charitable Trust, one in five federal student loan borrowers (i.e., more than 8 million borrowers) are in default, and many more are struggling to make payments. The government does offer income-driven repayment plans for those experiencing challenges, but Pew argues that the process is cumbersome and can lead to increased payment requirements if not done properly. If some class of borrowers misperceives the labor income benefits of borrowing to invest in their human capital, underestimates future labor market uncertainty, or misjudges their ability to complete an educational program, then these errors coupled with high educational expense and ease of borrowing through the government could lead to adverse welfare outcomes for such households. Given the prevalence, magnitude, and in some cases, heavy burden of student loan debt, some FinTech companies have found opportunities to provide service in the areas of student loan refinance, results-based students loans, and debt support as an employee benefit.

¹¹ In response to the Oct 1957 firing of Sputnik I by the Soviet Union, the legislation initiated a student loan program to colleges and universities to promote the flow of talent into science, mathematics and foreign language careers.

¹² <https://www.heritage.org/education/commentary/soaring-student-debt-costs-us-all>

(1) Student loan refinance

SoFi and CommonBond are the leading FinTech businesses that consolidate and refinance both government and private student loans. Both focus on higher quality credits and sell the loans in the secondary market (e.g., through securitizations). Reductions in the debt service burden for this population may help dampen any residual impact on household formation, consumption, or other areas that could be crowded out by high debt burden.

(2) Results-based student loans

Given the challenges regarding government expansion of student loan credit, but substantial heterogeneity in returns to education and ability to pay back debt, a new class of FinTech entrants such as Climb Credit and Ascent Student Loans are trying to better align incentives and improve transparency in student lending. As an example, Climb Credit uses a data-driven approach to evaluate partner schools for education value. Climb funds loans for students attending programs that develop knowledge and skills for jobs with strong earnings potential. Climb claims a 66.7 percent median salary increase for Climb school graduates and also claims an application process time of five minutes. Originated loans are sold in the secondary market. Climb's investment-oriented approach to underwriting also helps borrowers evaluate the ROI in financing post-high school education, thereby directly addressing the potential over-investment issue noted above vis-a-vis Federal student loans for for-profit education. According to Forbes, the company currently partners with over 100 college-level schools, having originated close to \$100 million in loans.¹³

(3) Debt support as an employee benefit

Recognizing the financial debt challenges of employees and job candidates and the challenges faced by many enterprises in attracting and retaining talent, FinTech companies such as Tuition.io, FutureFuel.io, and Gradifi developed platforms for employers to offer student loan debt payment support as a benefit. These include digital financial wellness tools to help employees better manage their debt.

While government policy and legislation (especially regarding government direct lending) unleash the macro forces that directly impact the overall trajectory and health of the student loan market, these FinTech developments may help some households make better education loan debt decisions, reduce costs of debt through refinance, and more efficiently and effectively pay down debt after completion of an educational program.

III-3. Insurance

The United States is the world's largest single-country market for insurance by premium volume (over \$1trillion in 2017). Figure 5 shows the breakdown of premiums into two

¹³ <https://www.forbes.com/sites/ayurellahornmuller/2019/01/30/student-loan-startup-climb-credit-raises-50-million-from-goldman-sachs/#78f397e273f6>

broad categories: property/casualty and life/health. The insurance industry and related activities play an important role in the overall U.S. economy. According to the OECD, total insurance spending (defined as the ratio of direct gross premiums to GDP) stands at 11.2% in the U.S. in 2017, compared to 8.9% for the entire set of OECD countries.

Figure 5

Property/Casualty And Life/Health Insurance Premiums, 2017 (1)

(US\$ billions)



(1) Property/casualty: net premiums written after reinsurance transactions, excludes state funds; Life/health: premiums, annuity considerations (fees for annuity contracts) and deposit-type funds.

Source: Insurance Information Institute (<https://www.iii.org>)

From a household finance perspective, risk hedging through insurance provides households opportunities to smooth consumption over the life cycle. In a standard economic model, a risk-averse agent, faced with uncertain future states, will purchase insurance policies to maximize expected utility of consumption. The intuition behind this is that a risk averse agent with a concave utility function and diminishing marginal returns will willingly accept a known “cost” in the present (in the form of an insurance premium payment) in exchange for transferring away the risk of larger losses in the future (e.g., from loss of property or significant medical expenses). In the classical framework, the size of the premium the agent would be willing to bear is a function of the fair actuarial expected loss from the risk to be hedged and the agent’s level of risk aversion.

However, there is a growing body of empirical evidence suggesting significant departures of household insurance choices versus behaviors expected using this standard classical model. Kunreuther et al. (2013) overview a number of apparent insurance choice anomalies, including the following: purchase of low-deductible insurance policies and insurance against small losses, where premiums appear far in excess of reasonable actuarial probability of loss; sub-optimal switching from overpriced, poorly-designed policies (which they attribute to inertia and confusion); failure to take advantage of subsidized insurance against catastrophic losses (such as floods); or viewing insurance as a “bad investment” and cancelling after years of having no loss claim. Further, Gottlieb (2012) summarizes a number of insurance choice puzzles, including apparent under-utilization of annuities to hedge longevity risk, insufficient holding of life insurance among working-age families, and excessive holdings of life insurance among the elderly. Whether departures from standard economic benchmarks have behavioral roots (e.g., households exhibit preferences consistent with prospect theory [Kahneman and Tversky, 1979]), reflect constraints on households, or result from supply/demand distortions due to market imperfections (e.g., information asymmetries, adverse selection, and moral hazard), the sheer complexity of insurance choice confronting

households suggests a potential welfare-improving role for technology in this decision domain.¹⁴

“InsurTech” is the subset of FinTech companies leveraging technology to address challenges in the insurance industry. Juniper estimates that the global market for the InsurTech sector was about 4 percent in 2018 and will grow to under 10 percent by 2023.¹⁵ Companies in this space seek to make insurance cheaper (e.g., targeting specific pools hurt by adverse selection or reducing moral hazard), more accessible, and easier to manage—typically by leveraging mobile technologies. In this section, we provide specific examples of how InsurTech companies are addressing the needs of households in five areas: automobile, homeowners/renters, health, life and annuity, and search.

III-3-1. Automobile insurance

Some InsurTech companies address adverse selection problems in the insurance market with usage-based business models that provide cheaper pricing for low-use customers. Founded in 2011, Metromile is a prime example of a car insurance company that charges drivers based on the actual number of miles driven. In addition to lower cost, policyholders benefit from several perks: first, the in-car telematic device that tracks miles also monitors the health of the car and reports any problems; second, the Metromile mobile app can track and report the physical location of the car in case the user forgets where the car is parked, or the car is stolen; and third, claims may be handled more efficiently due to ML algorithms that can distinguish among types of collisions. Although Metromile targets low-distance drivers, there are competitors that focus on other pools of lower-risk customers.

Like Metromile, Root Insurance launched in 2015 and offers usage-based car insurance to provide cheaper pricing for a subset of drivers; however, instead of targeting those who drive less, Root targets those who drive more safely. Customers download a mobile app and uses AI to track and assess driving performance and other information during a two or three-week “test drive,” and can directly apply for a policy using the same app. As additional perks, all policies include roadside assistance and offer faster claims processing. By gamifying the driving experience, the company hopes to transform policyholders into better drivers—a win-win for households and insurance companies.

Large, incumbent automobile insurance carriers have responded by introducing their own versions of usage-based insurance pricing models (e.g., Esurance’s Pay Per Mile program) and/or discounts based on driver behavior using telematics (Progressive’s Snapshot, Allstate’s Drive Wise, State Farm’s Drive Safe & Save and In-Drive, Hartford’s TrueLane, etc.). Root argues that it differs from the large, national carriers by focusing more exclusively on the pool of “good” drivers, more heavily weighting driving behavior into underwriting

¹⁴ Adverse selection in the insurance market occurs because high-risk consumers are more likely to purchase insurance than low-risk consumers. Insurance companies can only partially identify the riskiness of each consumer (an asymmetric information problem). Therefore, insurance companies must charge higher rates than what would be normally charged to the average consumer because the weighted-average risk of the insurance pool is greater than average risk across consumers.

¹⁵ [https://www.juniperresearch.com/press/press-releases/insurtech-based-premiums-to-exceed-\\$400-billion-by](https://www.juniperresearch.com/press/press-releases/insurtech-based-premiums-to-exceed-$400-billion-by)

and pricing, and offering discounts at the initial point of underwriting rather than after months of driving. Kunreuther et al. (2013) find the auto insurance market consistent with supply and demand behavior expected based on standard economic benchmarks; consequently, the primary gains from innovation and competition in this area are likely to be focused on drivers with lower risk behaviors and those with below average driving mileage—as these risk may have been historically overpriced in larger risk pools.

III-3-2. Homeowners and renters insurance

Kunreuther et al. (2013) highlight a number of challenges with renters and homeowners insurance. With regard to renter's insurance (covering loss or damage to contents in the residence and often liability coverage), they find high average premium loading factors coupled with low wealth protection potential; they conclude it appears reasonable that many renters would elect not to purchase coverage. While some households fail to purchase insurance against high-consequence, low-probability events, demand for homeowners insurance (which typically protects contents, liability, and housing structure value) also reflects the requirement of mortgage lenders for borrowers to carry such insurance. Kunreuther et al. (2013) find apparent anomalies in consumer choice in this area, such as under-purchase of reasonably priced insurance against natural catastrophes and over-purchase of low deductible property insurance.

Lemonade and Hippo Insurance are examples of FinTech companies attempting to redesign the home insurance market (and in the case of Lemonade, also renters insurance). Lemonade attempts to remove the conflict of interest between profit-maximizing insurance companies and their policyholders; that is, Lemonade argues that insurance companies have an incentive to reject or delay claims by policyholders, because it impacts their own profits. Lemonade tries to improve policyholder claim behaviors by having each policyholder select a charitable cause; policyholders interested in supporting the same charitable causes are assigned to peer groups. Twenty percent of premiums paid by policyholders are used by Lemonade to cover expenses—including payments to reinsurers. If claims from a peer group leave a net residual premium, such residual is paid to the charitable cause identified by the peer group. The hope is that rather than claiming against the profit pool of a corporation, reframing this as claims reducing a residual that goes to a charity will help curb claim abuses—leaving Lemonade with greater flexibility to provide policyholders with a better and faster claim processing experience. Lemonade claims to leverage AI and behavioral economics to redesign the homeowners and rental insurance market.

Hippo Insurance launched in 2015. Leveraging technology and data from a variety of sources (including aerial photography of roof conditions), Hippo claims the ability to provide a homeowners or condominium insurance quote within 60 seconds and access to a policy in minutes. Policies are issued by third-party insurance companies rated A- Excellent or better by A.M. Best and reinsured by other providers. The company provides policyholders with additional discounts when using a smart home sensor kit (e.g., for water leaks, temperature, etc.) developed by a third-party company, Notion, and provided by Hippo to the

policyholder.

It is unclear whether Lemonade or Hippo are directly addressing the anomalies identified by Kunreuther et al. (2013); however, these two FinTechs potentially improve participation by homeowners who might otherwise remain under-insured to the extent that they can create marginal improvements in underwriting pricing efficiencies, reduce search and switching costs to change policies, and improve accessibility.

III-3-3. Health insurance

Given the high costs of medical care in the United States, it is reasonable to expect most risk-averse households to have a strong motivation to hedge against adverse health risks. However, any analysis as to whether health insurance supply and demand dynamics comport with an expected utility maximization benchmark using a standard economic model is challenging given the introduction and continued evolution of features of the Patient Protection and Affordable Care Act (ACA) passed in 2010 and the interplay between employer-sponsored and individual plans. Features of the ACA include subsidies for moderate to low-income households, elimination of risk-based underwriting/pricing discretion for pre-existing conditions, tax penalties for non-coverage introduced in 2014 (but eliminated in 2018), and other evolving attributes. Therefore, rather than focusing on demand- or supply-side challenges regarding health insurance, we instead address the technological features of new FinTech entrants.

As with Property and Casualty (P&C) insurance, FinTech innovators are bringing new technology-leveraged approaches to the provision of health insurance. Clover Health, for example, is trying to reduce the cost of insurance by using big data analytics and preventative health measures for its customers. The company claims that it has an 85 percent accuracy rate in determining which patients are at risk of being admitted to the hospital within the next 28 days.¹⁶ It markets to senior citizens and low-income customers by offering a low-premium, no-copay Medicare Advantage plan.

Oscar Health targets a completely different demographic than Clover—namely, customers who prefer to use smartphones to manage their healthcare. The company relies on their mobile app to provide 24/7 telemedical care to customers as well as assisting customers to file claims more efficiently. Oscar aims to help customers book doctors faster by using ML algorithms. Although the company is growing, it only has coverage in 9 states—with a total of about 250,000 members.

III-3-4. Life insurance and annuities

For many households, human capital is one of the most important assets on the household balance sheet. Risk-averse households would be expected to have a strong motivation to hedge income risk from that human capital in two ways: first, purchasing life insurance while human capital levels are relatively high (typically earlier in the life cycle) to hedge

¹⁶ <https://www.nashvillemedicalnews.com/clover-health-expands-to-nashville-releases-flu-findings-cms-2782>

away uncertainty regarding loss of income for the survivors in the household in the event of premature death on the part of the policyholder; second, purchasing annuities as human capital is depleted (typically later in the life cycle) so as to use the annuity's lifetime income stream as a hedge against longevity risk. Gottlieb (2012) and Kunreuther et al. (2013) review evidence that both life insurance and annuities appear under-purchased by households. Kunreuther et al. (2013) and Beshears et al. (2018) review a number of rational explanations that may explain some cases of apparent under-purchase behavior in the case of annuities: substitution by other forms of retirement annuity, such as social security and defined benefit pensions; bequest motives; and existence of the productive potential of a spouse. However, there are also several constraints and behavioral explanations that may elucidate this observed under-hedging on the part of some households.

Traditional life insurance companies often require working through a human sales agent and a multi-week process to provide applicants with a decision on underwriting a policy. New InsurTech companies such as Fabric have launched to reduce the inconvenience and speed issuance of insurance policies. Fabric offers an accidental death policy that can be secured via mobile phone in minutes; policyholders may then upgrade to Fabric Premium, a 20-year term life policy at up to \$5 million in coverage. Rather than having to visit a doctor and submit results to a carrier, Fabric will dispatch a medical professional to conduct the health check at the applicant's home or office. Policies are underwritten by a third-party insurance company.

Ladder is another insurance startup offering term life insurance with a number of term options ranging from 10 to 30 years and up to \$8 million coverage. Policies are sold online without the necessity of working through sales agents and feature a quick application process. Upon completion the applicant may receive an immediate approval or be required to undergo a health check; like Fabric, if a health check is required, the company will dispatch a traveling technician to the applicant's home or office. One interesting feature of Ladder may help address apparent anomalies in some subset of household use of life insurance (i.e., the tendency to hold too much life insurance later in the life cycle); Ladder allows policyholders to easily "ladder down" coverage through the life cycle as insurance needs decline (e.g., child graduates from college). Incumbent life insurance companies are beginning to respond to the InsurTechs; for example, The Massachusetts Mutual Life Insurance Company established Haven Life (a wholly owned subsidiary with policies underwritten by MassMutual), which offers the online efficiency and speed of decision features of InsurTech competitors.

In the area of annuities, the InsurTech Blueprint Income, launched as an online marketplace that helps households design fixed-term annuities, lifetime income annuities, and what it terms as "personal pensions" by matching them to one of over 30 insurance companies. Instead of purchasing an annuity with a large, lump-sum investment, Blueprint's "personal pension" breaks the purchase into smaller contributions earlier in the policyholder's life cycle. This may help address one of the behavioral explanations for under-utilization of annuitization by households. Chen, Haberman, and Thomas (2016) show how under cumulative

prospect theory, loss-averse agents in retirement will find immediate annuities undesirable. Such agents may frame annuities as a gamble, with a large, known up-front cost and uncertain discounted value of gains (i.e., from unknown duration of the future income stream based on longevity). Blueprint's product, which breaks the purchase into smaller increments to fund a long-term deferred annuity, reduces the "price" and changes the framing in such a way as to potentially improve uptake of annuities. Additional innovations are likely needed in this area to address the many constraints and behavioral issues leading to under-annuitization for households.

III-3-5. Search

Given the depth and breadth of policy options in the U.S. insurance market, American consumers are faced with large search costs. PolicyGenius reduces these costs by helping consumers search and compare quotes across policy options. The company acts as a broker (earning commissions) and has disrupted the brick-and-mortar insurance model by providing access to lower pricing and improved customer education. The company is licensed in every state, and since inception it has helped millions of Americans search for insurance and has brokered over \$20 billion in coverage.¹⁷

Like the other FinTech segments, InsurTech has seen adoption from major insurance and re-insurance companies—typically by setting up incubators/accelerators or by entering into partnerships with start-ups. Munich Re, for example, provides on-demand insurance underwriting to both Trov and Slice as well as reinsurance coverage for Lemonade. Allianz X, the digital investment arm of Allianz Group, has formed a strategic partnership with American Well—a leading telehealth platform headquartered in Boston. AXA Venture Partners invested over \$5 million in Series A funding for Policy Genius.¹⁸ These examples are a clear indication that the incumbents view FinTech as integral to their digitization strategy.

III-4. Payments

The United States has been gradually shifting to a cashless society. In 2015 total non-cash payments in the U.S. totaled about \$178 trillion dollars, of which about 82 percent were via Automated Clearing House (ACH); about 83 percent of the non-ACH, non-cash payment amounts were made with paper checks.¹⁹ These statistics include payments by households, businesses, and governments. According to the 2017 TSYS U.S. Consumer Payment Study, the most preferred payment type among consumers was debit card (44 percent) followed by credit card (33 percent) and then cash (12 percent).

PayPal, arguably one of the most influential and successful FinTech companies, kicked off online money transfers during the dot-com boom in the late 1990s—well before FinTech was considered a buzzword. PayPal connects peers seamlessly through a digital layer that

¹⁷ <https://www.policygenius.com/>

¹⁸ <https://www.axavp.com/avp/policygenius/>

¹⁹ The Federal Reserve Payments Study (2016)

permits a user to send and receive ACH transfers with knowledge of just the counterparty's email address. Their original peer-to-peer (P2P) business model has since expanded to merchant accounts that include the ability to accept credit card payments. The U.S. Consumer Payment Study (2017) estimates that 75 percent of consumers have a PayPal account, and 29 percent have used PayPal or another service to send person-to-person payments. Green and Stavins (2018) state that by 2017 about 45 percent of consumers had a nonbank payment account, and PayPal was the most common. As of September 30, 2018, the company had over 250 million active accounts worldwide.²⁰

One of the disadvantages with P2P payments through PayPal is that it typically takes up to three business days for the payment to clear. Venmo, the social payments service acquired by PayPal in 2013, has recently launched an option to send payments instantaneously for a one-percent fee. Zelle, a digital payment network created by a consortium of large banks, competes directly with Venmo for instant payments, with the advantage that the network does not charge fees for money transfers. Both Venmo and Zelle, however, require that the sender and recipient banks be in the U.S.

Circle is a P2P payments technology company that offers more flexibility than Venmo and Zelle. With the Circle Pay app, users can send and receive money in U.S. dollars, G.B. pounds, euros, and even bitcoin in more than 20 countries.²¹ Cashing out Circle payments to a U.S. debit card typically takes under one minute; yet, funding the account from a bank account takes up to four business days.

A more thorough review of other FinTech companies innovating in the consumer payments ecosystem in the U.S. (including in the cryptoasset area) is beyond the scope of this paper. Given the relative efficiency and effectiveness of the domestic consumer payments system, the magnitude of opportunity to improve consumption smoothing or financial well-being for the average U.S. household here appears limited, especially relative to the other categories previously covered in this paper.

IV. Conclusion

Since the Great Recession concurrent technological developments in mobile/wireless communications, cloud hosting/computing, and ML/AI software libraries have contributed to an explosive increase in the number of FinTech start-ups. Also, the post-crisis atmosphere in the U.S. was painted with a growing mistrust of large financial institutions, which created fertile ground for FinTechs to thrive and receive investment funding. This environment has created challenges for the proprietary financial services industry, while at the same time providing opportunities for households.

There is a growing body of empirical evidence that households have behavioral biases and appear to behave sub-optimally when making financial decisions. For example, house-

²⁰ <https://www.paypal.com/stories/us/paypal-reports-third-quarter-2018-results>

²¹ Up until December 2016 Circle Pay was a bitcoin wallet, but currently the app does not support functionality to buy and sell bitcoin.

holds under-save for retirement, overpay for investment expenses, under-diversify investments, sub-optimally manage debt, and under-hedge a variety of significant risks in the life-cycle. The central contribution of our paper is to illustrate how FinTechs may help address these biases and alleviate constraints that prevent households from efficiently smoothing intertemporal consumption.

The FinTech revolution in the United States is helping to spearhead improvements in the availability, choice set, and efficiency of several key areas of household finance such as investment, credit, insurance, and payments. While the direct effects of FinTech innovation on households may be small when considering FinTech's nascent market penetration relative to well-established financial services companies, the indirect effects are substantial: Competitive entry by FinTechs is forcing incumbent financial services firms to respond by partnering with and acquiring FinTechs, opening APIs to FinTechs, and launching new features and services to directly compete with FinTech innovations. This competitive dynamic is placing downward pressure on pricing, speeding innovation, and improving choice for households.

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