THE END OF THE MORTGAGE "DARK AGE":
Fintech and the Equity Implications of Disruptive Technology in the U.S. Residential Mortgage Market

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FINTECH AND THE EQUITY IMPLICATIONS OF DISRUPTIVE TECHNOLOGY IN THE US RESIDENTIAL MORTGAGE MARKET

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I. Introduction

Executive Summary

The mortgage market in the United States represents a huge basis of the US economy, currently consisting of about $14 trillion of assets, making it approximately 14 times larger than the auto loan or student loan markets.[1] The size and significance of the home mortgage market to both the American economy and individual homeowners, for whom homeownership may be their only wealth-building vehicle, makes any change or shift in market activity extremely consequential.

Until a few years ago, the mortgage market was dominated by players who had been around for decades, and who had largely avoided the technological disruption that was affecting other major industries. Today, Wells Fargo, JP Morgan Chase, and Bank of America, along with other traditional banks, still control the dominant share of mortgage originations, but lenders who operate almost entirely online, like Quicken Loans, CashCall Mortgage, LoanDepot, Lending Home, and SoFi have nearly tripled their market share, creating deep implications and questions for the future of mortgage debt and access.

Indeed, between 2007 and 2014, traditional, commercial banks' market share of residential mortgage lending declined from 74% to 52%, as the regulatory burden on commercial banks has increased, and as people have begun to lose trust in traditional banking institutions.[2] During this same time, non-bank mortgage lenders and financial technology lenders (referred to in this report as "fintech" lenders), who have a strong online presence and conduct nearly the entire mortgage origination process online, have increased their total market share from about 5% to 15%, according to various metrics.[3] With the unprecedented success of Rocket Mortgage, non-bank Quicken Loans grew to become the nation's largest mortgage lender in the fourth quarter of 2017, surpassing Wells Fargo. In 2016, Quicken also closed a company-record of $96 billion of mortgage volume across all 50 states, an eightfold increase since 2008.[4] Yet despite this rapid growth in market share, the loans originated by fintech companies have not been

[1] "The 14-trillion mortgage market disruption game is about to start." *Daily Fintech*. 06 January 2017. https://dailyfintech.com/2017/01/06/the-14-trillion-mortgage-market-disruption-game-is-

[2] Cuen, Leigh. "Here's How Fintech Is Shaking Up The Mortgage Market." *International Business Times*. Newsweek Media Group, 14 June 2017. http://www.ibtimes.com/heres-how-fintech-shaking-mortgage-market-2552076

[3] Buchak, Greg, Gregor Matvos, Tomasz Piskorski, Amit Seru. "Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks." *National Bureau of Economic Research Working Paper Series*, no. 23288 (2017). http://www.nber.org/papers/w23288

[4] "Fast Facts." *Quicken Loans*. Rock Holdings, Inc. 2017. http://www.quickenloans.com/press-room/fast-facts/

adequately studied, raising questions about the types of products being pushed, the effects of technology on their financing, and ultimately the equitable access to this debt.

In this paper, I answer the following questions related to the equity implications of fintech lending:

- Does fintech expand access to credit for low-income and minority groups?
- Is there a role for fintech in high-cost lending?
- What is the geographic penetration of fintech lending?

My research reveals several important trends across fintech lenders:
- Fintech improves access to the mortgage application for low-income and minority groups.
- There is a role for fintech in offering FHA-insured loans.
- There are major differences in the lending practices of various fintech lenders.
- Refinanced loans account for the majority of all fintech originations.
- It is difficult to assess discriminatory lending practices because of the disproportionate amount of fintech applications that do not have race information.
- Black applicants are more likely to be denied by a fintech lender than by a traditional bank.
- Fintech lenders show significant market penetration in cities that were hit the hardest during the Recession.

The paper is structured as follows. The following section will provide additional background on the questions being addressed. Chapter 2 will then review the existing literature on the history and structure of the US mortgage market more generally, the persistence of discrimination in mortgage lending, the rise of fintech, and their presence in the residential lending market. Chapter 3 will then begin by cataloguing and characterizing fintech mortgage lenders, and will then describe the history of some particularly notable players like Quicken Loans and SoFi to add additional context to the rise and implications of fintech mortgage lending. Chapter 4 will outline the specific, key questions addressed in this report and will describe the methods used to collect and analyze the data referenced above.

Chapters 5 and 6 will then dig into the loan-level HMDA data of fintech lenders and traditional banks to answer the specific equity questions raised by these new lending technologies and practices. Chapter 5 will describe the race, ethnicity, income, and census tract characteristics of mortgage applicants to both fintech and traditional lenders, while Chapter 6 will analyze the respective mortgage denial rates and loan costs. Here, several regressions that highlight the impact race and income have on mortgage origination for fintech lenders as compared to traditional banks are discussed to identify important challenges and trends. Chapter 7 looks specifically at fintech lending in California to better understand the specific markets in which fintech lenders are growing and dominating. Finally, the report will close with overall conclusions and recommendations drawn from the data analysis to discuss the implications the rise in fintech lending have for the overall mortgage market in the United States. Ultimately, the

findings from this report will clarify the role of technology and the role fintech lenders play in the mortgage industry today while opening up further lines of inquiry to ensure a fair and equitable path to homeownership for all Americans.

Background on Mortgage Originations and Fintech

Traditionally, the mortgage origination process involves several agents, and a real estate agent or mortgage broker is often the first point of contact for a consumer interested in purchasing a home or refinancing an existing loan. Applicants and brokers then interact with loan originators, who take information supplied by the applicant and provide advice regarding alternative mortgage products, pricing, and underwriting policy. In most cases, loan originators pass partially completed applications on to loan processors, who assemble private information on the applicant's financial and employment history that is obtained with the applicant's formal permission. The loan processor also secures an applicant's credit history as well as an estimate of the market value of the property, which is usually done with an outside appraiser. Once the loan processor has completed the application, an underwriter makes the decision to accept or reject, relaying that information back to the loan processor, originator, broker, and applicant.

Indeed, because of the large dollar size associated with mortgage loans, mortgage origination has traditionally been a complex labor- and paper-intensive process, employing multiple specialized third-party providers like credit agencies, appraisers, title companies, and escrow agents, in addition to the loan underwriting staff. As a result, the transaction costs and origination fees of mortgages have traditionally been quite high.

Internet technology has the potential to reduce these costs dramatically by reducing the costs of information and by having all the above services clearly held and transacted on one digital platform, thereby resulting in substantial labor and office space savings for the lender, and potentially making mortgages far more convenient for borrowers. But while reduced transaction costs may be beneficial to the borrower by making mortgage loans and payments less costly for the individual household, it may also expose lenders who own the loans or securities to greater prepayment risk and interest losses from an unscheduled early return of the principal of the mortgage. Some researchers have hypothesized that to offset this risk, highly efficient online lenders may originate mortgages with slightly higher interest rates to compensate for the lower transaction costs at origination and the increased prepayment risk.[5] Nonetheless, prepayment risk has typically been associated with general market risk and interest rate volatility, but the extent to which fintech lenders grapple with this risk has not yet been precisely studied.

Yet if online origination does in fact offer more attractive pricing and reduces the overall costs of mortgage lending, the critical question is how those cost reductions will be shared between the borrower and the lender. The "digital divide," which suggests greater use of the internet by younger, better-educated, and more affluent households, may have

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[5] Buchak, Greg, Gregor Matvos, Tomasz Piskorski, Amit Seru. "Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks." *National Bureau of Economic Research Working Paper Series*, no. 23288 (2017). http://www.nber.org/papers/w23288

a significant impact on the equity of online lending. Indeed, if borrowers are to reap most of the benefits of reduced online mortgage costs, then the most affluent and technologically savvy individuals and households may likely benefit the most. If, however, lenders claim most of the financial benefits and borrower benefits are limited to savings in time and the ease of the application, the accessibility of debt and the eventual financial outcomes may not differ significantly for low-income or minority groups when compared to traditional banks. In a journal article from 2000 discussing the evolving role of technology in mortgage finance, Michael LaCour-Little found that the average internet sourced loan during 1999 had a balance of $354,000, which did suggest that these mortgages were being originated to affluent households looking for property significantly above the national average.[6] However, no similar study has been conducted since then, despite huge changes in internet and financial technology.

Furthermore, technology may also enable fintech lenders to use more customized risk-based pricing as they can access all relevant information for pricing decisions instantaneously and can develop complex, sophisticated algorithms for automated underwriting beyond what individual, human underwriters could achieve. Clearly, to the extent that fintech companies assess credit risk differently than traditional banks and use big data approaches, there is a question whether online origination can make mortgages more or less accessible for homebuyers across different demographic groups. As online mortgage lending may present new and disproportionate language or income barriers for lower-income, non-white, or rural households, additional equity issues are raised with these new technologies.

As such, it is not immediately clear if this disruptive technology in the mortgage market may benefit potential homeowners by decreasing the cost and increasing access to debt, or if it will serve to hide and further inequities in homeownership across the nation, or some combination of both. This report will then attempt to tie together the separate strands of literature relating to residential mortgage lending in the United States, the growing role of fintech companies in this sector, and the equity implications of this shift.

After the financial and subprime mortgage crisis of 2007-2009, much of the literature began to address the structure of the mortgage origination chain and inequities in predatory, subprime lending that often targeted low-income, non-white households. However, little attention has been devoted specifically to the lending practices of fintech lenders, who grew predominantly in the aftermath of the crisis. While the questions have been identified, information and data on the equitable or inequitable lending practices of these lenders outside of the traditional banking system has not yet been explored. As mentioned, because of the structure of these lenders, there is potential for both increased equitable access to debt under fintech origination, and greater disparities in access as these lenders may base their risk assessments on different information than traditional depository banks. Thus, it is critical to examine these practices and the loan-level characteristics of these originations at an early stage in order to protect consumers and homebuyers.

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[6] LaCour-Little, Michael. "The Evolving Role of Technology in Mortgage Finance." *Journal of Housing Research*, Vol. 11, No. 2 (2000), 173-205.

Furthermore, because fintech lenders are not regulated in the same way as depository institutions, any indication of inequitable practices may have a profound impact on future regulation for this rapidly growing segment of the industry.

Some existing research has also focused on the value-add of fintech firms more generally and their ability to make use of big data. In an influential 2016 paper, Thomas Philippon illustrated how advances in financial technology across all sectors have actually failed to reduce intermediation costs by increasing the price of efficiency for the consumer, which may have similar implications for fintech mortgage lenders[7]. Nonetheless, the rapid growth of the fintech mortgage sector and the obvious convenience of these technological innovations for borrowers suggests new, shifting trends in origination that should be examined thoroughly.

While there is potential for many lines of inquiry into fintech lending practices, this report will focus primarily on whether fintech actually expands access to mortgage credit for low-income and minority households. By exploring mortgage lending trends among a sample of fintech lenders, and comparing those outcomes with more traditional lenders, I identify some primary indicators for the equitable reach of fintech lending.

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[7] Philippon, Thomas. "The FinTech Opportunity." *National Bureau of Economic Research Working Paper Series*. no. 22476 (2016). http://www.nber.org/papers/w22476

II. Related Literature and Background

This report draws from and builds upon previous research that explores the long history of discrimination in the U.S. residential mortgage market, banking regulations, the growing role of fintech across all lending institutions, and the implications of race data in evaluating fair lending.

Discrimination in the U.S. Mortgage Market

There is a diverse body of research that examines racial disparities in mortgage lending across the United States, particularly after fair housing legislation was enacted in the second half of the 20th century to combat years of uncontested racial discrimination.

Redlining

One area of research focuses in particular on the effects of redlining and race-based deed restrictions, which were pervasive in the early decades of the 20th century. Bradford (1979), Jackson (1980), and Dane (1993) all examine the role the FHA and the Home Owners' Loan Corporation (HOLC) played in perpetuating racial covenants and racial separation. LaCour-Little and Green (1998) also add that both the FHA and HOLC cultivated racially discriminatory practices and views among real estate appraisers, and provide further evidence of the role discriminatory appraisals play in the actual mortgage lending process.

Redlining still has implications on access to mortgage debt and the opportunity to build wealth through homeownership for minorities. In their seminal work, Massey and Denton (1993) argue that this long history of residential segregation is ultimately the essential factor underlying black poverty in the United States today, and illustrate that despite fair housing laws, racial segregation has diminished little in recent decades.

Forms of Discrimination

Discrimination in housing and homeownership can take other forms beyond redlining and exclusionary zoning, however. LaCour-Little (1999) most clearly outlines these distinctions and describes that discrimination in mortgage lending consists of either refusing to transact or varying the terms of the transaction. Much research has focused on the first form of discrimination, but work by Shafer and Ladd (1981) and Black and Schweitzer (1985) have found evidence of interracial pricing differences and differences in loan terms. That is, in some instances, African American borrowers have paid higher prices for equivalent funding and housing compared to whites. LaCour-Little goes on the further outline that discrimination in the mortgage market can fall into three categories: overt discrimination, disparate treatment, and disparate impact. LaCour-Little clarifies:

> Overt discrimination occurs when a lender openly discriminates based on a prohibited factor. Disparate treatment occurs when lenders treat applicants differently based on a prohibited factor. Disparate impact occurs when a business

practice is applied uniformly but has a disparate impact on a protected class…If we assume that overt discrimination is rare, the distinction between disparate treatment and disparate impact is essential: disparate treatment constitutes intentional discrimination and cannot be rebutted, whereas disparate effect is unintentional and may be rebutted by a business necessity argument.[8]

These two forms of discrimination are what most contemporary mortgage discrimination research is concerned with, particularly after the substantial growth of subprime mortgages and the changes in loan products and services.

Racial Discrimination in Subprime Lending

Indeed, Apgar and Calder (2005) note that today, mortgage lending discrimination is often more subtle, and illustrate that minority consumers continue to have less than equal access to loans at the best price and on the best terms that their credit history, income, and other financial considerations merit.[9] Apgar and Calder go on to argue that the nature of the dual mortgage market of origination and securitization perpetuates this kind of discrimination by denying lower-income minorities equal access to prime mortgages.[10] Written before the Great Recession, Apgar and Calder discuss the ways default-prone subprime mortgages disparately affect minority groups.

Reid et al. (2017) build upon this literature by examining how lending practices during the subprime boom contributed to the disproportionate impact of the foreclosure crisis on Black and Hispanic households.[11] Indeed, despite the widespread nature of the foreclosure crisis of 2006-2013, Reid et al. demonstrate that neither foreclosures nor their negative impacts were uniformly distributed, and that Blacks and Hispanics in particular were much more likely to receive mortgages with nontraditional loan terms. The authors also show that these specific loan features have a measurable effect on the likelihood of default, revealing the ways in which discriminatory lending practices during the subprime boom served to disadvantage borrowers of color and contributed significantly to higher rates of default for these groups.

Geographic Implications of Mortgage Lending

Work by Calem, Gillen and Wachter (2004) also reveals that controlling for risk, subprime mortgages are still geographically concentrated in census tracts where there are

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[8] LaCour-Little, Michael. "Discrimination in Mortgage Lending: A Critical Review of the Literature." *Journal of Real Estate Literature*, Vol. 7 (1999), 19-20.
[9] Apgar, William, and Allegra Calder. "The Dual Mortgage Market: The Persistence of Discrimination in Mortgage Lending." *The Geography of Opportunity: Race and Housing Choice in Metropolitan America*, edited by Xavier de Souza Briggs. Brookings Institution Press (2005).
[10] *Ibid*.
[11] Reid, Carolina, Debbie Bocian, Wei Li, and Roberto G. Quercia. "Revisiting the subprime crisis: The dual mortgage market and mortgage defaults by race and ethnicity." *Journal of Urban Affairs*, Vol. 39, No. 4 (2017), 469-487.

high concentrations of low-income and minority households.[12] The authors note that while these products represent an expansion in the supply of mortgage credit among households who do not meet prime market underwriting standards, the concentration of subprime lending suggests that these households may not be obtaining equal opportunity in the prime mortgage market.[13] Calem et al. (2004) also find that African-American borrowers, regardless of the neighborhood where they are located, have a relatively high likelihood of obtaining a subprime compared to a prime loan.

Pennington-Cross (2002) also examines the spatial distribution of subprime mortgage lending across several hundred metropolitan areas, and finds that subprime lending is most prevalent in locations with weak labor market conditions and declining house prices.[14]

Thus, there is overall evidence that there is disparate access to prime loans and certain types of other mortgage products among African-American and minority borrowers.

Key Legislation & the Community Reinvestment Act

Most of these studies rely on data on the individual characteristics of mortgage loans and borrowers that are collected by the Federal Financial Institutions Examination Council (FFIEC) under the Home Mortgage Disclosure Act (HMDA), created in 1975. This legislation focused on the role of institutions in perpetuating segregation and is premised on the notion that public scrutiny of institutional lending would force greater accountability.[15]

While HMDA focuses on all mortgage lenders located within a metropolitan statistical area and requires those with assets in excess of 30 million dollars to file loan registers with the FFIEC providing information on each mortgage loan application, the Community Reinvestment Act (CRA), passed in 1977, is directed at insured, depository institutions.[16] Although there is significant overlap between the institutions covered under both pieces of legislation, critically, fintech lenders are exempt from much CRA oversight.

Gaughan (2017) notes that CRA's principal unit of analysis, the geographically based "assessment area" is increasingly irrelevant given the disparity between where deposits are held and where the business of banks actually takes place, a disparity most acutely

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[12] Calem, Paul, Kevin Gillen, and Susan Wachter. "The Neighborhood Distribution of Subprime Mortgage Lending." *The Journal of Real Estate Finance and Economics*, Vol. 29. No. 4 (2004).
[13] *Ibid*.
[14] Pennington-Cross, Anthony. "Subprime Lending in the Primary and Secondary Markets." *Journal of Housing Research*, Vol. 13, No. 1 (2002), 31-50.
[15] LaCour-Little, Michael. "Discrimination in Mortgage Lending: A Critical Review of the Literature." *Journal of Real Estate Literature*, Vol. 7 (1999), 15-49.
[16] Calem, Paul, Kevin Gillen, and Susan Wachter. "The Neighborhood Distribution of Subprime Mortgage Lending." *The Journal of Real Estate Finance and Economics*, Vol. 29. No. 4 (2004), 2.

evident for fintech lenders.[17] The definition of the assessment area has been unchanged since 1977, and focuses on a bank's geographic locations of branches, ATMs, and offices. CRA compliance is also not required of financial service providers that are not Federal Deposit Insurance Corporation-insured depositories, which includes most fintech participants. Indeed, fintech has moved beyond this traditional landscape, and to date, fintech lenders and organizations are without community reinvestment obligations. The staggering growth of fintech lending presents a new opportunity to rethink these assessment areas, and to use this kind of technological innovation to more equitably distribute CRA investments.

Gaughan also describes the unique way fintech has avoided much regulation, subject primarily to laws related to consumer protection.[18] The Consumer Financial Protection Bureau (CFPB) oversees and enforces acts like the Truth in Lending Act of 1968, which requires terms and conditions disclosure, the Equal Credit Opportunity Act of 1974, which prevents discrimination on the basis of race, color, religion, national origin, sex, marital status, age, and receipt of public assistance, and the Real Estate Settlement Procedures Act of 1974, which requires disclosure and fee restrictions with regard to home loans. Gaughan notes that many states also have usury laws that limit the maximum interest rate charged by institutions, but such state-specific laws can be avoided when the lender is a bank based in another state with more flexible interest rate regulations. Many fintech lenders have used this exception.[19]

In December 2016, the Office of the Comptroller of the Currency (OCC) announced that it would grant special-purpose banking charters for fintech companies.[20] As a part of the special-purpose charter application, fintech lenders would be required to create a Financial Inclusion Plan that identifies markets and communities touched by the organization's products and services. However, it remains to be seen how this will be used and applied in practice.

It is also difficult for new regulation to address the proprietary algorithms and data aggregation that fintech lenders use as the basis of credit evaluation. The CFPB has articulated a goal to develop regulation that ensures that third-party data used by financial institutions is available to consumers and that consumers grant permission prior to data use, but until then, fintech lenders can use many alternative metrics to evaluate

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[17] Gaughan, Michael. "FinTech and the Liberation of the Community Reinvestment Act Marketplace." *Cityscape: A Journal of Policy Development and Research*, Vol. 19, No. 2 (2017).
[18] Gaughan, Michael. "FinTech and the Liberation of the Community Reinvestment Act Marketplace." *Cityscape: A Journal of Policy Development and Research*, Vol. 19, No. 2 (2017).
[19] *Ibid*.
[20] Office of the Comptroller of the Currency (OCC). "Supporting Responsible Innovation in the Federal Banking System: An OCC Perspective." (2016). https://www.occ.gov/publications/publications-by-type/other-publications-reports/pub-responsible-innovation-banking-system-occ-perspective.pdf.

creditworthiness.[21] Identifying organizations' proprietary models that evaluate unique indicators like college major, number of post-college moves, and trust scores based on social-network data and assessing whether they violate any fair lending legislation is currently not on the table.[22] There are clear, significant hurdles to overcome to establishing a fair regulatory system for fintech lenders, but utilizing accessible data reported under HMDA and identifying the implications of their lending practices is the first step toward greater fintech transparency.

Fintech

The narrative of discrimination in mortgage lending, racial covenants, subprime loans, and wealth accumulation and the responding legislation is evidently well established. The entrance of fintech into the mortgage market specifically, however, is less understood, and is the next key subject of study to ensure fair lending practices.

Some researchers have looked at the implications of fintech in lending more generally, particularly as its penetration in lending practices has grown tremendously in the last decade. In a high-level assessment of the implications of fintech lending across all sectors, Gaughan (2017) explains that on one hand, fintech's new approaches to granting credit have the potential to help previously underserved and unbanked communities. However, such alternative algorithms may also lead lenders to deny credit because of a lack of access to internet or an avoidance of social media. Gaughan notes that there is still a spatial aspect to this kind of data, which may further residential segregation.

Buchak et al. (2017) have studied the rise of fintech and non-fintech shadow banks in the residential lending market, and have found that such lenders were more likely to enter markets where traditional banks faced more regulatory constraints, and that the lower regulatory burden for fintech lenders has driven much of their growth.[23] Buchak et al. also argue that fintech lenders appear to be able to make use of big-data to "better screen borrowers and set interest rates that better predict ex-post loan performance," yet the authors leave out a discussion of race and income implications, focusing instead on the regulatory burden, cost, and performance of the loans at a national level.

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[21] Cordary, Richard. "Prepared Remarks of CFPB Director Richard Cordray at Money 20/20." Consumer Financial Protection Bureau. (2016). https://www.consumerfinance.gov/about-us/newsroom/prepared-remarks-cfpb-director-richard-cordray-money-2020/.

[22] Dietz, Miklos, Somesh Khanna, Tunde Olanrewaju, and Kausick Rajgopal. "Cutting Through the Noise Around Financial Technology." McKinsey & Company. (2016). https://www.mckinsey.com/industries/financialservices/our-insights/cutting-through-the-noise-around-financial-technology.

[23] Buchak, Greg, Gregor Matvos, Tomasz Piskorski, Amit Seru. "Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks." *National Bureau of Economic Research Working Paper Series*, no. 23288 (2017). http://www.nber.org/papers/w23288

Data and Race

Lastly, research conducted by Wyly et al. (2007) has shown that while HMDA is central to evaluating fair lending, the statistical representation of race is complex, and there remain deep implications and misunderstandings about missing, "non-reported" race data in this dataset. Wyly et al. argue that by many measures, credit is now widely available, but its terms still vary enormously, and it has become increasingly difficult to measure the inequalities of predatory lending.[24] Each year, several million people who apply for mortgage loans in the US are classified in HMDA records as "I do not wish to furnish this information."[25] Some of these individuals have consciously decided not to provide race-ethnicity information, but most are classified this way by the actions of lenders. Wyly et al. note that because of regulatory loopholes, mortgage marketing practices, and perhaps cases of noncompliance, the race of many applicants and borrowers is not disclosed.

Their paper goes on to explain that HMDA is implemented officially by Regulation C, which requires that lenders request race-ethnicity data from all persons who file applications in face-to-face situations (like meeting a loan officer in a bank office). Moreover, until 2001, lenders were not required to ask for the information on applications taken entirely by phone or similar media, which has driven the rapid expansion in nondisclosure in Internet banking. If the applicant does not provide the information, the regulation states that "the lender shall note the data on the basis of visual observation or surname, to the extent possible."[26] If there is no visual interaction between lender and applicant, the lender codes the application as "information not provided."

Wyly et al. note that the likelihood of HMDA nondisclosure is driven by the lender's compliance with the data-collection regulations, the borrower's decision when presented with the request, and the technology used by the lender to solicit applications. Nonetheless, nondisclosed applications are much more likely to be located in urban and minority neighborhoods, the very places where data is needed to monitor exclusionary credit tactics and predatory lending. This suggests that many of these applicants who have not disclosed their race are often minority populations that may still in fact be subject to discriminatory lending, despite being concealed in the data. Wyly et al. also found that across the nation, nondisclosed applications are more likely to be denied, withdrawn, or closed and incomplete, and that the rate of nonreporting is consistently higher for institutions that are of the most concern in the predatory-lending debates.

As fintech lenders do not report race data under these conditions far more often than traditional banks, the implications of this missing data become critical. There is often no

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[24] Wyly, Elvin, Mona Atia, Elizabeth Lee, Pablo Mendez. "Race, gender, and statistical representation: predatory mortgage lending and the US community reinvestment movement." *Environment and Planning*. Vol. 39 (2007), 2139-2166.

[25] *Ibid*.

[26] Wyly, Elvin, Mona Atia, Elizabeth Lee, Pablo Mendez. "Race, gender, and statistical representation: predatory mortgage lending and the US community reinvestment movement." *Environment and Planning*. Vol. 39 (2007), 2139-2166.

visual interaction between fintech lenders and applicants, and some online applications do not explicitly ask for applicant race. Yet because of the complex algorithms used to assess credit online, it is unlikely that race is truly "unknown," despite being concealed in the HMDA data. It is in this context that this paper assesses fintech's high-level lending practices for the first time.

III. Characterizing Fintech Mortgage Lenders

The fintech landscape is complex, and online mortgage lenders play just one role in shaping the future of the housing market. While this research only focuses on fintech lending and origination, this chapter catalogs and characterizes fintech lenders for the first time, and reveals many other topics and players for future study.

Figure 3.1 Residential Real Estate Tech Startups (courtesy of CB Insights)

The Residential Real Estate Tech Market Map
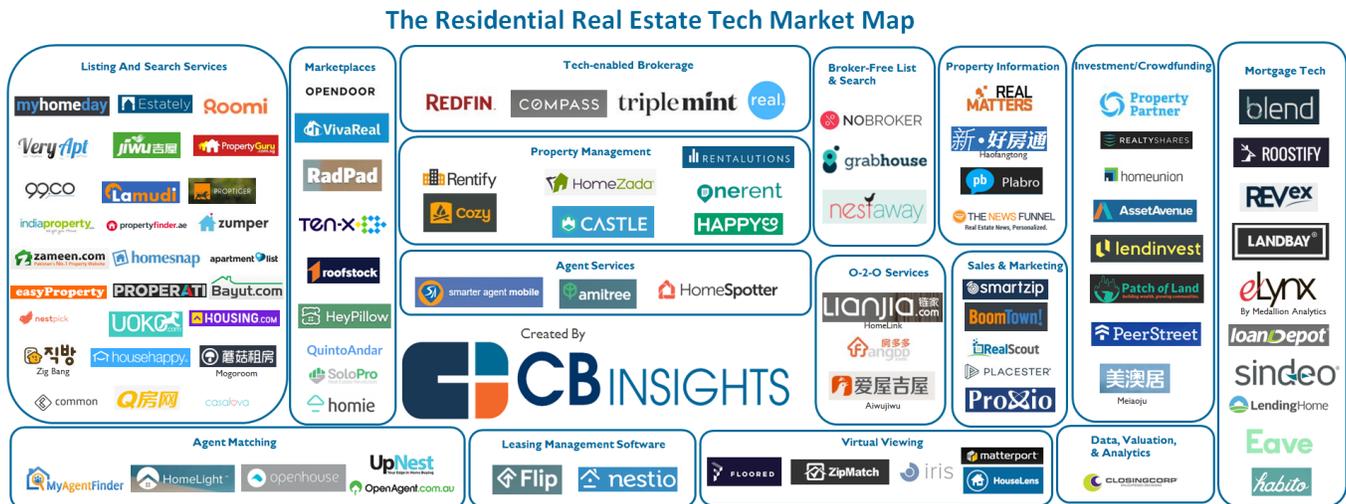
In 2016, CB Insights, a research outfit that specializes in analyzing the startup industry, created a map to reflect the large number of startups and technology-driven companies emerging across several different categories of residential real estate (see Figure 3.1).[27] While names like Zillow and Redfin might be recognized as the dominant examples of real estate tech, the map illustrates the specialization and growth of this space, and the sheer number of companies that are emerging to shape the state of housing.

In this landscape, CB Insights has categorized mortgage tech generally, including in this category fintech mortgage lenders as well as brokers and software services that aggregate data for borrowers and lenders. Yet these players differ vastly in the products and services they offer, and adding a bit more texture to this category is critical to understanding the implications of the growth of mortgage tech, identified only broadly in the last column of Figure 3.1. The following section will discuss the various key roles mortgage tech companies may hold in the field and will point to some particularly notable players.

Online Mortgage Brokers
While there are now more options and multiple types of mortgages available to households looking to buy a home or refinance, the process of comparing loans from multiple lenders before making a decision is still mostly an archaic and arduous process

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[27] "Home, Sweet Home: 96 Tech Startups Reshaping Residential Real Estate." CB Insights. May 04, 2016. https://www.cbinsights.com/research/residential-real-estate-tech-market-map-company-list/.

that involves significant paperwork and back-and-forth negotiations. Typically, the mortgage broker has existed to act as an intermediary to navigate this process and to find a bank or direct lender that is willing to make a specific, competitive loan a household or individual is seeking.

Many of the emerging online mortgage brokers are seeking to simplify the brokerage process by providing more options and more transparency for borrowers and by increasing the accessibility of various mortgage products by comparing them entirely online. These companies allow potential borrowers to shop, compare, and ultimately close on a mortgage from the convenience of an online platform.

Morty
Morty is a licensed mortgage brokerage service that has branded itself as an online mortgage marketplace. The company allows users to build a profile with their financial information, get custom quotes from multiple lenders to see what options might be available to them, utilize educational content and get advice from in-house experts, and ultimately close on the selected mortgage all from the company's website.

Formed in 2015, Morty officially launched in 2017 across 10 markets around the country with 10 lenders that users can compare.[28] Morty's mission is to increase the number of lenders on the platform, providing borrowers with a wider range of choices than they would see with other, more traditional mortgage brokers. For borrowers, Morty is a free tool; only at the close of the loan does Morty receive a fee from the lender.

As a broker, the company does not fund the loan or collect payments, but it does the hard work of underwriting the loan and qualifying borrowers, reducing the cost of the loan for lenders and reducing the need for standard brick and mortar brokerage locations. Morty is able to connect with borrower's bank accounts to survey two years of transaction-level data to determine the creditworthiness of a borrower, bringing an additional level of detail to the process. Morty also says it is appealing to a different demographic of users that lenders would not have ordinarily had access to.

Sindeo
Sindeo is an online mortgage broker that was purchased in July 2017 by Renren, one of its existing investors, when it was on the edge of bankruptcy.[29] Sindeo briefly shuttered in June 2017 due to financial troubles, but is now active in 11 states and Washington, DC, with brokerage applications submitted in the remaining 39 states, and offers more than 1,000 products from 45 mortgage lenders.[30] Because it works with so many partners,

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[28] Lawler, Ryan. "With $3M in funding, Morty is launching a marketplace of mortgage lenders." Tech Crunch. *Oath Tech Network*. May 02, 2017. https://techcrunch.com/2017/05/02/morty-3m-thrive/.
[29] Finkelstein, Brad. "How digital broker Sindeo came back from the brink of bankruptcy." National Mortgage News. *Source Media.* November 21, 2017. https://www.nationalmortgagenews.com/news/how-digital-broker-sindeo-came-back-from-the-brink-of-bankruptcy.
[30] *Ibid.*

Sindeo's administrative costs are significantly higher than most mortgage brokers, illustrating some of the challenges with early-stage online mortgage brokerage startups. Yet Sindeo maintains that the concept of a "transparent one-stop marketplace" that offers consumers a wide range of loan choices is central to its mission and business model.[31]

Sindeo is designed as a self-service process built to promote borrower transparency and help revive the struggling mortgage wholesale channel. It has tried to differentiate itself from other online mortgage brokers through its technology, closings within as little as 15 days, lower interest rates, consumer savings that average $20,000 over the life of the loan, investor support, and a large network of lenders. Sindeo also advertises that its incentive model for its brokers is different than for most loan offers, because the company removes the commission bias that gives brokers an incentive to work with customers requesting larger loans. At Sindeo, Mortgage Advisors receive a salary, benefits, and a flat fee for each loan they close, as well as quarterly bonuses that are strictly based on customer satisfaction, not the size of the loan.

Other Players
- Trussle – an online mortgage broker in the United Kingdom that searches more than 11,000 deals from 90 lenders, and continues monitoring refinancing options after the close of the loan.

- Habito – an online mortgage broker in the United Kingdom that uses AI-technology to analyze mortgages on the market from 70 lenders.

While the processes, methods, behavior, and equity implications of these online mortgage brokers are beyond the scope of this report, online brokerage will undoubtedly have an impact on the growth of fintech lenders and on the cost of mortgage debt, and future research should be conducted to address these ramifications.

Online Mortgage Software Developers
Another group of mortgage tech companies work directly with banks and lenders as service providers to build the online mortgage application software for them. Because of the growth of mortgage tech, and particularly because of the success of Quicken's Rocket Mortgage, many larger, traditional lenders want to simplify the home loan process and develop better online systems to attract more borrowers. Though their process may not be as fully automated or as technology-enabled as those mortgage lenders that operate entirely online, a streamlined, digital application and system is becoming necessary to compete in the market.

Ultimately as automation becomes more prevalent in the mortgage lending space, lenders have to decide if they want to develop technology on their own, partner with a firm to build the technology, or acquire a company with the technology. Currently these platform developers are focusing on establishing partnerships to help banks harness existing information about their customers and reduce their document-intensive procedures that impact the efficiency of the origination process.

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[31] *Ibid*.

Blend

Blend is digital mortgage platform developer that, since its founding in 2012, has been a key developer in digitizing the mortgage industry. Blend's customer base includes huge, traditional banks like Wells Fargo and U.S. Bank, and online lenders including Movement Mortgage. Blend now works with lending organizations that control 25% of the total U.S. mortgage market, and in 2017, Blend's online platform processed more than $30 billion in mortgage applications.[32] In August 2017, Blend raised $100 million in Series D funding as it plans to replicate its success with mortgages to other types of loans and expand operations outside of the U.S.

Blend builds technology that is primarily used to help banks and lenders collect and evaluate information in their mortgage underwriting process. By moving much of a bank's application and data analysis online, Blend is able to simplify the user experience and ultimately increase completed applications more quickly. Their technology is also critical in tracking mortgages in process and keeping lenders connected to their clients throughout the mortgage application and origination process.

Roostify

Roostify is a digital mortgage technology developer that counts JPMorgan Chase and Guild Mortgage among its clients. Roostify develops software products and works with banks to create online consumer-direct origination processes, which the company believes are the future of the mortgage industry.[33] Roostify recently released its newest product, Decision Builder, which simplifies loan options before approval so consumers may better evaluate, understand, and select the loan that fits their needs.

While Roostify offers online application development for lenders and can expedite the closing process, the real value in their services comes from their growing platform that automates more of the post-application home-buying process, including asset verification, purchasing homeowners' insurance, and scheduling an appraisal. Roostify CEO and Co-founder Rajesh Bhat has said that while much of the current discussion "has been centered on the benefits of intake and aggregation of consumer data in the origination process," Roostify's "biggest opportunity is to expand the narrative around the digitization of home lending."[34] Roostify's mission is to overhaul the workflow of lenders and third-parties to truly change the mortgage origination process for consumers.

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[32] Swanson, Brena. "Investing in the future: Blend raises $100 million in series D funding." Housing Wire. *HW Media*. August 24, 2017. https://www.housingwire.com/articles/41082-blend-raises-100-million-in-series-d-funding.

[33] Finkelstein, Brad. "Don't blame digital mortgages for Sindeo's demise." National Mortgage News. *Source Media*. June 29, 2017. https://www.nationalmortgagenews.com/news/dont-blame-digital-mortgages-for-sindeos-demise.

[34] "Roostify focuses on the consumer experience with education and transparency." Housing Wire. *HW Media*. December 01, 2017. https://www.housingwire.com/articles/41981-roostify-focuses-on-the-consumer-experience-with-education-and-transparency.

Other Players
- Mortgage Hippo – a mortgage technology startup that offers software to lenders. Mortgage Hippo develops multiple interfaces for borrowers and lenders to maximize loan conversions across multiple origination channels.

- Notarize – the first legal online notary public platform and online mortgage closing service. Beyond creating a fundamentally easier borrower experience, Notarize can enable borrowers and lenders to complete remote, online mortgage closings by changing the way notarizations are executed.

These software developers are critical in bringing advanced mortgage technology to more traditional lenders, and their influence on underwriting is significant. Further research should address the penetration of these developers across the mortgage market and the criteria and data points used in the development of their application systems to better assess the equitable implications of such software.

Online Mortgage Lenders
The central research of this report, however, focuses on the online lenders that originate mortgages and actually provide the loan to the borrower. These companies specialize in issuing the mortgage via the internet, performing much of the application and review process online, and minimizing the in-person contact needed. Most have developed the technology on their own, although some have partnered with some of the software developers discussed above to improve their platform.

Quicken Loans
By almost all measures, Quicken Loans is the leader of the fintech mortgage market. The second largest lender in the country as a whole (behind Wells Fargo), Quicken funded $96 billion in closed loans in 2016, with $7 billion funded through Rocket Mortgage, Quicken's completely digital mortgage service.[35] On its own, Rocket Mortgage would place among the top 30 mortgage lenders in the country in closed loan volume. Clearly, the digital mortgage is already one of the most successful lenders in the nation by itself.

Much of the draw is Quicken's application-to-approval time, which averages 17.8 days, well below competitors in the market, which can take up to 40 or 50 days.[36] Quicken also argues that it has some of the lowest default rates in the market, and per its own data, 80% of Rocket Mortgage users were first-time homebuyers, and two-thirds of Rocket Mortgage customers used the platform for a home purchase mortgage, rather than a

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[35] Lane, Ben. "Here's how much Rocket Mortgage helped Quicken Loans in 2016." Housing Wire. *HW Media*. March 7, 2017. https://www.housingwire.com/articles/39505-heres-how-much-rocket-mortgage-helped-quicken-loans-in-2016.
[36] Beyer, Scott. "The Future of Mortgage Lending Could Be Online." Forbes. January 15, 2016. https://www.forbes.com/sites/scottbeyer/2016/01/15/the-future-of-mortgage-lending-could-be-online/2/#3d14d7265964.

refinance.[37] Quicken is also quick to prove that not all of its Rocket Mortgage users are Millennials, noting that 43% of first-time buyers using Rocket Mortgage were 35 years of age or younger, while 57% were over 35.[38] Rocket Mortgage has undoubtedly changed the way the industry thinks about getting a mortgage, and will continue to be a part of Quicken's long-term growth.

SoFi

SoFi (officially Social Finance, Inc.) is an online personal finance company that originally specialized in student loan refinancing, but has since moved into originating mortgages and personal loans. The company's mortgage business recently posted its best quarter ever, issuing 765 mortgages in the third quarter of 2017, yet continues to face scandal both over its internal governance and over the demographics it appears to be marketing its products toward.[39]

In September 2017, SoFi's CEO resigned following sexual harassment claims, a year after it faced pushback over a controversial television advertisement that described the company's mission of creating "great loans for great people." SoFi openly seeks out successful, college-educated, high earners (the "great"), and develops competitive products specifically for them. SoFi's mortgage application requires the applicant to list the universities attended, and the company's business model is based on identifying this tiny subset of economic 'winners.' Yet the company has continued to raise new funding, most recently raising $500 million in February 2017, less than a year and a half after it raised $1 billion from SoftBank Group in September 2015. The most recent round of funding values SoFi at $4.3 billion.[40]

SoFi has also indicated that "at least one" of the big banks has tried to acquire SoFi, but the company indicates that it isn't interested in selling.[41] The potential acquirer seemed to indicated that it saw SoFi as a source of loan generation, since it has attracted younger customers that may distrust traditional banks, but SoFi has remained committed to developing a better mortgage product, rather than serving as a lead generator.

Other Players
• Better Mortgage – a digital mortgage direct lender that is working to improve access to home financing through transparency, honest guidance, and zero loan officer

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[37] Lane, Ben. "Here's how much Rocket Mortgage helped Quicken Loans in 2016." Housing Wire. *HW Media*. March 7, 2017. https://www.housingwire.com/articles/39505-heres-how-much-rocket-mortgage-helped-quicken-loans-in-2016.
[38] *Ibid.*
[39] Swanson, Brena. "SoFi posts best mortgage quarter ever as expansion plans come to a screeching halt." Housing Wire. *HW Media*. November 10, 2017. https://www.housingwire.com/articles/41785-sofi-posts-best-mortgage-quarter-ever-as-expansion-plans-come-to-a-screeching-halt.
[40] Griffith, Erin. "Student Loan Startup SoFi Just Raised $500 Million As it Expands Into Deposits, Asset Lending." Fortune. *Time Inc.* February 24, 2017. http://fortune.com/2017/02/24/sofi-funding-silver-lake/.
[41] *Ibid.*

commissions or origination fees. The company differentiates itself by offering instant loan estimates, 24-hour verified pre-approval, and 24/7 availability to maintain the personal connection desired in loan origination.

- CashCall Mortgage – a 'discount mortgage lender' that offers a streamlined application and lending process that occurs online and over the phone, which reduces its costs. CashCall advertises noticeably lower interest rates, and passes on much of the savings from the lending process on to the consumer. The company offers a full range of loan products, including 10-, 15-, and 30-year fixed rate mortgages, and offers no closing cost jumbo loans, as well as a "Do Over Refinance" for owner-occupied borrowers who funded a loan elsewhere in the last 18 months. CashCall is among the top 30 mortgage originators in the country, but the company has openly struggled with poor customer service.

- LendingHome – a direct lender that has funded over $2 billion in mortgages to date. LendingHome was founded in 2013 to focus specifically on bridge loans, mostly serving real estate investors who bought residential property to fix and flip. Because it was providing capital in an otherwise underserved market, LendingHome developed its own software infrastructure and created its own risk models to determine the creditworthiness of borrowers when it was originating mortgages. With its proven technology, LendingHome began to go after the consumer mortgage lending market in recent years. The company has tried to further differentiate itself to the consumer by asking for the least amount of documentation possible and by creating an extensive online education center. LendingHome is also unique in that it provides a specialized investment platform for individual investors with a streamlined dashboard and reduced fees.

- LoanDepot – the second largest nonbank home lender, behind Quicken Loans. LoanDepot's digital lending platform is called "mello," and unlike most nonbank lenders, it offers a home equity loan program. It is also well-rated for low customer complaint volume.

The business consultancy group Rehmann has estimated that by 2020, today's traditional lenders who do not embrace online technologies or are unable or unwilling to become more customer-centric could lose up to 35% market share to new and current non-institution fintech lenders who are pioneering these models.[42] The same report suggests that coupled with an expected rise in interest rates, which could slow the pace of refinancing and purchases, and as much as a 79% increase in origination costs since 2009, partially due to increased regulatory costs, institutions must focus on increasing efficiencies to reduce expenses, much of which can be achieved through online origination.[43] Certainly there is additional market research to be done surrounding the business models, loan products, reach, and histories of these various online lenders, but the above catalog begins to identify and situate major fintech mortgage players.

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[42] "Online mortgage origination key to future success." Rehmann. 2017. https://www.rehmann.com/resources-insights/business-wisdom-2/item/1399-online-mortgage-origination-key-to-future-success.
[43] *Ibid*.

Having characterized the mortgage tech landscape and with the context for the rise of these technology-enabled lenders established, the following chapters will examine the loan-level data of applicants to fintech lenders to answer some specific equity and accessibility questions raised by these new lending technologies.

IV. Methodology & Key Questions

Measuring equal access to mortgage capital by racial and ethnic minorities has long been a key component of the civil rights agenda in the United States.[44] From enacting fair housing and fair lending legislation in the 1960s to the community advocacy that prompted Congress to pass the Home Mortgage Disclosure Act (HMDA) and the Community Reinvestment Act in the 1970s, much housing advocacy and research focuses on identifying and eradicating predatory or discriminatory lending practices. This issue is particularly important to identify today, as the mortgage market changes and as discrimination takes subtler and less explicit forms.

The analysis in this report relies on loan-level mortgage application data collected under the Home Mortgage Disclosure Act (HMDA) from 2016. Because HMDA requires all lenders with assets in excess of 30 million dollars to report, HMDA essentially covers the vast majority of home mortgage applications and approved loans in the United States. The data provides, among other things, the application outcome, loan type, the borrower's race, loan amount, census tract information, and originator's identity. Since 2004, HMDA data has also included an "interest rate spread" variable, which indicates whether the loan was three percentage points over the Treasury benchmark, indicating a higher-priced loan, often also referred to as "subprime".

To identify "fintech lenders," I use the definition of Buchak et al., who have classified fintech lenders as those that have a strong online presence and if nearly all of the mortgage application process takes place online with no human involvement from the lender. This research adopts this classification and adds additional lenders that have not been studied in previous research, but have received significant attention from the fintech community, including Social Finance (SoFi), Better Mortgage, Lending Home, and LoanDepot.

I use the five traditional, non-fintech, depository banks with the largest market share as a comparison group. Applicants to these lenders interact with a human loan officer very early in the process. Table 3.1 shows the list of lenders in both categories used in this study.

Table 3.1. Lender Identification

Fintech Lenders	Traditional Lenders
Amerisave Mortgage	Wells Fargo
Better Mortgage	JPMorgan Chase
CashCall Inc.	Bank of America
Guaranteed Rate Inc.	U.S. Bank
Homebridge Financial Services	Citi Bank
Homeward Residential	
Lending Home	

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[44] Apgar, William, and Allegra Calder. "The Dual Mortgage Market: The Persistence of Discrimination in Mortgage Lending." *The Geography of Opportunity: Race and Housing Choice in Metropolitan America*, edited by Xavier de Souza Briggs. Brookings Institution Press (2005).

LoanDepot
Movement Mortgage
Quicken Loans
Social Finance (SoFi)

Race and ethnicity were also recoded as a single variable, and variables were generated for individual lenders. Applicant income was also compared to the local metro area median income (AMI) to classify whether the applicant was of low-to-moderate income, around the median income, or high income. Table A1 in the appendix lists all variables used in this analysis.

A second dataset at the state level was then created from the national-level dataset to reflect all applications within California. 16% of all fintech applicants are in California, and as such, the state is used as a microcosm of the trends and challenges associated with the growth of fintech. This state-level data set is also used to assess the geographic penetration of fintech lenders at a more local level, although further research could refine this at other state levels or smaller metro area levels as well.

Using this data, I answer three key questions:

- **Does fintech expand access to credit for low-income and minority groups?**
- **Is there a role for fintech in high-cost lending?**
- **What is the geographic penetration of fintech lending?**

The key findings and implications of this data are discussed in the following chapters.

V. Findings: Characterizing Fintech Mortgage Applicants

In order to determine whether fintech is expanding access to credit for low-income and minority borrowers not well served by traditional banks, I first examined who is applying to fintech lenders. I used descriptive statistics to characterize the pool of applicants, first at the national level.

Overall, there are 2,438,217 loan applications to the five traditional lenders used in the sample and 1,813,764 applications to the 11 fintech lenders identified. In California specifically, there are 459,176 and 290,053 applications to traditional and fintech lenders, respectively. Nationally, fintech lenders originated 43.6% of all their loan applications, while the five traditional banks in the sample had an origination rate of 39.3%. In California, the overall origination rates were slightly higher and quite similar, with fintech lenders origination 47.5% of their applications and traditional lenders originating 47.8%.

Applicant Data at the National Level

Figure 5.1 begins to categorize the applicants to fintech and traditional lenders by race. The proportions of applicants that are non-Hispanic white are comparable between fintech and traditional lenders, both around 57%. However 7.9% of all applicants to fintech lenders are black or African American, compared to just 5.0% of applicants to traditional banks. Nationally, while there are about 625,000 more applications to traditional lenders than fintech lenders, the absolute number of black or African American applicants to fintech lenders is actually higher, around 144,000, compared to just 123,000 black applicants to traditional banks.

The proportion of applications where race is not provided is dramatically higher for fintech. Just over 22% of applications (around 400,000) do not include race information, compared to less than 10% (around 222,000) of applications to traditional lenders. The fact that nearly ¼ of applications in this sample are missing data on race or ethnicity has implications for assessing the equitable reach of fintech, and will be explored more fully in later sections.

Figure 5.1. Race of Applicants – National Level
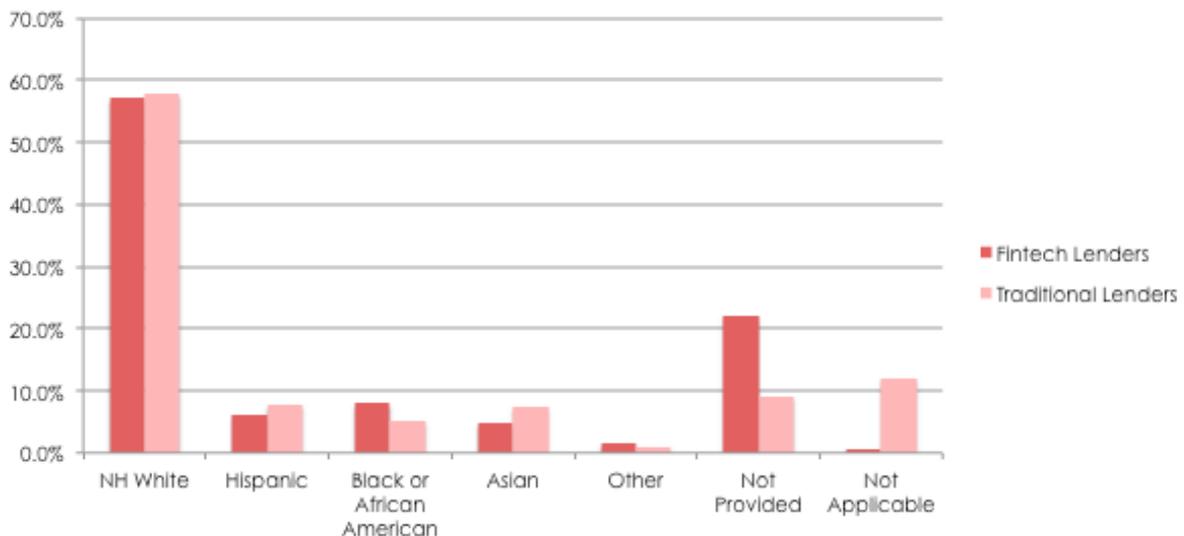
At the national level, the average applicant to fintech lenders makes $38,000 less than the average applicant to traditional lenders (approximately $99,000 compared to $137,000). Figure 5.2 breaks these differences down by race. Across all races, the average applicant income is less for fintech lenders than traditional lenders, although the differences are more striking for non-Hispanic white applicants and applicants where no race is provided.

Figure 5.2. Average Applicant Income by Race – National Level
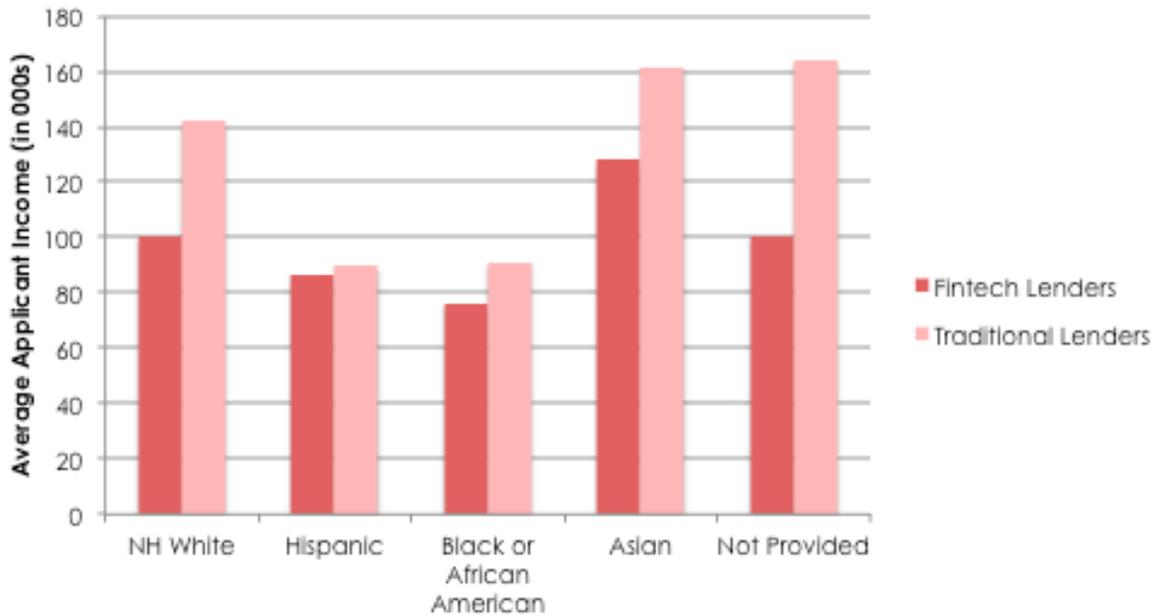
Further, over 21% of applicants to fintech lenders are making less than 80% of the national median income, compared to just 14% of applicants to traditional lenders. The absolute number is also higher, with over 396,000 low-to-moderate income applicants applying to fintech lenders, and 339,000 low-to-moderate income applicants applying to traditional lenders. At the other end of the income spectrum, 70% of applicants to traditional lenders make over 120% of the national median income, while only 56% of applicants to fintech lenders can be classified as high-income at the national level.

Figure 5.3. Percent of Applicants Above or Below Median Income – National Level
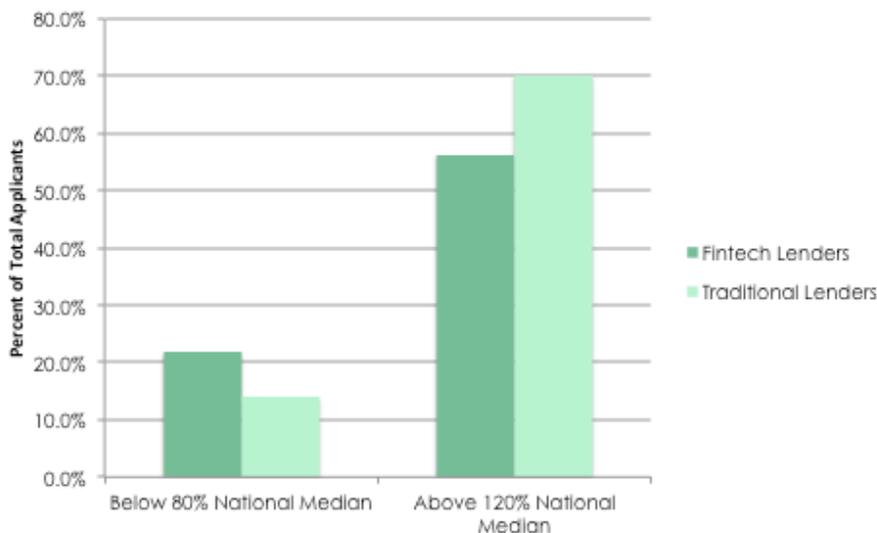
Figure 5.4. Average Originated Loan Amount by Race – National Level
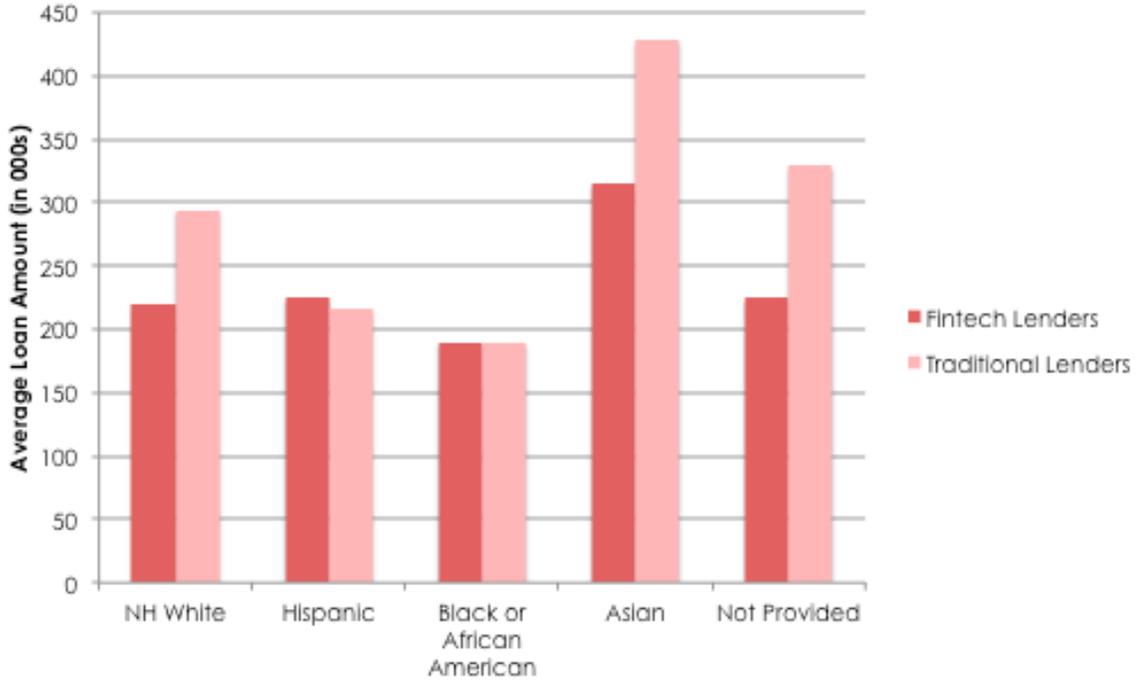
The average loan amount originated by fintech lenders is overall less than the average amount originated by traditional lenders. However, for black and African American borrowers, where the loan was actually originated, the average loan amount is virtually the same, and for Hispanic borrowers, the average loan from fintech lenders is about $9,000 more than for traditional banks.

Table 5.5 also reveals that a greater proportion of applicants to fintech lenders live in a census tract with a high minority population, defined as over 40%. The difference is also similar for those census tracts with a minority concentration over 60%.

Table 5.5. Percent of Applicants in Census Tract with High Minority Concentration – National Level

	High Minority Concentration Tract (Over 40%)	Very High Minority Concentration (Over 60%)
Fintech	592,091	331,312
	32.6%	**18.3%**
Traditional	747,218	408,822
	30.6%	**16.8%**

The applicant data above illustrates that fintech does in fact improve **access to the mortgage application** for many low-income and minority groups. Across nearly all metrics, fintech shows a substantial increase in the proportion and absolute number of low-income and minority applicants. Whether this is the result of intentional targeting or lower loan limits, and whether this increased access to the application for mortgage credit

actually results in the increased receipt of such credit will be explored more in the following sections.

Lender-Level Comparison
A lender-level breakdown of applicants by race also establishes the individual lenders that may be receiving a disproportionate number of applications from minority groups.

Table 5.6. Race of Applicants by Fintech Lender – National Level

	Non-Hispanic White	Hispanic	Black or African American	Asian	Other	Not Provided
Amerisave	55.0%	5.0%	5.2%	8.4%	1.3%	25.0%
Better	6.6%	0.4%	0.4%	7.0%	0.4%	85.1%
CashCall	40.7%	13.1%	3.0%	10.0%	1.5%	21.5%
GuaranteedRate	71.8%	6.1%	4.2%	7.5%	1.0%	9.5%
Homebridge	56.9%	15.1%	10.8%	6.7%	1.0%	9.6%
Homeward	56.9%	9.6%	10.0%	5.9%	1.4%	16.2%
LendingHome	3.3%	0.9%	1.1%	0.7%	0.2%	93.8%
LoanDepot	62.6%	6.2%	10.0%	4.9%	2.1%	14.2%
Movement	67.8%	11.0%	12.1%	4.6%	0.9%	3.6%
SoFi	47.4%	4.1%	1.8%	10.6%	0.7%	35.2%
Quicken Loans	48.4%	3.7%	5.5%	3.0%	1.0%	38.4%
Average	*57.1%*	*6.1%*	*7.9%*	*4.7%*	*1.5%*	*22.7%*

Table 5.7. Race of Applicants by Traditional Lender – National Level

	Non-Hispanic White	Hispanic	Black or African American	Asian	Other	Not Provided
Wells Fargo	63.4%	8.9%	5.8%	6.6%	1.2%	14.1%
JPMorgan Chase	62.0%	6.8%	3.7%	8.6%	0.6%	18.2%
Bank of America	58.9%	9.1%	6.6%	11.9%	1.3%	12.2%
U.S. Bank	38.9%	3.8%	2.4%	3.5%	0.7%	50.6%
Citi Bank	40.6%	7.0%	6.0%	9.8%	0.7%	35.9%
Average	*57.9%*	*7.7%*	*5.0%*	*7.3%*	*1.0%*	*21.0%*

Tables 5.6 and 5.7 indicate the proportions of applicants by race to fintech and traditional lenders. For fintech lenders, several observations stand out. First, Quicken applications most closely resemble the average racial distribution of applicants across fintech in general, although the number of applications where race is not provided is higher, at about 38%.

Better Mortgage and Lending Home, two of the newest fintech mortgage lenders, also have the highest proportion of applications where race is not provided, around 85% and 94%, respectively, making it nearly impossible to access the racial equity of their mortgage origination practices. Where race is provided, the two lenders have the lowest proportion of black or African American applicants, at 0.4% and 1.1%, respectively. SoFi is a close third, with just 1.8% of applications coming from black or African American applicants. Notably, SoFi has the highest proportion of applications of Asian applicants among fintech lenders, and the fourth highest proportion of applications missing race data. Across fintech lenders, Movement Mortgage and LoanDepot also have some of the highest rates of applications from black or African American applicants.

This variability among traditional lenders is also substantial. Wells Fargo, JPMorgan Chase, and Bank of America are relatively comparable in terms of the proportion of applications received from different racial groups, but differ significantly from U.S Bank and Citi Bank. Noticeable but not unexpected, Wells Fargo and Bank of America have a larger number of applications from black or African American applicants. Across these three lenders, fewer applications are missing race data, below the major fintech lenders and below U.S Bank and Citi Bank. The variability among fintech lenders is also significant, and raises similar questions for how lenders catalog and record race. This variability may also indicate that lenders are not marketing or making their products accessible to all applicants equally.

Thus, there appears to be **significant differences in the accessibility of individual lenders' mortgage applications** for minority applicants to fintech. This may be attributable to the way different lenders target and market their service. Again, the **high proportion of missing race data** is most significant for fintech lenders, particularly those who have openly developed complex risk assessing algorithms. Because of this missing data, it is then difficult to conclude whether fintech lenders are serving minorities better or worse than traditional lenders.

Loan Type

Figure 5.8 reveals that the majority of fintech applicants, nearly 80%, are looking to refinance their current mortgage, and 20% are seeking a home purchase loan. Less than 1% of fintech applicants are seeking a home improvement loan. Conversely, about 45% of applicants to traditional lenders seek a home purchase mortgage, and 48% are refinancing. Clearly, fintech is playing a critical role in refinancing mortgages originally made by other banks.

Figure 5.8. Loan Product Type – National Level
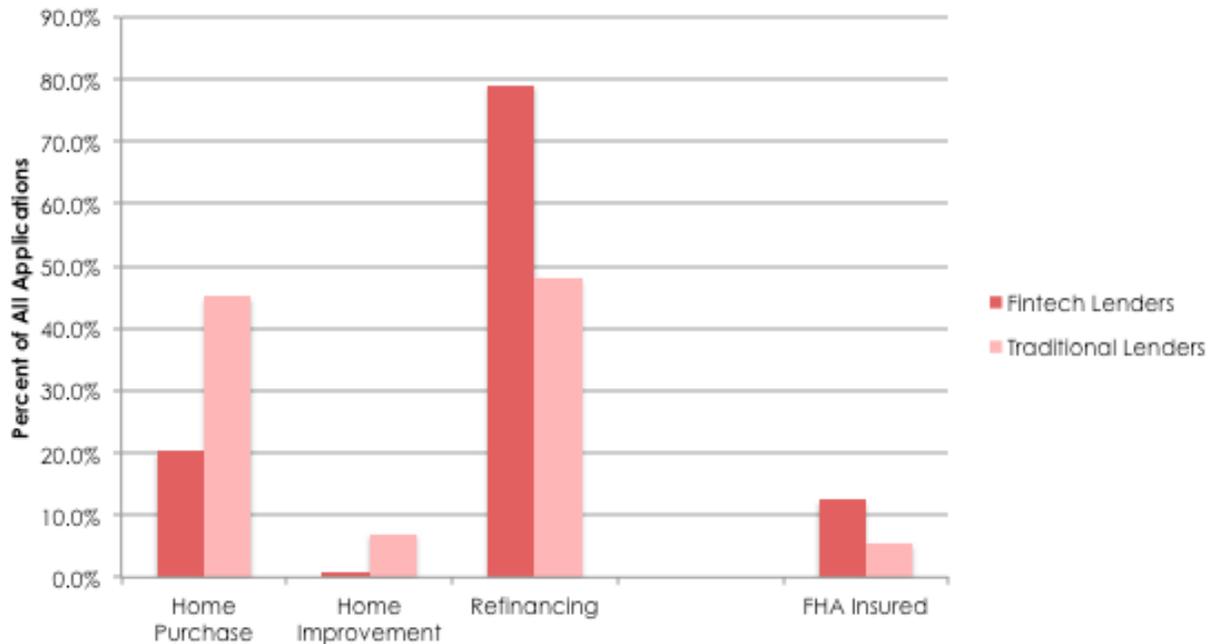
Furthermore, over 12% of fintech applicants are seeking an FHA-insured loan, compared to just 5% of applicants to traditional banks. FHA-guaranteed loans require an upfront insurance premium and typically have a higher annual interest rate, but can be acquired by borrowers with down payments of just 3-5%. Because of this, FHA has been an important source of credit for wealth-constrained borrowers, particularly in the aftermath of the subprime crisis. Fintech lenders are evidently offering more FHA products, and may perhaps be opening up access to credit where traditional lenders were not. Quicken Loans, Homeward Residential, and Movement Mortgage are some of the nation's largest FHA lenders, and are part of a greater trend that suggests, consistent with this data, that as the nation's large, traditional banks pull out of the FHA market, non-bank and fintech lenders are filling the void. This shift has occurred entirely after the housing crisis, as large banks facing regulatory scrutiny began to consider the costs and risks to serve FHA loans too great. Non-bank and fintech lenders are now more responsible for maintaining access to FHA loans for mortgage applicants, which has been a far better substitute for borrowers than subprime loans.

The data thus illustrates that there is a clear **role for fintech in offering FHA-insured loans**, but the distribution of the origination of these loans remains to be studied.

Having explored the types of applicants seeking fintech products, the following chapter will examine the origination and denial rates of fintech lenders to assess the likelihood of receiving mortgage credit, and at what cost and distribution.

VI. Findings: Fintech Mortgage Origination and Denial

While characterizing the applicants to fintech lenders reveals something about the overall accessibility and reach of fintech as a source of credit to different groups of borrowers, origination and denial rates illustrate the actual penetration and distribution of credit among borrowers and geographies. This has implications for the ability of different groups across different regions to build long-term wealth through homeownership. The next section will then assess the differences in origination and denial between fintech lenders and traditional lenders across different demographics and markets and thus how credit may be equitably or inequitably distributed in practice.

Denial Rates – Descriptive Statistics by Race

At a national level, fintech lenders deny approximately 56% of all loan applications, while the five traditional banks used in this research deny at a statistically significant, higher rate of 60%. However, as Figure 6.1 illustrates, this denial rate varies significantly by race.

Figure 6.1. Denial Rate by Race – National Level
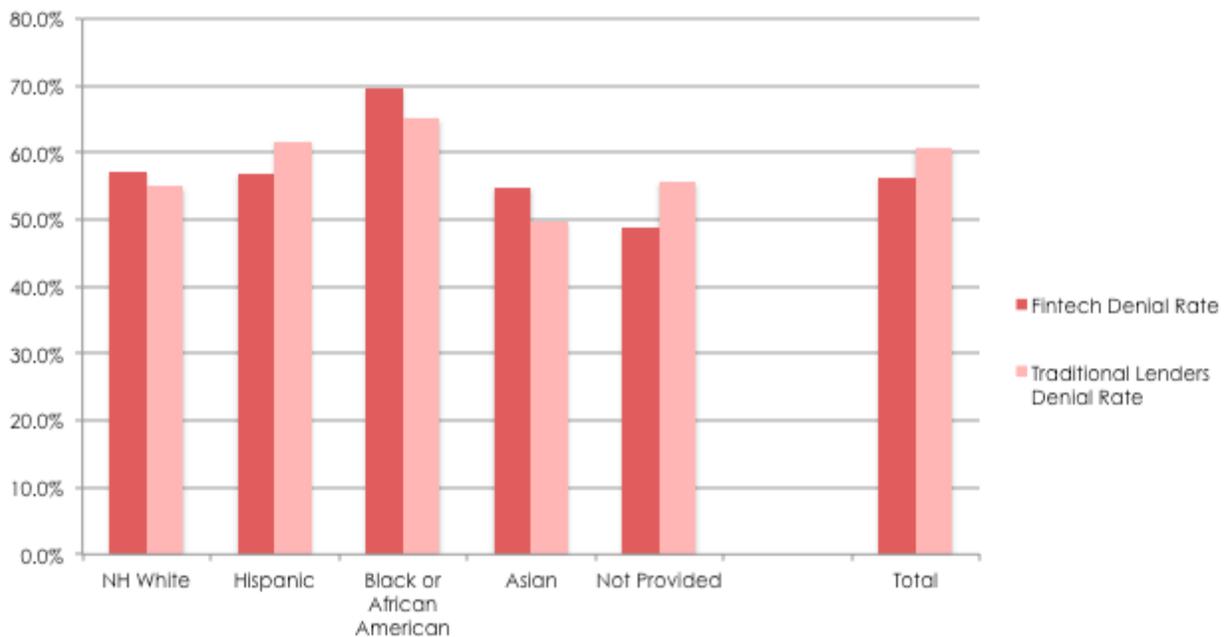
Notably, **fintech's denial rate is higher than the denial rate of traditional banks for all applicants who reported race, except for Hispanic applicants**. For applications missing race data, the denial rate is below 50%, the most significant difference from the average.

This missing data is significant, because while applicants that identified as black or African American made up just *7.9% of all applications* to fintech lenders, these applicants make up *10% of all denials* by fintech lenders. For traditional lenders, the spread is not substantively significant, as black applicants make up 5.0% of all

applications received, and 5.4% of all applications denied. For other reported races, this disparity does not exist. For instance, at the national level, Hispanic applicants make up 6.1% of all applicants and 6.2% of all denials, and Asian applicants make up 4.7% of all applications and 4.6% of all denials. Again, applications where race is missing represented 22% of all applications received, and only 19% of all applications denied.

Denial rates also vary by individual lenders, and Figure 6.2 reveals **major differences in the lending practices of various fintech lenders**.

Figure 6.2. Denial Rate by Race – Lender Level
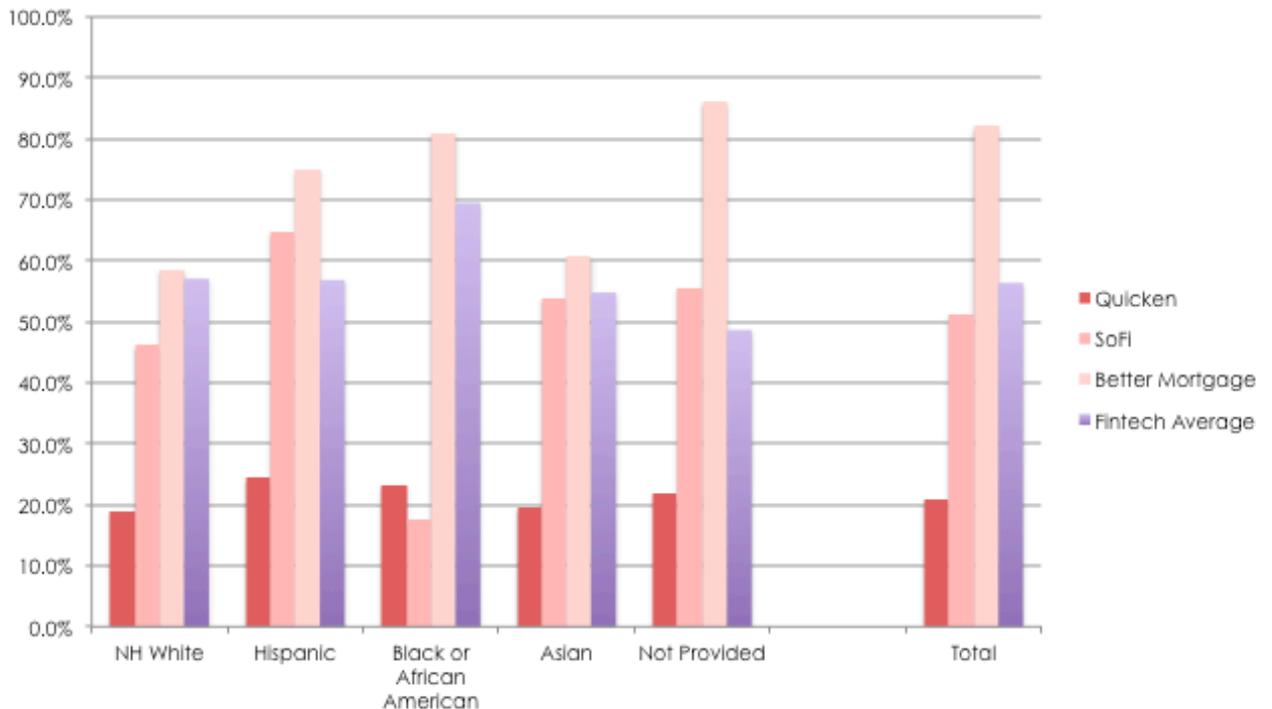
There is tremendous variability in the denial and origination rates of various lenders. Across all applications, Quicken Loans has the *lowest denial rate* (put another way, the highest origination rate) of *any* other fintech lender, denying just 20% of all applications received. Quicken's denial rate across race is also relatively consistent compared to other lenders. This is a critical point. Lenders like Quicken, who are non-bank lenders but had a traditional business before using fintech techniques appear to use fewer "filters" in their methodologies and expand credit to a larger number of people as a result.

Although Quicken denies non-Hispanic white applicants at a lower rate (19%) than Hispanic or black applicants (24% and 23%, respectively), the difference is substantively small. However, applications that do not provide race information make up 38% of all Quicken applications, and are also denied at a higher rate (22%). As will be discussed in the next section, should these applications actually come from minority households, the denial disparity may be much greater.

On the other hand, SoFi and Better Mortgage, two of the newest and most innovative lenders to enter the fintech mortgage market, have much higher denial rates with significant variability across race. Between the lenders identified in Figure 6.2, SoFi's denial rates are the most similar to the fintech average, although SoFi denies fewer non-Hispanic white applicants, and denies more Hispanic applicants and those who did not provide race. While it first appears that SoFi's denial rate for black and African American applicants is remarkably low, at 18%, this number is *insignificant* because the absolute number of black applicants to SoFi is so low, making up less than 2% of SoFi's applications. Thus, it's difficult to assess the equity implications of SoFi's lending practices, because the lender has attracted so few minority applicants. Again, 35% of all SoFi applications do not have race information, and over half of these applications are denied.

Better Mortgage is unique among fintech lenders because over 85% of applications have no reported race information, higher than almost any other fintech lender. As a result, it's nearly impossible to assess racial difference in the Better Mortgage's lending practices, because less than 15% of applications have race data. The differences where reported, however, are still telling.

Better Mortgage's denial rate is extraordinarily high, denying over 80% of all mortgage applications. For reported white applicants, however, only 58% of applications are denied, compared to 75% of Hispanic applicants, and 81% of black applicants. For the majority of all applications where race information is not provided, 86% are denied.

Thus, while there are substantive and significant differences between the denial rates of various fintech lenders, **it is difficult to properly assess racial disparities in lending practices and origination because of the disproportionate amount of fintech applications that do not have race information.**

Missing Race Data

As Wyly et al. discuss in their paper "Race, gender, and statistical representation," the geographic distribution of missing race data can create a more nuanced picture of the populations concealed by this lack of information, particularly if these applications are clustered in census tracts that have large minority populations.

As noted in Chapter 5, 18.3% of all fintech applicants live in a census tract that has a majority minority population (over 60%). Table 6.3 reveals, however, that the proportion of non-reporting applicants that live in these census tracts is much higher.

Table 6.3. Percent of Non-Reporting Applicants in Census Tracts with High Minority Populations

	Minority Population over 40%	Minority Population over 60%
Fintech Total	**66.4%**	**41.3%**
Better Mortgage	**59.9%**	**33.4%**
Quicken Loans	**62.8%**	**36.5%**

Applicants that do not report race are thus over twice as likely to live in census tracts with a large minority population, suggesting that many of these applicants may in fact be minorities, although their race is officially hidden from the reported data. This also suggests that lenders like Quicken Loans and Better Mortgage, who deny these missing race applications at a higher rate than their average, **may actually be denying minority applications at a dramatically higher rate than the reported data suggests.**

While missing data reported by traditional banks also has similar important implications, the severity of this issue is unique to fintech lenders. Indeed, if applicants that do not report race information are likely to be minorities, based on the concentration of minorities in their census tract, and if some lenders deny these applications at an above average rate, it stands to reason that some fintech lenders are denying mortgage credit at a remarkably disproportionate rate to non-white applicants, beyond what the data initially indicates. Further research needs to be conducted specifically on this missing data, but the racial disparities implied in this missing data are profound.

Denial Rates – Descriptive Statistics by Loan Product Type

As fintech's reach into expanding credit access for certain demographics and for certain markets is explored in the following sections, it is important to note that **fintech originates loans at much different rates depending on the loan product.**

Figure 6.5. Denial Rate by Loan Product Type
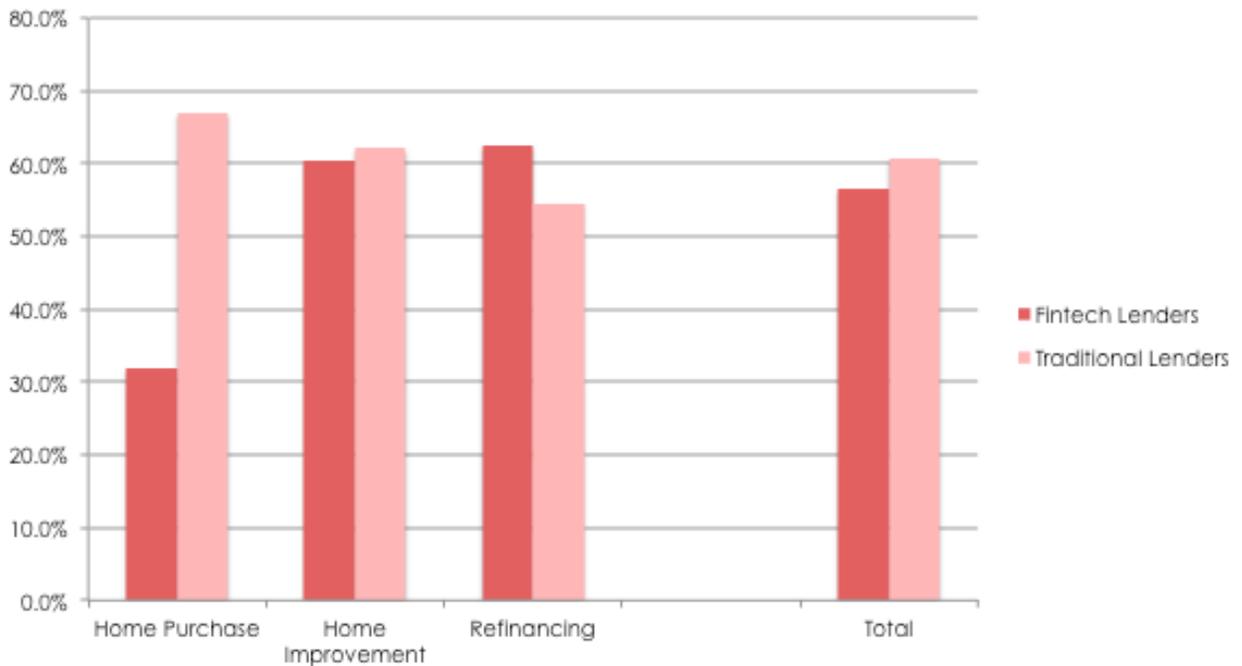
As Figure 6.5 illustrates, fintech lenders actually originate the majority of home purchase loans, denying only about 30% of all home purchase applications. By contrast, fintech lenders deny over 60% of all refinancing applications, which make up the majority of their portfolio. For traditional lenders, denial rates are more consistent, although traditional banks are less likely to deny refinancing applications.

While this report understands access to credit more broadly, additional research should certainly address the racial and demographic distribution of these various products to assess any other differences or inequities in origination and denial.

Origination – Regression Analysis

Key loan characteristics were also incorporated into several logit regression models to address whether fintech expands access to credit for low-income and minority groups while holding other variables constant. Whether the loan was originated was treated as the dependent variable, with a value of 1 equaling origination. The independent variables analyzed include applicant income, applicant race, the loan amount, whether or not the loan was an FHA loan, whether or not the loan was a fintech loan, the minority concentration of the census tract, and whether or not the applicant was considered low or moderate income compared to the surrounding census tract. The regressions do not account for FICO or credit scores, the interest rate of the originated loan, the amount of down payment, and several other factors that are often used by lenders to assess creditworthiness. These metrics are not included in the HMDA data, but further research could merge data sets to paint a fuller picture of fintech originations.

Table 6.6 below summarizes the likelihood of origination across all loans, and reveals that holding all else constant, black applicants were less likely to receive a loan compared to all other races. Applicants in census tracts with high minority populations were also less likely to receive a loan. Table 6.7 isolates applications only for home purchases, and the differences for black applicants become more stark. A similar model, included in the appendix, was run for refinance loans, and although again I find that black applicants were slightly less likely to have a loan originated, the models were generally consistent. This model also illustrates the likelihood of receiving a fintech refinance is much higher than a fintech purchase loan.

Table 6.6. Originations, All Loans

	Odds Ratio	**P > |z|**
Applicant Income	1.01	0.000
Black (dummy)	0.67	0.000
Hispanic (dummy)	0.93	0.000
Asian (dummy)	1.04	0.000
Race Not Reported (dummy)	0.78	0.000
Other Race (dummy)	0.18	0.000
Loan Amount	0.99	0.001
FHA Loan (dummy)	1.01	0.302
Fintech Loan (dummy)	0.69	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.94	0.000

	Odds Ratio	P > |z|
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.54	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.85	0.000
Constant	1.18	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.033

Table 6.7. Purchase Originations, All Loans

	Odds Ratio	P > |z|
Applicant Income	1.01	0.000
Black (dummy)	0.86	0.000
Hispanic (dummy)	1.17	0.000
Asian (dummy)	1.22	0.000
Race Not Reported (dummy)	0.71	0.000
Other Race (dummy)	0.29	0.000
FHA Loan (dummy)	3.47	0.302
Fintech Loan (dummy)	0.39	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.93	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.54	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.89	0.000
Constant	0.26	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0565

Tables 6.8 and 6.9 isolate fintech and traditional banks' originations, and additional tables in the appendix break these originations down further by refinance or purchase.

Table 6.8. Originations, Fintech Loans Only

	Odds Ratio	P > |z|
Applicant Income	0.99	0.000
Black (dummy)	0.64	0.000
Hispanic (dummy)	1.12	0.000
Asian (dummy)	0.99	0.572
Race Not Reported (dummy)	1.08	0.000
Other Race (dummy)	0.43	0.000
Loan Amount	0.99	0.001
FHA Loan (dummy)	0.73	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.97	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.34	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.74	0.000
Constant	1.43	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0311

Table 6.9. Originations, Traditional Bank Loans Only

	Odds Ratio	P > |z|
Applicant Income	1.01	0.000
Black (dummy)	0.80	0.000
Hispanic (dummy)	0.89	0.000
Asian (dummy)	1.12	0.000
Race Not Reported (dummy)	0.81	0.000
Other Race (dummy)	0.24	0.000
Loan Amount	1.01	0.000

FHA Loan (dummy)	0.23	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.95	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.72	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.89	0.000
Constant	0.99	0.383

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0368

Several key findings emerge from this analysis. First, **black applicants are less likely to receive a mortgage than non-Hispanic white applicants, and are more likely to be denied by a fintech lender than a traditional lender.** Indeed, holding income, loan product, and census tract constant, a black applicant is 0.64 times as likely to receive a loan from a fintech lender than a white applicant, but from traditional banks, the same applicant is only 0.80 times as likely.

For home purchase mortgages, fintech lenders are over **3 times as likely to originate FHA-insured mortgages** compared to traditional banks. Those **applications that do not include race information are also more likely to receive a refinanced mortgage** rather than an initial purchase mortgage. In fact, for refinance originations, applications with missing race data are even more likely than white applicants to receive a new mortgage. Across all applications, **fintech lenders are also significantly more likely than traditional lenders to originate refinanced loans**, and they are slightly more likely to issue these loans to applicants of lower income. In general, **fintech lenders are also more likely to originate smaller loans than traditional banks.**

There is also a strong relationship between increased income and likelihood of purchase origination, and across these loans, low- to moderate-income applicants are more likely to be denied by fintech lenders than by traditional lenders. Consistent with the above finding, these applicants are also more likely to pursue a refinanced mortgage from fintech lenders than a purchase mortgage. For traditional lenders, this difference does not exist.

Ultimately, black and African American applicants are the most likely to be denied by fintech lenders, suggesting that fintech may actually **reduce access to credit for black or African American applicants** compared to all other applicants, and may have underwriting practices that discriminate against these applicants more than traditional banks. Conversely, applicants who do not provide race information and are seeking a refinancing are the most likely to receive fintech mortgages. It thus appears that fintech lenders are becoming the dominant source of credit for small or mid-size refinanced loans with no race information, and are more likely to issue FHA-insured purchase mortgages to lower-income Hispanic and white households than traditional banks. Nonetheless, there are still differences between the "new fintech," those lenders that originate very few FHA loans and very few home purchase loans and the fintech lenders like Quicken, Homeward, and Movement Mortgage who are more likely to originate these loans to first time home buyers. With the evident growth of fintech, future research should attempt to distinguish between these groups within fintech lending.

<u>High-Cost Lending</u>

Because of these unique lending practices, there is a question whether or not fintech has a role in high-cost lending and in originating mortgages with above-market interest rates. The HMDA data includes an interest rate spread variable that indicates an interest rate above a certain Treasury threshold. For the purposes of this analysis, all loans with any interest rate spread are considered high-cost loans. Table 6.10 reveals that fintech lenders are responsible for 6.2% of all high-cost loans in the nation, whereas the larger, traditional banks combined are responsible for just 4.6% of all high-cost loans.

Table 6.10. Proportion of High-Interest Rate Loans

	% of All Loans with High Interest Rates	% of All Loans
Fintech Lenders	**6.2%**	**1.7%**
Traditional Lenders	**4.6%**	**0.8%**

That is, fintech lenders issue a significantly larger absolute number of high-cost loans than traditional lenders. Framed another way, 1.7% of all fintech loans are considered high-cost, compared to just 0.8% of traditional bank loans.

Nonetheless, high-cost lending can be a response to a variety of different variables. To assess whether certain applicants receive higher cost loans holding other factors like income and neighborhood constant, another logit regression model was run, summarized in Table 6.11.

Table 6.11 Likelihood of High-Interest Rate Loans

	Odds Ratio	**P > |z|**
Applicant Income	1.01	0.000
Black (dummy)	1.25	0.000
Hispanic (dummy)	1.57	0.000
Asian (dummy)	1.07	0.000
Race Not Reported (dummy)	0.68	0.000
Other Race (dummy)	0.45	0.000
Loan Amount	0.99	0.000
FHA Loan (dummy)	9.37	0.000
Fintech Loan (dummy)	0.41	0.000
Minority Concentration in Census Tract Over 40% (dummy)	1.11	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.93	0.000
Applicant Middle Income, 80-120% AMI (dummy)	1.24	0.000
Constant	0.01	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.1471

Notably, black and Hispanic applicants are more likely than white applicants to receive high-cost loans holding other factors constant, while applicants that do not report race are less likely to receive mortgages with high interest rates. The greatest determinant of whether a loan will be high cost is, however, whether the loan is FHA-insured. The APR on FHA loans is typically higher across the board because FHA loans include an

insurance premium. Fintech on its own is not responsible for high-cost loans when these other variables are constant.

Thus, **much of the higher-rate lending attributed to fintech lenders is likely associated with fintech's FHA lending**. In absolute numbers, fintech lenders originate more FHA loans than the large traditional banks identified in this research, which can likely explain the larger number of higher-rate loans. Again, fintech's growing role in FHA lending can serve to expand credit to those wealth-constrained applicants who are not able to access credit from a traditional bank. Despite distinct differences in origination rates across minority populations, it also does not appear that fintech lenders originate disproportionately more expensive mortgages to these populations outside of those pursuing FHA-insured home purchase loans.

VII. Findings: Fintech Market Penetration in California

Lastly, the overall rise of fintech's market share in the last 5 years coupled with its high rate of originating refinanced mortgages suggests that many fintech lenders may be taking advantage of vulnerable market conditions in areas most affected by the subprime mortgage crisis. In order to better understand and reflect upon the specific markets in which fintech lenders are making the greatest inroads, I have done a deeper dive into fintech lending and market penetration in California specifically. The geographic penetration of fintech lending across this smaller scale can then further illustrate the factors that are contributing to fintech's growth and the concerns this may ultimately elicit.

Table 7.1. Fintech Market Penetration in California MSA/MDs

FINTECH PENETRATION	
Metropolitan Statistical Area	% of all originations
Stockton	15.5%
Modesto	14.0%
Bakersfield	13.7%
Oxnard-Thousand Oaks-Ventura	13.4%
Riverside-San Bernardino-Ontario	13.1%
El Centro	12.4%
Anaheim-Santa Ana-Irvine	12.3%
Los Angeles-Long Beach-Glendale	12.2%
San Diego-Carlsbad-San Marcos	12.1%
Vallejo-Fairfield	12.0%
NA	11.9%
Oakland-Fremont-Hayward	11.4%
Napa	11.2%
Sacramento-Arden-Arcade-Roseville	11.2%
Merced	11.0%
Salinas	10.9%
Fresno	10.8%
Madera	10.7%
Santa Rosa-Petaluma	10.6%
Yuba City	9.6%
Visalia-Porterville	9.5%
San Rafael	9.3%
San Luis Obispo-Paso Robles	9.2%
San Jose-Sunnyvale-Santa Clara	9.2%
Santa Maria-Santa Barbara	9.0%
Santa Cruz-Watsonville	8.8%
San Francisco-San Mateo-Redwood City	8.8%

Hanford-Corcoran	8.7%
Chico	8.3%
Redding	7.7%

Indeed, Table 7.1 illustrates that in California, fintech lenders account for over 15% of all mortgage originations (including purchases and refinances) in Stockton, a city that was once called "Sub-Prime Capital, USA" and "Foreclosure Ground Zero."[45] Fintech lenders are also showing **above average penetration in cities that were hit hard during the Recession**, like Merced, Sacramento, Oakland, Irvine, El Centro, San Bernardino, Riverside, Oxnard, Bakersfield, and Modesto. It is important to note that home purchase loan levels in these areas are also more likely to fit into FHA and even Fannie Mae and Freddie Mac portfolio standards. Expensive markets like San Jose, Santa Barbara, Santa Cruz, and San Francisco, on the other hand, show some of the lowest levels of fintech penetration (see *Figure 7.3*). Many of these loans are above FHA, Fannie Mae and Freddie Mac loan limits, so many loans in these areas need to be "jumbo prime" and held in a bank portfolio or privately securitized. These large loans common in these larger, expensive metros often then require much tighter credit standards and will be originated by traditional banks. Fintech thus appears to be targeting markets with lower home values that many traditional banks have pulled out of.

Further, **fintech market penetration is also highly correlated with changes in the average home values of an area** between 2007-2011, the height of the crisis, and between 2012-2017, where recovery was evident.

Table 7.2. Change in Median Home Values

MARKET CHANGE		MARKET CHANGE	
Metro	PCT CHANGE 2007-2011	Metro	PCT CHANGE 2012-2017
Merced	-65.2%	Merced	122.5%
Modesto	-59.8%	Modesto	114.3%
Stockton	-54.9%	San Jose	107.3%
El Centro	-54.5%	Vallejo	106.0%
Vallejo	-53.7%	Yuba City	97.7%
Bakersfield	-51.6%	Stockton	97.3%
Riverside	-51.0%	San Francisco	88.1%
Madera	-50.2%	Santa Rosa	79.5%
Yuba City	-49.8%	Sacramento	74.7%
Salinas	-49.2%	Riverside	72.9%
Fresno	-46.0%	El Centro	70.9%
Visalia	-45.9%	Napa	69.3%
Sacramento	-43.0%	Salinas	69.0%
Ukiah	-41.7%	Santa Cruz	67.2%

[45] Clark, Adam. "Mortgage Crisis: Welcome to Sub-Prime Capital, USA." The Guardian. *Guardian News and Media*. July 27, 2008. https://www.theguardian.com/business/2008/jul/28/subprimecrisis.useconomy.

|			
Redding	**-41.2%**	Los Angeles-Anaheim	**60.6%**
Napa	**-40.0%**	Bakersfield	**59.6%**
Hanford	**-39.6%**	Visalia	**58.1%**
Chico	**-36.8%**	Madera	**57.0%**
San Luis Obispo	**-35.4%**	Santa Maria-Santa Barbara	**56.9%**
Santa Rosa	**-34.8%**	Fresno	**55.2%**
Ventura	**-34.5%**	San Luis Obispo	**55.0%**
Santa Cruz	**-34.3%**	San Diego	**53.7%**
Santa Maria-Santa Barbara	**-32.9%**	Chico	**51.5%**
Los Angeles-Anaheim	**-30.3%**	Redding	**51.1%**
San Diego	**-30.1%**	Ventura	**50.7%**
Eureka	**-25.8%**	Ukiah	**49.7%**
San Francisco	**-25.4%**	Hanford	**46.2%**
San Jose	**-18.3%**	Eureka	**30.0%**

According to Zillow data from the last decade, the metro areas that saw the greatest decline in the median home value between 2007 and 2011 were cities like Merced, Modesto, Stockton, Bakersfield, and Riverside. These areas have also seen some of the highest gains in the last 5 years, just as fintech's market share has accelerated.

It is evident that fintech lenders are seeing the most growth in cities that saw a steep drop in values during the subprime mortgage crisis but are now currently showing a dramatic growth in home prices. Cities that were less volatile during the crisis and have maintained expensive home prices (like San Francisco) or that have not recovered to the same extent (like Redding, Hanford, Chico, and Eureka) do not see a comparable amount of fintech lending.

The concern raised by this spatial pattern of lending is that fintech lenders are originating predatory or less than favorable loans to reap profit in these areas. As traditional banks pulled out of these markets and began enforcing loan-to-value restrictions and minimum down payment requirements, relatively unregulated fintech lenders have filled the void. While fintech lenders are still subject to FHA, Fannie Mae and Freddie Mac standards for those originations, loans funded by the fintech lender and then held in private securities will be beholden to different standards. While the exact products fintech lenders are issuing in these areas isn't known from this research, these different standards to which fintech lenders may be subject to suggests that fintech lenders may again be disproportionately increasing the amount of leverage in the residential markets in these areas. An increased amount of credit in areas like these has also been shown to inflate real estate prices, and while it is not evident from the data whether fintech is merely correlated with this growth or in some respect causing it by their growing lending practices, there is a very real risk that unchecked or unregulated fintech growth in these vulnerable markets may begin to drive another housing bubble.[46] The implications of these findings will be discussed more in depth in the following chapter.

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[46] Braggion, Fabio, Alberto Manconi and Haikun Zhu. "Is Fintech a Threat to Financial Stability?" *Federal Reserve Bank of Cleveland*, (2017).

Figure 7.3. Geographic Penetration of Fintech Lending
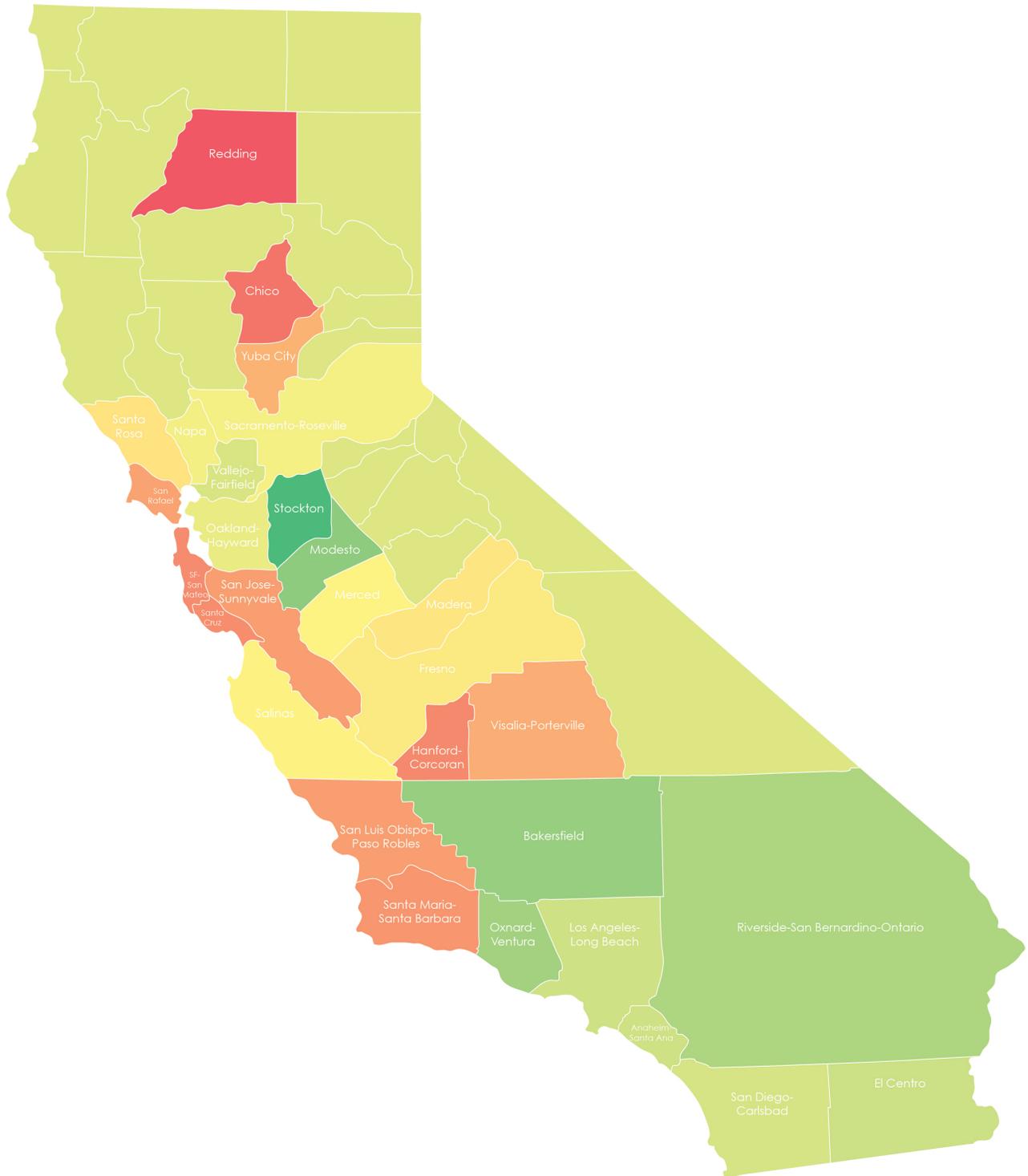
VIII. Conclusions

The fundamental goal of the research undertaken in this report was to begin the conversation and assessment of fintech lending in the U.S. residential mortgage market. By characterizing applicants and loan products, and by answering whether at this initial level, fintech can expand access to credit for low-income and minority groups, this research has revealed deep concerns about the equity implications of fintech lending. While much research remains to be done, this report has revealed the following:

- Fintech improves access to the mortgage application for low-income and minority groups.
  Compared to traditional banks, a higher proportion of fintech applicants are minorities or lower income. Whether this is due to strategic targeting and marketing on the part of individual lenders or due to simpler, less burdensome application systems that appear less intimidating than meeting with a formal loan officer is unclear. Irrespective of outcomes, increased access to mortgage credit applications is the first step to creating a more equitable mortgage market.

- There is a role for fintech in offering FHA-insured loans.
  Fintech lenders originate more higher-rate loans and more FHA-insured loans than the five traditional banks used in this comparison combined. For home purchase mortgages, fintech lenders are also three times as likely to issue an FHA-insured mortgage than a traditional bank. These loans typically have much lower down payments and, particularly since the Recession, have been an important tool for extending and maintaining access to credit for wealth-constrained individuals. The growth of FHA lending across fintech lenders has also come at a time when traditional lenders are pulling out of the FHA market, and has important implications for the future of FHA lending in the nation.

- There are major differences in the lending practices of various fintech lenders.
  Much of the underwriting of fintech mortgages is done with proprietary algorithms that differ lender by lender, and many lenders' development and growth have been achieved by targeting and disrupting a specific sector of the mortgage market. As such, the observable lending practices of individual lenders can very tremendously. Some lenders actually see very little applications from minority and low-income applicants, while others originate over 75% of all applications. Further research should be done to explore the implications of these differences in accessibility and origination and to identify any particularly harmful individual practices.

- Refinanced loans account for the majority of all fintech originations.
  Nearly 80% of all applicants to fintech lenders are seeking a refinancing, compared to less than 50% of applicants to traditional banks, and fintech also originates more refinanced mortgages across the nation than the five major banks combined. These refinanced loans are reshaping the mortgage market, and are also much more likely to

not have associated or reported race information. While many characteristics of these individual loans are not evident in this data, these surges in refinancing illustrate fintech's competitive advantage over traditional banking institutions and raise additional questions about the quality of these loans and the seemingly low interest rates or favorable terms they appear to initially offer. Refinances have enabled fintech lenders to penetrate nearly all local markets, but if their terms change or are misleading in nature, the stability of local residential mortgage markets may again be put at risk.

- It is difficult to assess discriminatory lending practices because of the disproportionate amount of fintech applications that do not have race information.
Unlike more traditional banking institutions, a disproportionate amount of fintech applications reported under the Home Mortgage Disclosure Act do not contain race information. For several lenders, the missing data can affect more than half of all applications in the dataset. High-level analysis of this data suggests that applications missing race data are more concentrated in census tracts with high minority populations and are more likely to ultimately receive a refinanced mortgage, yet this limited picture obscures the actual denial rates of minority applications. As a result, fintech lenders may be denying mortgage credit to minorities at a higher rate than the reported data suggests, which may have a discriminatory effect, but this is virtually impossible to capture with the missing data.

- However, black applicants are still more likely to be denied by a fintech lender than a traditional bank.
Despite the predominance of missing race information, the data still reveals that even when holding income and other factors constant, black applicants are more likely than white applicants to be denied by a fintech lender. Fintech's denial rate of black applicants is also higher than that of traditional banks, suggesting that racial disparities exist in the access to fintech mortgage credit.

- Fintech lenders show significant market penetration in cities that were hit the hardest during the Recession.
In California, fintech lenders have made the deepest inroads in less expensive markets that may better conform to federal loan limits and in markets whose values showed deep declines during the subprime mortgage crisis but have since rebounded dramatically. Fintech lending is also highly correlated with the recent growth in the median home values of an area. This expansion of credit in these areas raises additional concerns that home prices may begin to overinflate as fintech enters a market, creating another bubble in areas that have already struggled.

- <u>Fintech will change the US residential mortgage market, but more research and regulation needs to be undertaken to ensure that equitable and responsible lending occurs.</u>

While the introduction of technology in the mortgage market has the potential to simplify a cumbersome system and increase the ease of applying for and accessing mortgage credit, this has not yet materialized in practice. This research has demonstrated that fintech credit is concentrated in certain areas and is often unavailable to particular low-income and minority groups. Nonetheless, many more questions are raised by these findings, and the lending practices of fintech lenders should continue to be studied to further identify and clarify potential discriminatory practices and to develop specific recommendations to better regulate their lending.

Table A1. Variable Codebook

HMDA 2016 DATASET	
Variable Name	**Label**
year	As of Year (2016)
respid	Respondent ID
agencycode	Agency Code
loan_type	Loan Type
property_type	Property Type
loan_purpose	Loan Purpose
loan_amount	Loan Amount (in Thousands of $)
action_type	Action Type
msamd	MSA/MD
state_code	2-Digit FIPS State Identifier
county_code	3-Digit FIPS County Identifier
census_tract	Census Tract Number
app_ethnic	Applicant Ethnicity
app_race1	Applicant Race
app_sex	Applicant Sex
app_income	Applicant Gross Annual Income (in Thousands of $)
purch_type	Purchase Type
denial1	Denial Reason 1
denial2	Denial Reason 2
denial3	Denial Reason 3
rate_spread	Rate Spread
seq_no	Sequence Number
pop	Total Population in Census Tract
min_pop	Census Tract - % of Minority Pop to Total Pop
hud_income	Census Tract - HUD Median Income in $ for MSA/MD
tract_income	Census Tract - % of Median Income Compared to MSA
fintech	Fintech Lenders (Dummy)
traditional	Big 5 Traditional Lenders (Dummy)
race	Race/Ethnicity (Includes Hispanic)
denied	Application Denied (Dummy)
origination	Application Originated (Dummy)
r_black	Black Applicant (Dummy)
r_hispanic	Hispanic Applicant (Dummy)
r_asian	Asian Applicant (Dummy)
r_white	White Applicant (Dummy)
r_notreported	Race Not Reported for Applicant (Dummy)
r_other	Other Race Applicant (Dummy)
lowinc	Census Tract of Applicant Below 80% AMI
vlowinc	Census Tract of Applicant Below 60% AMI
elowinc	Census Tract of Applicant Below 30% AMI
min_concentration	Census Tract Minority Population Over 20%
vmin_concentration	Census Tract Minority Population Over 40%
emin_concentration	Census Tract Minority Population Over 60%
sofi	Social Finance (Dummy)
quicken	Quicken Loans (Dummy)
movementmortgage	Movement Mortgage (Dummy)
loandepot	LoanDepot (Dummy)
homeward	Homeward Residential (Dummy)
homebridge	Homebridge Financial Services (Dummy)

guaranteedrate	Guaranteed Rate Inc. (Dunny)
cashcall	CashCall Inc. (Dummy)
amerisave	Amerisave Mortgage (Dummy)
better	Better Mortgage (Dummy)
lendinghome	Lending Home (Dummy)
wellsfargo	Wells Fargo (Dummy)
chase	JP Morgan Chase (Dummy)
bofa	Bank of America (Dummy)
usbank	U.S. Bank (Dummy)
citi	Citi Bank (Dummy)
app_income_pct	Applicant Income as Percentage of MSA/MD Median
app_lowmod	Applicant Income Less than 80% Area Median
app_med	Applicant Income 80-120% Area Median
app_upper	Applicant Income Over 120% Area Median
FHA	FHA Insured Loan (Dummy)
high_interest	High Interest Loans (Dummy)

Table A2. Regression – Refinance Originations, All Loans

	Odds Ratio	P > |z|
Applicant Income	0.99	0.000
Black (dummy)	0.69	0.000
Hispanic (dummy)	0.83	0.000
Asian (dummy)	0.96	0.000
Race Not Reported (dummy)	0.92	0.000
Other Race (dummy)	0.25	0.000
FHA Loan (dummy)	0.29	0.000
Fintech Loan (dummy)	1.25	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.98	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.71	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.91	0.000
Constant	0.65	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.033

Table A3. Regression – Purchase Originations, Fintech Loans Only

	Odds Ratio	P > |z|
Applicant Income	0.99	0.000
Black (dummy)	0.79	0.000
Hispanic (dummy)	1.58	0.000
Asian (dummy)	1.11	0.000
Race Not Reported (dummy)	0.63	0.000
Other Race (dummy)	0.54	0.000
FHA Loan (dummy)	3.33	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.99	0.575
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.34	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.75	0.000
Constant	0.11	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0547

Table A4. Regression – Refinance Originations, Fintech Loans Only

	Odds Ratio	**P > |z|**
Applicant Income	0.99	0.000
Black (dummy)	0.66	0.000
Hispanic (dummy)	0.91	0.000
Asian (dummy)	0.95	0.000
Race Not Reported (dummy)	1.24	0.000
Other Race (dummy)	0.48	0.000
FHA Loan (dummy)	0.35	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.98	0.575
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.43	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.81	0.000
Constant	0.91	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0357

Table A5. Regression – Purchase Originations, Traditional Bank Loans Only

	Odds Ratio	**P > |z|**
Applicant Income	1.01	0.000
Black (dummy)	0.71	0.000
Hispanic (dummy)	0.76	0.000
Asian (dummy)	1.74	0.000
Race Not Reported (dummy)	0.89	0.000
Other Race (dummy)	0.29	0.000
FHA Loan (dummy)	1.18	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.90	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.32	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.55	0.000
Constant	0.20	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0425

Table A6. Regression – Refinance Originations, Traditional Bank Loans Only

	Odds Ratio	**P > |z|**
Applicant Income	1.01	0.000
Black (dummy)	0.85	0.000
Hispanic (dummy)	0.96	0.000
Asian (dummy)	0.89	0.000
Race Not Reported (dummy)	0.86	0.000
Other Race (dummy)	0.29	0.000
FHA Loan (dummy)	0.09	0.000
Minority Concentration in Census Tract Over 40% (dummy)	0.95	0.000
Applicant Low-to-Moderate Income, < 80% AMI (dummy)	0.94	0.000
Applicant Middle Income, 80-120% AMI (dummy)	0.94	0.000
Constant	0.52	0.000

Model: Prob > chi2 = 0.000, pseudo-R^2 = 0.0207

APPENDIX II. Bibliography

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