FEDERAL RESERVE BANK *of* ATLANTA WORKING PAPER SERIES

Can Everyone Tap Into the Housing Piggy Bank? Racial Disparities in Access to Home Equity

James N. Conklin, Kristopher Gerardi, and Lauren Lambie-Hanson

Working Paper 2022-17
November 2022

Abstract: An oft-touted benefit of homeownership is the ability to build and access equity, and in recent years the amount of "tappable" home equity held by US homeowners has reached historic levels. But more than one-quarter of recent applications for mortgage equity withdrawal (MEW) loan products were denied. Black and Hispanic homeowners' applications were denied at even higher rates: 44 percent and 32 percent, respectively. These racial disparities in denials are larger than those associated with purchase and rate/term refinance mortgage applications. Controlling for loan and borrower characteristics commonly used in the underwriting process significantly reduces the MEW disparities, with the Black-White denial rate gap falling by approximately 83 percent, and the Hispanic-White gap falling by 73 percent. In other words, seemingly race-neutral underwriting criteria in the MEW product space explain large differences in the extent to which minority homeowners can access their home equity.

JEL classification: G21, G51, J15

Key words: housing wealth, mortgage, home equity, racial disparities

https://doi.org/10.29338/wp2022-17

The authors thank Stephanie Sezen for excellent research assistance and Bob Avery for sharing his Home Mortgage Disclosure Act lender file. They are also grateful to Neil Bhutta, Julie Cheney, Hajime Hadeishi, Bob Hunt, Tesia Lemelle, Dubravka Ritter, Amanda Roberts, and Anna Tranfaglia for providing helpful comments and suggestions. The views expressed here are those of the authors and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

James Conklin is an associate professor of real estate at the University of Georgia Terry College of Business. Lauren Lambie-Hanson is a senior adviser in the Consumer Finance Institute at the Federal Reserve Bank of Philadelphia. Please address questions regarding content to Kristopher Gerardi, Federal Reserve Bank of Atlanta, 1000 Peachtree Street NE, Atlanta, GA 30309, kristopher.gerardi@atl.frb.org.

1 Introduction

A large literature in economics has documented significant racial disparities in the ability to access mortgage credit to purchase a home.[1] This literature has garnered considerable attention due, in part, to the widespread belief that homeownership plays a key role in household wealth accumulation, especially for low-income and minority households.[2] The concern is that if minority households do not have the same opportunities to build wealth through homeownership then it will be very difficult to close the large existing gaps in racial wealth inequality.

In this paper, we shift the focus toward a related question that has received much less attention: Are there disparities in the ability to access accumulated housing wealth across racial and ethnic lines? The ability to access housing wealth is vital for many households, especially since housing is the largest asset in most financial portfolios. Housing equity is used for numerous purposes, such as smoothing consumption in the face of adverse income/employment shocks and financing home improvement projects, businesses,[3] large durable goods purchases, and even educational costs.[4] Housing equity is also an important tool for building intergenerational wealth, as parents often bequeath their homes to their children (Begley, 2017). Thus, determining if there are large disparities along racial lines in the ease of accessing housing equity and addressing those disparities if they exist are critically important from a policy perspective.

Compared to many other assets, housing wealth is relatively illiquid. There are essentially three ways to access accumulated housing wealth. First, homeowners can sell their homes and

[1]See Black, Schweitzer, and Mandell (1978), Munnell et al. (1996) and Charles and Hurst (2002) for classic treatments. Ladd (1998) provides a survey of the literature.

[2]See Goodman and Mayer (2018), Charles and Hurst (2002), Shapiro (2006), Boehm and Schlottmann (2008). Wainer and Zabel (2020) and Killewald, Pfeffer, and Schachner (2017) for examples.

[3]Adelino, Schoar, and Severino (2015), Kerr, Kerr, and Nanda (2022), and Corradin and Popov (2015) document the importance of home equity for small business financing.

[4]Along with retirement savings, home equity associated with a primary residence is excluded from asset calculations in the federal student aid formula Levine and Ritter (2022), so for this reason and others, it is an advantageous form of wealth to use for funding post-secondary education, if it can be extracted. Benetton, Kudlyak, and Mondragon (2022) document in credit bureau data that parents also use their home equity to assist their children with down payments when purchasing their first homes.

transition into the rental market. Second, homeowners can downsize by selling their current homes and purchasing cheaper houses. Third, homeowners can remain in their homes and extract housing equity using a special type of mortgage such as a home equity loan (HELoan), a cash-out refinance, a home equity line of credit (HELOC), or a reverse mortgage. The first two methods of accessing home equity require changing residences. Because this entails paying significant transaction costs, most households who desire to tap into their housing wealth would likely prefer to stay in their homes. In this paper we focus on the third method of home equity extraction (via mortgage products) since it is the only way for a homeowner to access housing wealth without moving. Specifically, we analyze racial disparities in access to three mortgage products: HELoans, HELOCs, and cash-out refinances (hereafter referred to as mortgage equity withdrawal (MEW) products). We exclude reverse mortgages, because they are available only to borrowers aged 62 or older and have very different underwriting rules compared to "forward" equity withdrawal products (Mayer and Moulton, 2022).

Our paper is one of the first to measure racial disparities in access to MEW products, likely due to a dearth of quality data on these types of loans.[5] To conduct such an exercise, we use confidential Home Mortgage Disclosure Act (HMDA) data from 2018 through 2021, which contains extensive information on applications for MEW products that is not present in other commonly used mortgage datasets. In particular, the dataset has broad geographic coverage from many financial institutions and includes key underwriting factors used by lenders in making credit decisions, enabling us to systematically look at racial disparities in housing wealth extraction in a way that was not previously possible. Although the empirical evidence on race and housing wealth extraction is scant, there is anecdotal evidence suggesting that minority homeowners have a harder time getting access to MEW products.[6]

[5]Two other studies deal with MEW and race (Carlin and Divringi, 2018; Do, 2012). We discuss both in some detail below.

[6]See for example, https://www.nbcnews.com/news/nbcblk/american-dream-while-black-locked-vicious-cycle-n1235619.

Denial rates are significantly higher for MEW products (cash-out refis, HELoans, HELOCs) than for purchase-money mortgages and rate/term refinances. In our sample, 26% of MEW withdrawal applications are denied, compared to 10% for non-MEW products. Unconditional minority-White denial rate gaps (that is, the simple differences in denial rates between racial groups, not controlling for any risk factors) are larger for MEW products relative to non-MEW products. Figure 1 shows that for non-MEW applications, Black homeowners are 9 percentage points more likely than White borrowers to be denied, while Hispanic and Asian borrowers are 4 percentage points and 1 percentage point more likely to be denied than White borrowers, respectively. For MEW products, the Black-White, Hispanic-White and Asian-White denial rate gaps widen to 21, 9, and 7 percentage points, respectively.[7] These differences are striking — the unconditional minority-White denial disparities are 2 to 7 times larger for MEW products than non-MEW mortgages. These large unconditional differences show that, on average, minority homeowners do not have the same ability as White homeowners to access their accumulated housing wealth to improve their overall economic and financial well-being. In other words, the results suggest that even if policymakers are able to close the large gap in the minority-White homeownership rate, there would still be an important source of racial inequality stemming from the differential ability to access the financial benefits of owning a home.

But in order to understand what drives these large unconditional differences and determine the appropriate policy response, it is important to introduce controls for loan and borrower risk factors that are commonly used by lenders in underwriting. We show that nearly two-thirds of the Black-White and Hispanic-White disparities in MEW product denial rates can be explained by differences in homeowners' credit scores and debt-to-income ratios alone. Including additional controls, such as the requested loan amount and the level of the applicant's income, further reduces MEW rejection rate disparities.

Surprisingly, controlling for the applicant's combined loan-to-value (CLTV) ratio does not

[7] The bottom row of Table 1 reports unconditional MEW denial rates by race.

have a material effect on the estimated denial rate gaps, which suggests that minority borrowers are not being rejected for having insufficient levels of housing equity. We show that this is also supported by HMDA data on the (self-reported) reasons for why lenders rejected MEW product applications. While credit history and DTI ratios are the two most-cited reasons for why minority applications are denied in our sample, insufficient collateral is the least-cited reason.[8] Thus, the requirement that applicants have high credit scores and low DTI ratios to successfully navigate the underwriting process has a particularly large impact on minority households' ability to access their accumulated housing wealth.

For all three MEW products (cash-out refinances, HELoans, and HELOCs), accounting for standard borrower and loan characteristics used in mortgage underwriting significantly reduces–but does not fully eliminate–the gap in denial rates across borrowers. Black and Asian borrowers remain about 4 percentage points more likely to be denied for MEW products than White borrowers, and Hispanic borrowers are about 3 percentage points more likely to be denied (relative to White borrowers) after accounting for these observable factors. These residual racial disparities are non-trivial and are consistent with, but certainly not proof of racial discrimination. There are additional factors, such as liquid assets and information about an applicant's employment history, that lenders take into consideration in the underwriting process but are not included in the HMDA data.

In our remaining analysis, we focus on these residual denial rate disparities. We start by examining whether they have changed over time. Since MEW products can be used to smooth consumption, and many households experienced negative income and wealth shocks during the COVID-19 pandemic, MEW demand may have shifted as a result. At the same time, mortgage lenders may

[8]There are a few caveats that are worth noting about the small effect of CLTV on the size of the minority-White denial disparities. First, the CLTV measure for denied applications in HMDA data may reflect the applied-for CLTV rather than the "actual" CLTV, since a loan might reach a rejection decision before it receives an appraisal (which comes later in the underwriting process). Second, the sample period (2018–2021) was characterized by strong house price growth across the entire country, which somewhat mitigates cross-sectional variation in how much equity would be a binding constraint between racial groups. Thus, it isn't clear that this result is generalizable to periods with less robust house price growth.

have updated underwriting policies in response to evolving market conditions. Shifting mortgage supply and demand may have impacted racial disparities over time. Overall, unconditional denial rates on MEW products declined substantially from 34% in 2018 to 20% in 2021. The decline in residual denial rate gaps (gaps conditional on common underwriting factors) is less dramatic, however. The Hispanic-White and Asian-White gaps declined by 1.4 and 2.3 percentage points respectively, but the Black-White gap remained fairly constant from 2018 to 2021.

The different MEW products we examine tend to be offered by different types of financial institutions. For example, HELOCs generally are provided by banks and credit unions, while a large share of cash-out refinances are originated by nonbank lenders. The underwriting criteria likely vary across different types of financial institutions, and thus, disparities in access to MEW may also. When we estimate the models for each product type separately for each type of financial institution (banks, nonbanks, and credit unions), minority-White denial rate gaps exist in all models. Interestingly, although credit unions are the least likely to deny applications overall, the residual Black-White gaps are largest for credit unions across all MEW products. This finding is closely related to to empirical evidence suggesting that credit unions are less likely than banks to serve individuals of low to moderate income.[9] Our results speak to the inclusiveness of credit provision by credit unions along another dimension – race.

We also test for differences in denial rates among different types of banks. According to the Independent Community Bankers of America (ICBA), an industry trade group, "[M]inority banks were formed to empower minorities and low-to-moderate income communities by providing them with access to credit, capital, and financial services."[10] Indeed, relative to majority-owned banks, a larger share of originations by minority-owned banks are to minority borrowers (Breitenstein et al., 2014). Since minority-owned banks are formed, at least in part, to serve the credit needs of minority borrowers, a natural question is whether racial denial rate gaps are smaller at minority-

[9] See Marshall and Pellerin (2017) for a discussion of this research.

[10] https://www.icba.org/our-positions-a-z/minority-banking/minority-banks.

owned banks. We provide evidence consistent with this hypothesis. Relative to majority-owned banks, minority-White denial gaps are smaller at minority-owned banks, and in some cases reversed (minorities are less likely to be denied). Note, though, that only a small share (0.65%) of the mortgage applications handled by banks are from minority banks, and effects may be driven by a combination of treatment and borrowers' self-selection into applying with these lenders, so these results should be interpreted with caution.

Finally, we explore the relationship between MEW product pricing and borrower race. We use the interest rate spread on originated loans as our measure of price.[11] Large unconditional minority-White pricing gaps exist across all MEW products, but similar to our results on application denials, the gaps are significantly reduced, and in some cases eliminated, once we include a host of control variables. In our conditional specifications, Asian homeowners pay less than comparable Whites across all MEW products. In contrast, Black borrowers face higher spreads than comparable White borrowers on HELOCs. To our knowledge, ours is the first paper to examine the relationship between race and mortgage pricing on MEW products.

2 Literature Review

Our findings contribute to the broad literature on racial disparities in homeownership experiences.[12] A number of studies examine the relationship between race and transition into homeownership (Boehm and Schlottmann, 2004; Dawkins, 2005; Hall and Crowder, 2011), while others focus on the forces that drive large unconditional minority-White gaps in homeownership rates, such as income, wealth, age, family structure and location (Coulson and Dalton, 2010; Deng, Ross, and Wachter, 2003; Gabriel and Painter, 2003; Gabriel and Rosenthal, 2005; Gyourko, Linneman, and

[11]The interest rate spread is defined as the difference between a loan's APR and the average prime offer rate (APOR). APR incorporates fees, points, and the contract interest rate. Thus, the interest rate spread captures multiple dimensions of mortgage pricing.

[12]Our discussion here of the voluminous literature will necessarily be brief. We apologize to authors of relevant papers that are not listed here.

Wachter, 1999; Hilber and Liu, 2008). Another stream of research investigates racial differences in home equity and financial returns to homeownership (Flippen, 2004; Kahn, 2021; Kermani and Wong, 2021; Krivo and Kaufman, 2004). We study a related, but distinct question: after transitioning into homeownership, are there racial differences in the ability to access (and the cost of accessing) housing wealth via MEW products?

Our research is also closely related to the literature examining racial disparities in access to mortgage credit and mortgage pricing. For example, Black, Schweitzer, and Mandell (1978) and Munnell et al. (1996) find that minority applicants are more likely to be denied a first-lien mortgage, even after conditioning on a large set of controls. More recently, Frame et al. (2022) provide evidence that minority borrowers are less likely to have their mortgage applications denied when working with minority loan officers. Bhutta, Hizmo, and Ringo (2021) use the confidential HMDA data to show that conditioning on a "race-blind" automated underwriting decision, which accounts for underwriting factors that are unobservable in the HMDA data, reduces estimated disparities in mortgage denial rates. This field is not populated for the HELOCs and HELoans we study.[13]

With respect to mortgage pricing, Bartlett et al. (2022) find that minorities pay higher interest rates, on average, than comparable Whites in a sample of GSE-securitized and FHA-insured mortgages, while Kau, Keenan, and Munneke (2012) find that borrowers in minority neighborhoods pay higher interest rates after controlling for differences in the likelihood of default. But, using FHA-insured purchase loans, Bhutta and Hizmo (2021) argue that higher interest rates paid by minorities are offset by lower fees (points) to obtain the loan.[14] In the subprime mortgage market, Ghent, Hernandez-Murillo, and Owyang (2014) find that Black and Hispanic borrowers pay higher rates than comparable White borrowers on their mortgages. Using a sample of loans from a large subprime lender, Ambrose, Conklin, and Lopez (2021) show that minority-White fee gaps

[13]This is likely because standard AUS systems used for originating a large share of purchase and refinance loans (e.g., Desktop Originator, Loan Prospector) are not designed for underwriting HELOCs and HELoans.

[14]Willen and Zhang (2021) reconcile the contradictory findings of Bartlett et al. (2022) and Bhutta and Hizmo (2021) and offer an econometric solution to what they call the "menu problem", which refers to the trade-off between the amount of upfront fees/points and the level of the interest rate that most borrowers face.

depend on the race of the mortgage broker. In contrast with these previous studies that focus on first-lien mortgage products, we examine racial disparities in denial rates and mortgage pricing for MEW products (which often are not first-liens), including two product types that are excluded from earlier studies, HELOCs and HELoans.

Finally, we contribute to the mortgage equity withdrawal literature. Canner, Durkin, and Luckett (1998) provide a detailed description of the institutional features of the HELOC and HELoan market as of the late-1990s, as well as borrower characteristics related to their use. In a theoretical contribution, Hurst and Stafford (2004) study home equity withdrawal as a mechanism to smooth consumption in the face of negative income shocks. Agarwal, Ambrose, and Liu (2006), Benito (2009) and Hurst and Stafford (2004) present empirical evidence consistent with home equity use as a financial buffer for consumption smoothing purposes. Several papers examine the correlates of the likelihood of withdrawing equity and the method (e.g., HELOC and HELoan) used to do so (Benito, 2009; Canner, Durkin, and Luckett, 1998; Chen and Jensen, 1985; Duca and Kumar, 2014).[15] Whereas most of the empirical studies in this literature rely on survey data, Agarwal et al. (2011) use information on HELOC and HELoan applications to study dynamic contracting.

To our knowledge, there are only two studies that focus on the relationship between MEW and race. Do (2012) uses American Community Survey (ACS) data to show that Black homeowners are less likely than Whites to extract equity using MEW products. However, it isn't clear whether the difference in equity extraction is due to differences in underlying demand for MEW products or due to differences in the rate at which lenders accept or reject MEW applications. By focusing on MEW applications, we study racial disparities in MEW denials and pricing among individuals that actually wanted a MEW product.[16] In other words, we focus more on the supply-side of MEW products.

[15]For reasons already discussed, we exclude reverse mortgages from our analysis. For studies on the use and performance of HECMs see Case and Schnare (1994), Davidoff (2014), Davidoff, Gerhard, and Post (2017), Haurin et al. (2016), Moulton, Haurin, and Shi (2015), and Moulton, Loibl, and Haurin (2017).

[16]This assumes that applying for a MEW product indicates demand for a MEW product, which seems like a reasonable assumption.

The second study examining MEW and race, Carlin and Divringi (2018), focuses on mortgage equity withdrawals for a very specific purpose – home improvements. The authors use HMDA application data from 2015 through 2017 located in the Third Federal Reserve District, which covers Delaware, southern New Jersey, and eastern and central Pennsylvania. Among applications where the stated purpose of the loan is for home improvements, minority homeowners are approximately twice as likely to be denied credit after controlling for a number of factors. Whereas Carlin's analysis focuses on Pennsylvania, Delaware, and Southern New Jersey, our sample includes applications from all 50 states. We also cover a broader range of loan purposes, as only about 20% of our sample report home improvement as the reason for attempting to extract housing equity. Finally, it is important to note that Carlin and Divringi (2018) are not able to control for the credit risk factors used in our study because those fields were not available in the HMDA data before 2018. As we show below, these underwriting factors have a large impact on the size of estimated racial disparities in MEW denials and pricing.

3 Data Description and Sample Construction

3.1 Confidential HMDA Data

We use Home Mortgage Disclosure Act (HMDA) loan/application register data, which has been utilized extensively in previous studies. HMDA data is the most comprehensive publicly available source of mortgage lending application activity in the U.S. (Bhutta, Laufer, and Ringo, 2017), with over 90% coverage of the U.S. mortgage market (Consumer Financial Protection Bureau, 2019).[17]

For each application contained in the public version of HMDA data, the lender reports race/ethnicity,

[17]Coverage is not 100% because there are some reporting exemptions. Financial institutions that are exclusively rural or that originated fewer than 100 closed-end mortgages in either of the last two years are not required to report closed-end mortgage applications. See Federal Financial Institutions Examination Council (2019), Bhutta, Laufer, and Ringo (2017) and Frame et al. (2022) for a more detailed discussion on HMDA reporting requirements. Open-end line of credit (HELOC) reporting exemptions are discussed in further detail below. Note that both the publicly available data and the confidential data available to financial regulators are anonymized.

gender, and age of applicant and co-applicant (if applicable), combined income for the applicant and co-applicants; property location (census tract) and property type (single-family site-built and manufactured homes, as well as multi-family); occupancy type (primary residence, second home, investment property); and loan features (interest only, prepayment penalty, other non-amortizing features), as well as the amount of the loan. The data also records loan purpose (purchase, home improvement, rate/term refinance, cash-out refinance, other purpose) and lien priority (first or second lien). The lending institution that made the credit decision reports the record and is also identified in the data.

An important feature of HMDA data is that it reports the outcome of each loan application (loan originated, application denied, application approved but not accepted, application withdrawn by applicant, or file closed for incompleteness), known as the "action" on the application. Thus, one can examine the correlates of loan outcomes, with application denials (rejections) being the primary outcome of interest. However, historically HMDA data did not include key underwriting variables that lenders use to make credit approval and pricing decisions. But, starting in 2018, the public HMDA data fields were expanded to include several new variables related to underwriting risk, including but not limited to, the combined loan to value ratio (CLTV) and debt-to-income ratio (DTI) buckets, A subset of the data also includes the contract interest rate and the interest rate spread, which captures the difference between the annual percentage rate on the loan and a benchmark rate at the time the rate is set. Lenders were also required to report borrower credit scores beginning in 2018, but this information is not available in the public HMDA data.

Traditionally, financial institutions did not report open-end lines of credit (HELOCs) in their HMDA data. However, beginning in 2018, HELOC reporting became mandatory, although there is an exemption for financial institutions that originated fewer than 500 HELOCs in either of the two previous years (Federal Financial Institutions Examination Council, 2019). Effectively, this means that HELOC coverage from small financial institutions is limited.

In this study we use the confidential version of HMDA data available to regulatory agencies.

There are two key features of the confidential data that distinguish it from the public version. First, whereas the public version includes only the calendar year in which the loan action was taken, the confidential version includes the exact action and application dates. Second, the confidential version includes the applicant's credit score, which is one of the most important variables used in mortgage underwriting. The availability of credit score, CLTV, and DTI has sparked renewed interest in using HMDA data to analyze the relationship between race and mortgage application outcomes (Bhutta, Hizmo, and Ringo, 2021; Frame et al., 2022; Jiang, Lee, and Liu, 2021).

3.2 Sample Construction

We use the confidential version of HMDA data from 2018 to 2021. Our primary interest lies in products used for extracting mortgage equity, so our main sample excludes applications for rate/term refinances and applications for home purchase mortgages.[18] Thus, our main MEW sample includes cash-out refinances, HELoans, and HELOCs. Since we focus on credit approval and pricing outcomes, we omit observations where the financial institution purchased the loan from another lender or the application was a preapproaval request. We also exclude reverse mortgages and applications with loan amounts less than $5,000 or greater than $1,000,000. We further restrict our sample to non-Hispanic White (hereafter "White"), Black, Hispanic White ("Hispanic"), and Asian applicants.[19] Our final MEW sample includes over 16 million observations across the 50 states and Washington, DC.

[18]At times we use rate/term refinances and purchase mortgage applications for comparison purposes. However, our main analysis excludes these loan types.

[19]For each applicant and co-applicant, we apply a waterfall to code the loans into mutually exclusive and exhaustive categories. Loans are classified as having an applicant who is Black if either the applicant or co-applicant is listed as Black in the first or second reported race field for that applicant. If not, then the observations moves on to the next phase of the waterfall, which identifies loans by Asian applicants. The third step of the waterfall looks for Hispanic White applicants. In the fourth step, remaining observations (for White applicants) are coded as non-Hispanic White if neither the applicant nor the co-applicant is coded as having a first or second race as Black or Asian and neither is coded as having ethnicity of Hispanic. All other observations (such as those with no race reported) are excluded from our analysis.

4 Results

We first look at mortgage denial rates by race and product type. We begin by exploring unconditional denial rate gaps and then explore how much of the gaps remain after taking into account typical underwriting criteria used in making these loans. Throughout the paper, unless otherwise noted, we focus on applications where a credit decision was made, which includes originated loans, applications approved but for which the borrower did not accept the lender's offer, and applications denied by the lender. We exclude applications where the file is closed for incompleteness or the application is withdrawn prior to a credit decision.[20]

4.1 Unconditional Denial Rates

Figure 1 reports unconditional denial rates (among those with a credit decision) by race for each MEW product. For the purposes of comparison, we also report denial rates for non-MEW mortgages in the bottom right panel of the figure. A number of interesting facts are documented in Figure 1. First, relative to non-MEW products (purchases and rate-term refinances), denial rates for MEW products are significantly higher for all races. For example, White applicants are denied credit on only 8% of non-MEW applications, however, this number doubles to 16% on cash-out refis. White denial rates climb even further to 29% on HELoans and 32% on HELOCs. This pattern holds within each of the other races as well; denial rates are highest on HELOCs, followed by HELoans, cash-out refis, and non-MEW products, respectively.

Second, minority-White denial rate gaps are larger for MEW products relative to non-MEW products. As an example, Black applicants are 9 percentage points (that is, 17% minus 8%) more likely than White applicants to be denied non-MEW products. On cash-out refis the Black-White gap increases dramatically to 16 percentage points. The gap is even larger for HELoans (26 per-

[20]Appendix Table A.1 reports application outcome shares by race across all of these categories. The sample of applications where a credit decision is made includes almost 13 million observations.

centage points) and HELOCs (30 percentage points). This is notable as HELoans and HELOCs have relatively low transaction costs, and thus are generally regarded as low-cost methods of extracting home equity (Greenspan and Kennedy, 2008). The large racial disparities in denial rates in cash-out refis, HELoans, and HELOCs highlights the importance of analyzing MEW products as we do in this study.

Third, although they are smaller than the Black-White gaps, the Hispanic- and Asian-White denial gaps are also large on HELoans and HELOCs. Hispanic applicants are 11 percentage points more likely to be denied than Whites on HELoans and 22 percentage points more likely on HELOCs. The corresponding Asian-White gaps on HELoans and HELOCs are 8 and 14 percentage points, respectively.

Overall, these comparisons suggest very different levels of access to MEW products for different racial groups and that minority homeowners, in particular, may have an especially difficult time tapping into accumulated housing wealth. We can borrow a framework from the 1978 federal Uniform Guidelines for Employee Selection Procedures to assess the magnitude of these differences—the "four-fifths rule," used for measuring disparities in hiring rates between groups with the highest acceptance rates (usually White men) and a comparison group (usually a protected class). In this framework, one divides the acceptance rate for a minority group's job applications by the White male acceptance rate to generate an "adverse impact ratio." If the ratio is less than 0.8, then there is evidence that the hiring practices have an adverse impact of the hiring process on the minority group (Newman and Lyon, 2009). Using this as a heuristic for acceptance rates in mortgage applications,non-MEW products meet the four-fifths rule (with ratios ranging from 0.83 to 0.91), whereas for HELOCs Black, Hispanic, and Asian applicants all have acceptance rates less than 80 percent of the White acceptance rate, indicating adverse impact.[21]

Although the unconditional denial rates exhibit large differences across race in Figure 1, sig-

[21] Among HELoan applications, the AIR is 0.63 for Black applicants but 0.85 and 0.89 for Hispanic and Asian applicants, respectively. For cash-out refinances, the AIR is just above the borderline, at 0.81 for Black applicants.

nificant differences in observable borrower and loan characteristics exist across race as well. Table 1 reports average borrower and loan characteristics for MEW applications broken out by race. Loan amounts and credit scores, in particular, vary considerably across racial groups. In the next section we examine conditional correlations between race and application denial rates.

4.2 Relationship between Race and Application Denial on MEW Applications, Conditional on Underwriting Factors

In the previous section we documented large unconditional differences in MEW product denial rates across races. But, as Table 1 shows, there are borrower and loan characteristics that likely covary with both race and the likelihood of an application being denied. To examine this possibility, we next estimate a series of loan application-level linear probability models (LPMs) of the following form:[22]

$$Y_i = \beta_1 Black_i + \beta_2 Hispanic_i + \beta_3 Asian_i + \boldsymbol{X_i}\gamma + \eta_t + \lambda_l + \omega_s + \epsilon_i \tag{4.1}$$

where Y_i is an indicator for whether borrower i's mortgage application is denied. $Black_i$, $Hispanic_i$, and $Asian_i$ are indicator variables set to one if the applicant is Black, Hispanic, or Asian, respectively. White is the excluded category in the econometric model, so the β coefficients should be interpreted as relative to a White applicant. X_i is a vector of covariates that varies across models. η_t and λ_l are application year and lender fixed effects, respectively. State fixed effects are represented by ω_s. Finally, ϵ_i is an error term.

[22] We also consider logit models and find that the average marginal effects of race are similar to the LPM coefficient estimates. The logit results are reported in the Appendix.

4.2.1 Decomposition of Denial Rate Differences

Our empirical approach is to sequentially expand the covariates included in our regression models to determine whether the inclusion of additional controls reduces (in absolute magnitude) the β coefficients in equation (4.1). In other words, are the racial gaps smaller once we control for factors used by lenders in mortgage underwriting (such as credit score)?

Table 2 reports coefficient estimates from equation (4.1) using the sample of MEW applications where a credit decision was made. We pool all MEW products together in this table, but we estimate our models separately for each loan product type later in the analysis. Unless otherwise noted, standard errors are double-clustered at the lender and state levels. In the interest of concision, we only report the race coefficients,[23] however, the full set of coefficient estimates are available in Appendix Table A.3. As a baseline, column (1) only controls for applicant race so the coefficients can be interpreted as unconditional differences in denial rates relative to White applicants. Black applicants are 21.2 percentage points more likely than White applicants to be denied credit, while Hispanic applicants and Asian applicants are 9.5 and 7.6 percentage points more likely to be denied, respectively.[24] These racial gaps are large relative to the mean denial rate of 26%, reported at the bottom of the table.

In column (2) we include application year fixed effects to account for temporal changes in economic conditions and denial rates at the national level. Because mortgage regulations vary across states, particularly with respect to foreclosure, we also include state fixed effects. Adding these controls has a marginal impact on the racial gaps.

In column (3) we add controls for DTI and credit score, two key factors used by lenders in mortgage underwriting. More specifically, we flexibly control for these variables by creating DTI

[23]When an underwriting characteristic is not used to make a credit decision on a specific application it is reported as “not applicable" in HMDA data. This applies to small share of our sample (see Appendix Table A.2). We include “not applicable" indicators in our regression models.

[24]Notice that these unconditional differences are slightly larger than what can be inferred from Table 1 because denial rates are rounded to the nearest percentage in that table.

and credit score bin dummies.[25] Adding DTI and credit score bins reduces the racial gap for Black and Hispanic applicants to 6.8 and 3.4 percentage points, respectively, reductions on the order of 63-65%. The Asian gap declines somewhat less to 7.3 percentage points, but this still represents a 16% reduction.

In column (4) we add dummies for the following CLTV bins: (0,60], (60,70], (70,75], (75,80], (80,85] (85,90], (90,95], (95,98], (98,100], and CLTV missing. Including these dummies has a minimal effect on the estimated racial gaps.[26] Thus, underwriting factors associated with the borrower's ability and willingness to pay (DTI, credit score) explain more of the racial gaps than the collateral-based factor of CLTV.

In column (5) we add a host of other application-level controls: loan amount bins, applicant income buckets, loan term bins, and product type dummies (HELoan, HELOC). We also include dummies indicating whether the proceeds are used for home improvements, the existence of a prepayment penalty, second-lien loan, FHA and VA loans, interest-only payments, other non-amortizing features, a second home purchase, an investment property purchase, the absence of a co-applicant, and number of units (1-4) dummies. The Black, Hispanic, and Asian gaps are reduced to 5.6, 2.7, and 5.8 percentage points, respectively.

Two recent studies document that minorities tend to sort into high-cost lenders and brokers (Ambrose, Conklin, and Lopez, 2021; Bayer, Ferreira, and Ross, 2018). A similar type of sorting could occur with respect to denials. For example, if minorities tend to apply to lenders with conservative underwriting guidelines, this could explain the observed racial gaps in denials. After adding lender fixed effects in column (6) to account for this possibility, we indeed see sizeable reductions in the Black-White and Asian-White denial gaps. Throughout the remainder of the

[25] The DTI bins are (0,25], (25,35], (35,45], (45,101], and DTI missing because it was reported as "not applicable." Credit score is binned as [300,620], [620,639), [640,660), [660,680), [680,700), [700,720), [720,740), [740,851), and credit score not applicable.

[26] This finding holds even using an alternative ordering of the model controls, in whch CLTV is added before credit score and DTI. Results available upon request.

paper we refer to the specification in column (6) as the saturated model.[27]

Overall, Table 2 shows that the large unconditional minority-White denial rate gaps are reduced considerably after including standard control variables. Yet, even after including these controls, the residual disparities are non-trivial (3–4 percentage points). We caution against interpreting the relationship between race and application denial as causal. There are underwriting factors that likely covary with both race and denial that are not included in HMDA data, such as an applicant's liquid assets and employment type (salaried or self-employed). One might also be tempted to interpret the reduction of racial disparities as we add controls to be evidence of only minor racial differences in access to MEW products. We are careful not to make this claim, as differences in control variables that affect access to MEW products may themselves be the result of systemic racial inequities. With these limitations in mind, the fact that controlling for basic underwriting variables reduces most of the minority-White gaps in denial rates suggests that taste-based discrimination is unlikely to explain most of those unconditional disparities.

4.2.2 Product Type

In Table 3 we estimate our denial rate models separately for each MEW product type. The sample in Panels A, B, and C include cash-out-refinances, HELoans, and HELOCs, respectively. Most of the MEW applications are for cash-out refinances (7 million), with the next largest group being HELOCs (4 million applications). Column (1) includes only applicant race controls, while column (2) reports estimates from the saturated specification (column (6) in Table 2).[28] Column (1) shows that unconditional minority-White denial rate disparities exist in all three product types, but the gaps are much larger in HELoans and HELOCs. For example, Black applicants are 16.8 percentage

[27] Appendix Table A.4 presents marginal effects estimates from logit models. The models do not converge when we include lender fixed effects, but the marginal effects from the logits are similar to the LPM coefficients for the models we can estimate. Appendix Table A.5 explores the robustness of our results to alternative fixed effects specifications. The race coefficient estimates are similar when we include lender by location (Census tract) fixed effects and location by time (county-year) fixed effects.

[28] Columns (1) and (2) in Table 3 are comparable to columns (1) and (6) in Table 2. Appendix Table A.6 shows the full build out table by product type where we include additional controls sequentially.

points more likely than White applicants to be denied on a cash-out refinance, but this Black-White gap increases to 25.9 percentage points on HELoans and 30.1 percentage points on HELOCs. Similar patterns hold for the Hispanic-White and Asian White gaps. Note, though, that the mean denial rate for HELoans (33%) and HELOCs (37%) are also significantly higher than the mean for cash-out-refinances (18%).

For cash-out refinances in Panel A, moving to the saturated model in column (2) reduces the Black coefficient from 16.8 to 4.0 percentage points, a reduction on the order of 76%. The Hispanic coefficient declines by approximately 64% in the saturated model relative to its value in column (1). In contrast, the Asian coefficient increases from 1.7 percentage points in column (1) to 2.6 percentage points in column (2). Panel B focuses on HELoans, and shows that there are dramatic reductions in racial denial gaps once we include the full set of controls in column (2). The Black coefficient is reduced by 80%; the Hispanic coefficient by 71%; and the Asian coefficient by 47%. We see even larger coefficient reductions moving from column (1) to (2) for HELOCs, reported in Panel C.

4.2.3 Application Year

Next, we examine whether racial disparities evolve over time. Since MEW products can be used to smooth consumption, and many households experienced negative income and wealth shocks during the COVID-19 pandemic, MEW demand may have shifted as a result. At the same time, mortgage lenders may have updated underwriting policies in response to evolving market conditions. These mortgage supply and demand shifts may have impacted racial disparities in access to mortgage equity starting in 2020. We estimate our saturated denial model separately by application year on the pooled sample of MEW products and report the results in Table 4. Notice first that the number of applications increases monotonically over time. In contrast, the mean denial rate declines every year in our sample, and is almost halved moving from 2018 to 2021. The explanatory power of the fully saturated model, as indicated by the adjusted R-squared, is relatively stable across all years, which might suggest that the implementation of underwriting guidelines was also stable. Both the Hispanic and Asian coefficients decline over time, but relative to the mean denial rate for the corresponding year (reported at the bottom of the table), the magnitude of the gap is similar across years. In contrast, the Black coefficient decreases modestly through 2020 but then reverts back to 2018 levels in 2021. Relative to the mean denial rate, this increase represents a nearly doubling in the Black-White gap (relative to the mean denial rate) from 2018 to 2021.

4.2.4 Lender Type

The different MEW products we examine tend to be handled by different types of financial institutions. For example, HELOCs generally are offered by banks and credit unions, while a large share of cash-out refinances are originated by nonbank lenders. The underwriting criteria may vary across different types of financial institutions, and thus, disparities in access to MEW may also. We next estimate our models separately for each of the product-by-institution type groupings. The first three columns of Table 5 include cash-out refinance applications from banks, nonbanks, and credit unions. Nonbanks handle most of the cash-out refinances (61%), followed by banks (31%), with the remaining market share belonging to credit unions. The coefficient estimates in the first three columns show that minorities are more likely than Whites to be denied a cash-out refinance, regardless of the type of financial institution. Interestingly, for all three minority groups, racial denial gaps are smallest at nonbanks..

Turning to the observation counts in columns (4)-(6), we see that credit unions have a much larger market share in HELoans compared to cash-out refinances (35% versus 9%). Similar to the cash-out refinance patterns, all of the minority coefficient estimates for HELoans are positive across the different types of financial institutions. The Black-White denial gap is largest at credit unions.

Columns (7)-(9) focus on HELOCs. Banks handle most HELOC applications (77%), followed by credit unions (22%). Nonbanks receive a trivial share of the HELOC applications (1%). Similar to cash-out refinances and HELoans, the minority coefficients for HELOCs are all positive across lender types. However, the Hispanic gap is small and indistinguishable from zero for nonbanks. Again, we see that that residual Black-White denial rate gap is largest at credit unions.

To summarize, there are two key findings in Table 5. First, across all product types and lender types, minorities are more likely to be denied credit relative to comparable White applicants. Second, the residual Black-White denial rate gap is largest at credit unions, especially for HELOCs and HELoans. This is particularly interesting because the inclusiveness of lending by credit unions, especially with respect to low-to-moderate income borrowers, has been questioned in previous empirical studies.[29]

Table 6 tests whether minority-White applicant denial rate gaps vary between majority- and minority-owned banks. We merge the HMDA data with the "Avery HMDA Lender File," that distinguishes banks' ownership based on National Information Center data.[30] Because minority ownership does not vary within lender, we exclude lender fixed effects from our models in Table 6. Minority-owned banks tend to be small lenders, so we control for bank size in all regressions in Table 6.[31] We exclude HELOCs from our analysis here because very few minority lenders offer them. Specifically, there are only 2-3 minority-owned banks that receive HELOC applications in any year in our sample. In contrast, on average there are 16 minority-owned banks with cash-out applications each year, and 14 with HELoan applications.

Column (1) of Table 6 provides a baseline regression for the sample of cash-out and HELoan applications by majority- and minority-owned banks, with coefficient estimates similar to our full

[29] See Marshall and Pellerin (2017) and citations therein.

[30] The Avery file is provided by Bob Avery of the Federal Housing Finance Agency for 2018–2021 and is available at `https://sites.google.com/site/neilbhutta/data`.

[31] Banks are classified into one of three groups: small, intermediate small, and large using Community Reinvestment Act (CRA) asset size thresholds available at https://www.ffiec.gov/cra/pdf/2021_Asset_Size_Threshold.pdf. Asset size for HMDA-reporting banks is available in the Avery file and is sourced from the Call Report. If asset information is missing, but the bank is affiliated with another banking institution, we use the affiliate's asset information to classify bank size. Visual inspection of bank names and (low) mortgage origination volumes for independent banks that have missing asset information suggests that these are small banks, and we classify them as such. Appendix Table A.7 shows denial regressions separated out by bank size categories.

MEW sample in Table 2 (with no lender fixed effects). In column (2), we include a minority-owned bank dummy and its interaction with applicant race. Minority banks are 6.9 percentage points less likely to deny a White applicant, on average. Hispanic and Asian applicants are 3.9 percentage points (0.036 + -0.075 = -0.039) and 6.7 percentage points (0.061 + -0.128 = -0.067) less likely to be denied than comparable White applicants at minority-owned banks. In column (3) we separate out the minority-owned banks by the race of minority ownership. We group Black-, American Indian-, multi-racial-, and Native American- or Alaskan Native American-owned banks into one category (Other Minority Bank) because the number of banks in each of these groups is small. Hispanic-White applicant denial gaps are reduced at all minority-owned bank types (Hispanic, Asian, and other minority-owned banks). In contrast, the Asian-White gap is only statistically significantly reduced at Asian-owned banks. No clear pattern emerges for Black applicants at minority-owned banks. Although there is some evidence consistent with minority applicants receiving more favorable treatment at minority-owned banks, we caution against interpreting the majority- versus minority-owned bank results too strongly because applications to minority-owned banks represent a small share (0.65%) of the sample in Table 6, and a borrower's self-selection of which lender to apply to may be endogenous.

4.3 Denial Reasons

For denied mortgage applications, lenders report in their HMDA data the reason(s) for denial: credit history, collateral, incomplete application, employment history, insufficient cash for down-payment/closing, unverifiable info, and insurance denied. The last four categories constitute a small share of the denials, so we group these together in a category called "Other." Lenders can report multiple reasons for denial, however, the overwhelming majority (79%) of denied applications in our sample include only one denial reason. Our analysis in this section is based off the first denial reason listed, but results are similar when we allow for multiple denial reasons.

Figure 2 shows the rate of each denial reason (conditional on denial) for each race category split out by MEW product type. Notice that within any race-product type combination, the shares sum to 100%. The top panel includes application denials for cash-out refis. For White applicants, the share is fairly similar across all denial reasons. However, for Black applicants credit history stands out as the most likely reason for denial. Hispanic and Asian applicants, on the other hand, tend to be denied due to DTI.

Credit history appears to be a larger driver of denials in HELoans. Relative to cash-out refinances, the share of denials due to credit history is higher for all races in HELoans. The increase is particularly high for Black and Hispanic homeowners. For example, whereas 23% of Hispanic denials on cash-out refis are due to credit history, this number climbs to 35% for HELoans (the middle panel of Figure 2). Turning to HELOCs, the share of denials due to credit history climbs even further for White, Black, and Asian applicants. As with HELoans, the share is particularly high for Black and Hispanic applicants, at 57% and 46%, respectively.

A key takeaway from Figure 2 is that credit history is a major reason for MEW denial, particularly for Black homeowners on HELoans and HELOC applications. Surprisingly, collateral (e.g., lack of equity) plays a fairly limited role in denials for all races in HELoans and HELOCs. Thus, it appears that denied applicants tend to have adequate equity in their homes, but their credit history precludes them from accessing this equity.

4.4 Relationship between Race and Price on MEW Products

In this section we examine whether mortgage pricing on MEW products varies by race. In a recent contribution, Bartlett et al. (2022) show that Black and Hispanic borrowers pay higher interest rates on first-lien GSE-securitized mortgages and FHA-insured loans. In related work, Bhutta and Hizmo (2021) recognize that in addition to interest rates, fees, and points are important dimensions of mortgage pricing. In a sample of FHA-insured first-lien mortgages, Bhutta and Hizmo (2021) show that minorities pay higher interest rates, but this is offset by lower fees. In contrast with these previous studies, we focus on MEW products, many of which are not first-lien mortgages. In addition, whereas the studies mentioned above focus on FHA-insured and GSE-securitized loans, a large share of the MEW products in our study, in particular HELoans and HELOCs, are not backed by the U.S. government. There is limited research on MEW product pricing, and to our knowledge, this paper is the first to examine racial pricing disparities in this market.

Our measure of mortgage pricing is the interest rate spread, defined as the difference between the loan's APR and the average prime offer rate (APOR). Rate spread is meant to capture the premium (or discount) that a borrower pays relative to a benchmark rate on a prime mortgage with similar terms (e.g., fixed-rate or adjustable-rate, lien status, and loan maturity). Note that the APR is calculated based on the interest rate, points, and fees associated with a loan, thus it accounts for the different dimensions of mortgage pricing discussed in Bhutta and Hizmo (2021).[32] In earlier waves of HMDA data, lenders were only required to report whether the rate spread on a loan was greater than 150 bps (1.5 percentage points). However, during the period covered in our sample, the rate spread is reported for nearly all applications that result in originated loans.

We estimate pricing regressions using equation (4.1) where the dependent variable Y_i now becomes rate spread. Our sample includes only originated mortgages, since we do not have pricing information for applications that are denied. Columns (1) and (2) of Table 7 report results for cash-out refinances. For these loans, the average rate spread is 43 bps. Controlling just for origination month and state, Black and Hispanic borrowers pay an additional 13.6 and 11.1 bps, respectively, relative to White borrowers for cash-out refinances. Asian homeowners, on the other hand, pay 6.3 bps less than Whites. Once we account for underwriting factors and other controls in column (2), pricing differences for Black and Hispanic borrowers disappear. The Asian pricing discount declines after including our controls.

Columns (3) and (4) focus on HELoan pricing differences. Note that the mean rate spread

[32]Bhutta and Hizmo (2021) also discuss limitations of the APR measure.

for HELoans (139 bps or 1.39 percentage points) is much higher than for cash-out refinances (43 bps or 0.43 percentage points). Conditioning on just origination month and state, Black borrowers pay an additional 47.6 bps on average, while the corresponding figure for Hispanic borrowers is 20.2 bps. Similar to column (1), Asian borrowers pay lower prices for HELoans in column (3). In the saturated regression model reported in column (4), there is no statistically significant difference between what Black and Hispanic borrowers pay for HELoans relative to comparable White borrowers, while Asian borrowers pay 7.3 bps less.

In columns (5) and (6) the mean rate spread for HELOCs (85 bps or 0.85 percentage points) falls between cash-out refis and HELoans. Consistent with columns (1) and (3), Black and Hispanic borrowers pay higher prices on average for HELOCs, while Asian borrowers pay less. Once we add controls, the gaps significantly narrow; Black borrowers pay 10.0 bps more for HELOCs than comparable White borrowers, while Asian borrowers pay 5.6 bps less. Like with cash-out refis and HELOans, the HELOC pricing gap for Hispanic and White borrowers is not statistically different from zero.[33]

Similar to our results on mortgage denials, we find that unconditional minority pricing gaps on all MEW products are large. However, once we account for a number of control variables these gaps are significantly reduced. Black borrowers pay more than comparable White borrowers for HELOCs (about 10 bps), while Asian borrowers face slightly lower mortgage prices than comparable Whites. Hispanic and White borrowers' pricing look statistically indistinguishable when these controls are incorporated.

[33]We caution that HELOCs often come with introductory pricing that is different from what the borrower will pay later in the life of the loan. We are not able to distinguish introductory from subsequent pricing and assume the rate spreads we observe correspond to what the borrower is charged at the beginning of the life of the loan. This could affect the interpretation of racial differences in pricing over the life of the loan, if some racial groups are more likely than others to take out HELOCs with low introductory rate periods.

5 Discussion

We have documented large, unconditional differences in average denial rates for mortgage equity withdrawal products across racial groups. Similarly, we also find large unconditional differences in MEW pricing across racial groups in a sample of originated loans. In both cases, the racial disparities significantly decline when we control for differences in observable loan and borrower characteristics as well as lender fixed effects. In this section, we begin by discussing a few ways one might interpret these patterns. We then conduct a back-of-the-envelope calculation to try to determine how much racial differences in denial rates translate into differences in the amount of housing wealth accessed by minority vs. White homeowners.

5.1 Interpretation

One may be tempted to interpret these patterns as evidence that racial discrimination in the MEW product market is quantitatively unimportant. However, we believe that this would be a naïve interpretation, as it is unclear exactly what factors some of our controls are picking up. For example, while controlling for credit scores, debt-to-income ratios, and CLTV ratios significantly lowers denial rate disparities between Black and White applicants by approximately two-thirds (columns (1) vs. (3) in Table 2), the differences in the levels of these controls across racial groups may themselves be reflective of structural discrimination against minority applicants. For example, the large differences in average credit scores and DTI ratios between White and minority individuals documented in Table 1 may be due to historical lending practices that were discriminatory. Alternatively, discrimination in other markets (e.g., labor markets) may cause racial disparities in factors used in underwriting. Although incorporating these factors into credit decisions may be justified in terms of credit risk, by doing so, credit markets may “import" structural discrimination from other markets. Regardless of the source of minority-White disparities in underwriting factors, credit markets have the potential to serve as a mechanism for perpetuating disparities through differential access to MEW products.

Similarly, it may be tempting to interpret the remaining, small, but statistically significant conditional disparities in MEW product denial rates and prices as arising from racially discriminatory practices on the part of the lenders. However, while the existence of such disparities is consistent with the presence of racial discrimination, it is also consistent with more benign explanations. One such explanation is the absence of information in the HMDA data about variables that may play a significant role in the underwriting process for certain lenders. For example, the HMDA data do not include any information on an applicant's liquid assets. Many mortgage lenders require that a potential borrower have sufficient liquid assets (i.e., funds in a checking/savings account) to be able to cover a certain number of mortgage payments in the event of an adverse financial shock. Additionally, the HMDA data do not include any information about an applicant's employment history. Many lenders require proof that a potential borrower has held a stable job for a certain amount of time prior to approval. If minority applicants have lower amounts of liquid assets and higher employment volatility compared to White applicants, then we would expect to see disparities in denial rates that would reflect those differences.

5.2 Aggregate Differences in MEW Amounts by Race

The high denial rates for MEW products apparent in Figure 1 suggest significant unmet demand for these products. Moreover, the significantly higher minority denial rates that we have documented in this paper imply that the unmet demand is much higher for Black, Hispanic, and Asian homeowners. In this section, we perform a simple back-of-the-envelope calculation to estimate the differences in the amount of housing equity accessed by minority and White homeowners. We perform the exercise using both conditional and unconditional denial rate differences, since as we discussed above, both measures are relevant from a policy perspective. Although this exercise is informative and relevant to policy discussions, it should not be interpreted as a welfare analysis because we are unable to measure the full benefits and costs (e.g., higher default rates) of increased access to mortgage equity withdrawals.

Table A.8 presents the results of these calculations for all four racial groups we study. We estimate that, in total between 2018 and 2021, Black homeowners in our sample applied to extract \$46.4 billion in home equity, but were denied \$23 billion.[34] Had they experienced the denial rate of White applicants (ignoring underwriting factors), they would have only been denied \$11.8 billion, or about half as much demand would have gone unmet.[35]

"Excess" denials conditional on borrower and mortgage characteristics are much smaller but still reflect a large amount of locked-up home equity that borrowers were unable to access. A back-of-the-envelope calculation using our regression model results in Table 3 suggests that the "excess" denials for Black borrowers, controlling for observable loan and borrower characteristics, was \$2.0 billion over this 4-year period.[36] Hispanic and Asian applicants were denied the ability to cash out about \$2.2 billion and \$3.9 billion in equity more than White borrowers, respectively, after controlling for these factors. Although excess denials are smaller after accounting for underwriting factors, they are still large, at 18%, 25%, and 46% of the unconditional excess denials for Black, Hispanic, and Asian applicants, respectively. Or in other words, observable underwriting factors can explain only about four-fifths of the Black-White gap, three-quarters of the Hispanic-White gap, and a bit over half of the Asian-White gap.

[34]We estimate the amount of loan proceeds that each product application, if successful, would yield using a simple formula: Loan proceeds for HELOCs and HELoans are equal to 97.5% of the applied-for loan amount. (We assume 2.5% closing costs, which represent equity withdrawn but not received as cash by the borrower.) Because cash-out refinances include paying off the existing mortgage lien(s), a smaller portion of the loan amount becomes cash to the borrower. Gross loan proceeds for cash-out refinances are estimated as 16% of the loan amount for conventional loans and 11% for FHA/VA loans in the data used by Gerardi, Lambie-Hanson, and Willen (2022), with net proceeds subtracting \$2,000 and 1% of the total loan amount.

[35]For example, Black HELOC applicants had an unconditional denial rate of 62.4%, vs. 32.3% for White applicants. They were denied \$11.5 billion in equity withdrawal via these HELOCs, an estimated \$5.5 billion "excess" relative to the rate at which White applicants were denied (\$18.4 billion * (0.624-0.323)).

[36]We can calculate this by multiplying the estimated total loan proceeds applied for by Black homeowners (\$18.4 billion in the case of HELOCs) by the corresponding Black coefficient (0.044) in Table 3's Model 2. Calculations are very similar if we instead use loan proceeds-weighted denial rates and weighted regression coefficients.

6 Conclusion

Scrutiny of the racial homeownership gap has led to initiatives to help address purchase lending disparities, such as Fannie Mae and Freddie Mac's Equitable Housing Finance Plans announced in June 2022. Likewise, recent studies have documented lower rates of rate/term refinancing among Black and Hispanic consumers in periods of falling interest rates, calling for the consideration of ratchet mortgages and other interventions that would better ensure that lower mortgage interest rates get passed on to borrowers equitably (Gerardi, Lambie-Hanson, and Willen, 2022; Gerardi, Willen, and Zhang, 2020). But far less attention has been paid to date about the barriers to accessing mortgage financing to help a homeowner withdraw the housing wealth he or she has accumulated.

Lenders offering home equity products often advertise to homeowners using messages such as "Don't borrow from a bank! Borrow from yourself." Indeed, home equity products generally offer lower interest rates than credit cards or other products, and they can be a useful tool for borrowers who need cash to complete home repairs or improvements, pay medical debt, or send a child to college. But as we show in this paper, MEW products have very high denial rates, especially for minority homeowners. Much of the minority-White gap in denial rates can be explained by borrower characteristics such as credit score, signalling that the underwriting system for these loans has a particularly large impact on these consumers. Americans hold record levels of home equity, following the historic house price increases of 2020–2021. Policymakers and researchers should not assume this newfound housing wealth will be equally liquid among all homeowners.

References

Adelino, M., A. Schoar, and F. Severino. 2015. House prices, collateral, and self-employment. *Journal of Financial Economics* 117:288–306. ISSN 0304-405X. doi:https://doi.org/10.1016/j.jfineco.2015.03.005.

Agarwal, S., B. W. Ambrose, S. Chomsisengphet, and C. Liu. 2011. The role of soft information in a dynamic contract setting: Evidence from the home equity credit market. *Journal of Money, Credit and Banking* 43:633–55.

Agarwal, S., B. W. Ambrose, and C. Liu. 2006. Credit lines and credit utilization. *Journal of Money, Credit and Banking* 1–22.

Ambrose, B. W., J. N. Conklin, and L. A. Lopez. 2021. Does borrower and broker race affect the cost of mortgage credit? *The Review of Financial Studies* 34:790–826.

Bartlett, R., A. Morse, R. Stanton, and N. Wallace. 2022. Consumer-lending discrimination in the fintech era. *Journal of Financial Economics* 143:30–56.

Bayer, P., F. Ferreira, and S. L. Ross. 2018. What drives racial and ethnic differences in high-cost mortgages? The role of high-risk lenders. *The Review of Financial Studies* 31:175–205.

Begley, J. 2017. Legacies of homeownership: Housing wealth and bequests. *Journal of Housing Economics* 35:37–50.

Benetton, M., M. Kudlyak, and J. Mondragon. 2022. Dynastic home equity. Working Paper, Federal Reserve Bank of San Francisco.

Benito, A. 2009. Who withdraws housing equity and why? *Economica* 76:51–70.

Bhutta, N., and A. Hizmo. 2021. Do minorities pay more for mortgages? *The Review of Financial Studies* 34:763–89.

Bhutta, N., A. Hizmo, and D. Ringo. 2021. How much does racial bias affect mortgage lending? Evidence from human and algorithmic credit decisions. *Evidence from Human and Algorithmic Credit Decisions (July 15, 2021)* .

Bhutta, N., S. Laufer, and D. R. Ringo. 2017. Residential mortgage lending in 2016: Evidence from the Home Mortgage Disclosure Act data. *Federal Reserve Bulletin* 103:1–.

Black, H., R. L. Schweitzer, and L. Mandell. 1978. Discrimination in mortgage lending. *The American Economic Review* 68:186–91.

Boehm, T., and A. Schlottmann. 2004. The dynamics of race, income, and homeownership. *Journal of Urban Economics* 55:113–130.

Boehm, T. P., and A. Schlottmann. 2008. Wealth accumulation and homeownership: Evidence for low-income households. *Cityscape* 225–56.

Breitenstein, E. C., K. Chu, K. Kalser, and E. W. Robbins. 2014. Minority depository institutions: Structure, performance, and social impact. *FDIC Quarterly* 8.

Canner, G. B., T. A. Durkin, and C. A. Luckett. 1998. Recent developments in home equity lending. *Fed. Res. Bull.* 84:241–.

Carlin, A., and E. Divringi. 2018. Home improvement lending in the Third Federal Reserve District: Patterns by income, race, and gender. *Cascade Focus* .

Case, B., and A. B. Schnare. 1994. Preliminary evaluation of the HECM reverse mortgage program. *Real Estate Economics* 22:301–46.

Charles, K. K., and E. Hurst. 2002. The transition to home ownership and the black-white wealth gap. *Review of Economics and Statistics* 84:281–97.

Chen, A., and H. H. Jensen. 1985. Home equity use and the life cycle hypothesis. *Journal of Consumer Affairs* 19:37–56.

Consumer Financial Protection Bureau. 2019. Data point: 2018 mortage market activity and trends. Working Paper.

Corradin, S., and A. Popov. 2015. House prices, home equity borrowing, and entrepreneurship. *The Review of Financial Studies* 28:2399–428.

Coulson, N. E., and M. Dalton. 2010. Temporal and ethnic decompositions of homeownership rates: Synthetic cohorts across five censuses. *Journal of Housing Economics* 19:155–66.

Davidoff, T. 2014. Reverse mortgage demographics and collateral performance. *Available at SSRN 2399942* .

Davidoff, T., P. Gerhard, and T. Post. 2017. Reverse mortgages: What homeowners (don't) know and how it matters. *Journal of Economic Behavior & Organization* 133:151–71.

Dawkins, C. 2005. Racial gaps in the transition to first-time homeownership: The role of residential location. *Journal of Urban Economics* 58:537–554.

Deng, Y., S. L. Ross, and S. M. Wachter. 2003. Racial differences in homeownership: the effect of residential location. *Regional Science and Urban Economics* 33:517–56. ISSN 0166-0462. doi:https://doi.org/10.1016/S0166-0462(02)00058-3.

Do, C. 2012. Withdrawing home equity: Differences across race and ethnicity. *Housing Studies* 27:299–323.

Duca, J. V., and A. Kumar. 2014. Financial literacy and mortgage equity withdrawals. *Journal of Urban Economics* 80:62–75.

Federal Financial Institutions Examination Council. 2019. A guide to HMDA reporting: Getting it right! Working Paper.

Flippen, C. 2004. Unequal returns to housing investments? A study of real housing appreciation among black, white, and Hispanic households. *Social Forces* 82:1523–1551.

Frame, W. S., R. Huang, E. J. Mayer, and A. Sunderam. 2022. The impact of minority representation at mortgage lenders. Working Paper, National Bureau of Economic Research.

Gabriel, S., and G. Painter. 2003. Pathways to homeownership: An analysis of the residential location and homeownership choices of black households in Los Angeles. *The Journal of Real Estate Finance and Economics* 27:87–109.

Gabriel, S. A., and S. S. Rosenthal. 2005. Homeownership in the 1980s and 1990s: Aggregate trends and racial gaps. *Journal of Urban Economics* 57:101–27.

Gerardi, K., L. Lambie-Hanson, and P. Willen. 2022. Housing policy: Part I. Mortgage-Borrowers. In W. Edelberg, L. Sheiner, and D. Wessel, eds., *Recession Remedies: Lessons Learned from the U.S. Economic Policy Repsonse to COVID-19*, chap. 5, 166–91. Brookings Institution Press.

Gerardi, K. S., P. S. Willen, and D. H. Zhang. 2020. Mortgage prepayment, race, and monetary policy. Working Paper, Federal Reserve Bank of Boston.

Ghent, A. C., R. Hernandez-Murillo, and M. T. Owyang. 2014. Differences in subprime loan pricing across races and neighborhoods. *Regional Science and Urban Economics* 48:199–215.

Goodman, L. S., and C. Mayer. 2018. Homeownership and the American dream. *Journal of Economic Perspectives* 32:31–58.

Greenspan, A., and J. Kennedy. 2008. Sources and uses of equity extracted from homes. *Oxford Review of Economic Policy* 24:120–44.

Gyourko, J., P. Linneman, and S. Wachter. 1999. Analyzing the relationships among race, wealth, and home ownership in America. *Journal of Housing Economics* 8:63–89.

Hall, M., and K. Crowder. 2011. Extended-family resources and racial inequality in the transition to homeownership. *Social Science Research* 40:1534–46.

Haurin, D., C. Ma, S. Moulton, M. Schmeiser, J. Seligman, and W. Shi. 2016. Spatial variation in reverse mortgages usage: House price dynamics and consumer selection. *The Journal of Real Estate Finance and Economics* 53:392–417.

Hilber, C. A., and Y. Liu. 2008. Explaining the black–white homeownership gap: The role of own wealth, parental externalities and locational preferences. *Journal of Housing Economics* 17:152–74.

Hurst, E., and F. Stafford. 2004. Home is where the equity is: Mortgage refinancing and household consumption. *Journal of Money, credit and Banking* 985–1014.

Jiang, E. X., Y. Lee, and W. S. Liu. 2021. Disparities in consumer credit: The role of loan officers in the fintech era. *Available at SSRN* .

Kahn, M. E. 2021. Racial and ethnic differences in the financial returns to home purchases from 2007 to 2020. Working Paper, National Bureau of Economic Research.

Kau, J. B., D. C. Keenan, and H. J. Munneke. 2012. Racial discrimination and mortgage lending. *The Journal of Real Estate Finance and Economics* 45:289–304.

Kermani, A., and F. Wong. 2021. Racial disparities in housing returns. Working Paper, National Bureau of Economic Research.

Kerr, S. P., W. R. Kerr, and R. Nanda. 2022. House prices, home equity and entrepreneurship: Evidence from US census micro data. *Journal of Monetary Economics* 130:103–19.

Killewald, A., F. T. Pfeffer, and J. N. Schachner. 2017. Wealth inequality and accumulation. *Annual Review of Sociology* 43:379–.

Krivo, L., and R. Kaufman. 2004. Housing and wealth inequality: Racial-ethnic differences in home equity in the United States. *Demography* 41:585–605.

Ladd, H. F. 1998. Evidence on discrimination in mortgage lending. *Journal of Economic Perspectives* 12:41–62.

Levine, P., and D. Ritter. 2022. The racial wealth gap, financial aid, and college access. Working Paper 22-32, Federal Reserve Bank of Philadelphia.

Marshall, L., and S. Pellerin. 2017. Credit unions: A taxing question. *Econ Focus* 20–3.

Mayer, C., and S. Moulton. 2022. The market for reverse mortgages among older americans. In O. S. Mitchell, ed., *New Models for Managing Longevity Risk*. Oxford University Press.

Moulton, S., D. R. Haurin, and W. Shi. 2015. An analysis of default risk in the Home Equity Conversion Mortgage (HECM) program. *Journal of Urban Economics* 90:17–34.

Moulton, S., C. Loibl, and D. Haurin. 2017. Reverse mortgage motivations and outcomes: Insights from survey data. *Cityscape* 19:73–98.

Munnell, A. H., G. M. Tootell, L. E. Browne, and J. McEneaney. 1996. Mortgage lending in Boston: Interpreting HMDA data. *The American Economic Review* 25–53.

Newman, D. A., and J. S. Lyon. 2009. Recruitment efforts to reduce adverse impact: Targeted recruiting for personality, cognitive ability, and diversity. *Journal of Applied Psychology* 94:298–317.

Shapiro, T. M. 2006. Race, homeownership and wealth. *Wash. UJL & Pol'y* 20:53–.

Wainer, A., and J. Zabel. 2020. Homeownership and wealth accumulation for low-income households. *Journal of Housing Economics* 47:101624–.

Willen, P. S., and D. H. Zhang. 2021. Do lenders still discriminate? A robust approach for assessing differences in menus. Working Paper, National Bureau of Economic Research.

7 Figures

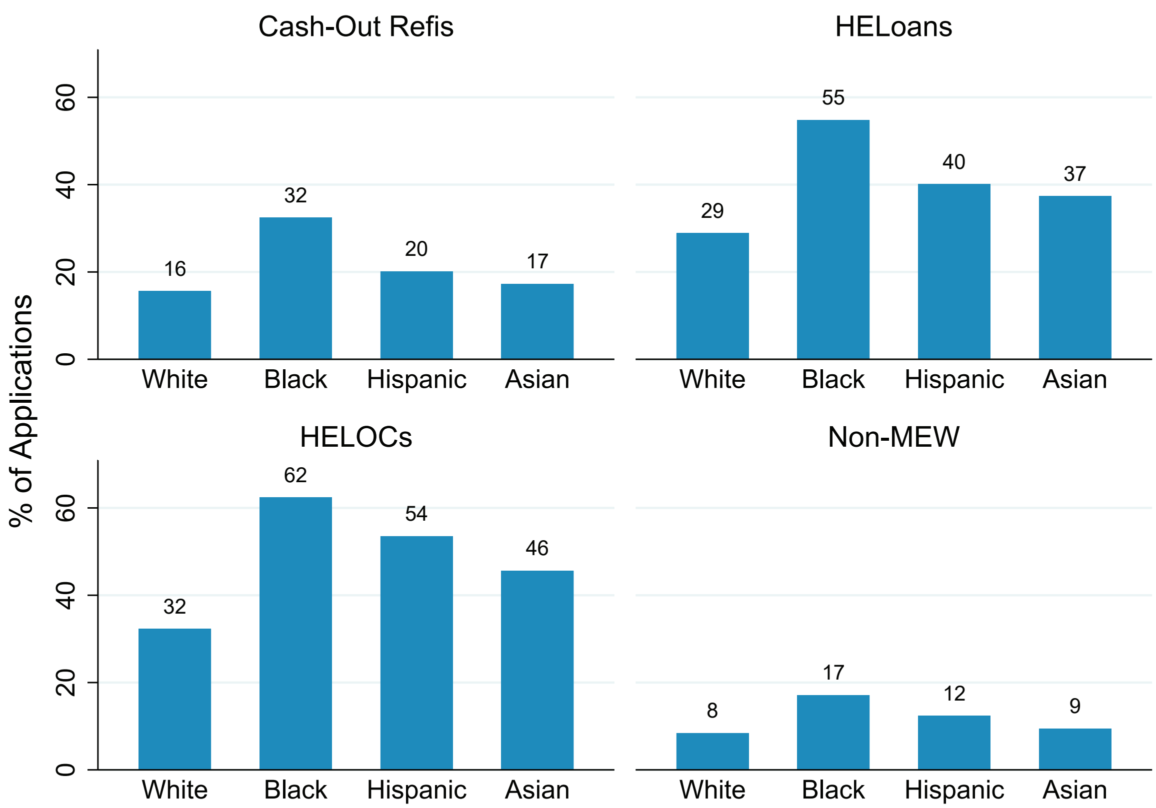

Figure 1. Application Denial Rates

Note: Denial rates conditional on credit decision, 2018–2021. Non-MEW includes first-lien purchase loans and rate/term refinances. Source: Home Mortgage Disclosure Act data.

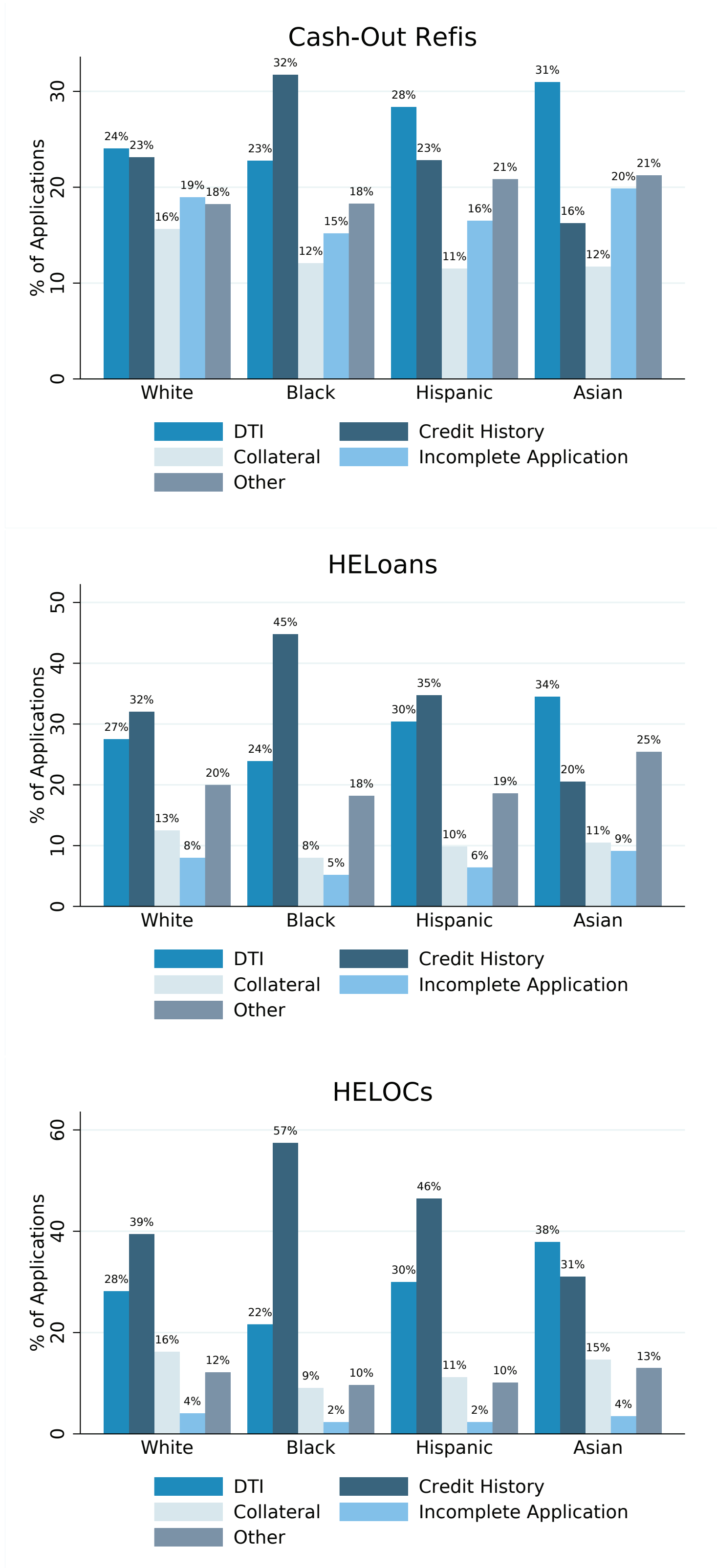

Figure 2. Application Denial Reason

Note: First reported denial reason for denied applications, 2018–2021. Non-MEW includes first-lien purchase loans and rate/term refinances. Source: Home Mortgage Disclosure Act data.

8 Tables

Table 1. Descriptive Statistics for MEW Products

	White	Black	Hispanic	Asian
Income (thousands $)	118.1	93.1	102.3	147.8
DTI (%)	36.5	41.2	40.7	40.3
Credit Score	735	688	715	745
CLTV (%)	65.2	68.4	64.9	63.4
Loan Amount	185,529	166,378	195,211	264,885
Units	1.0	1.1	1.1	1.0
Loan term (months)	301	311	310	315
Second Home (d)	0.02	0.01	0.01	0.02
Investment Property (d)	0.04	0.06	0.06	0.10
No Co-applicant (d)	0.53	0.72	0.54	0.53
Home Improvement (d)	0.22	0.23	0.21	0.23
Second Lien (d)	0.30	0.27	0.28	0.35
Prepayment Penalty (d)	0.08	0.08	0.08	0.13
Interest Only (d)	0.16	0.09	0.11	0.15
Other Nonamortizing Features (d)	0.02	0.02	0.03	0.03
Application to Minority-Owned Bank (d)	0.001	0.001	0.002	0.009
Application Denied (d)	0.23	0.44	0.32	0.30
# Observations	9,572,670	1,011,791	1,184,479	870,398

Note: This table reports mean values for observations populated on the variable in question. The sample includes MEW products (cash-out refis, HELoans, and HELOCs) for which a credit decision was made. See the appendix for data on the rate at which these fields are missing by loan type and racial/ethnic group. Dichotomous variables are signified by (d).

Table 2. Applicant Race and Likelihood of Denial on MEW Products

Dependent Var: Loan Denied (d)	(1)	(2)	(3)	(4)	(5)	(6)
Black (d)	0.212***	0.192***	0.068***	0.065***	0.056***	0.042***
	(0.022)	(0.019)	(0.008)	(0.008)	(0.005)	(0.004)
Hispanic (d)	0.095***	0.092***	0.034**	0.034**	0.027**	0.028***
	(0.025)	(0.015)	(0.011)	(0.011)	(0.008)	(0.005)
Asian (d)	0.076***	0.087***	0.073***	0.075***	0.058***	0.043***
	(0.018)	(0.013)	(0.012)	(0.012)	(0.008)	(0.005)
Year FE	N	Y	Y	Y	Y	Y
State FE	N	Y	Y	Y	Y	Y
DTI Buckets	N	N	Y	Y	Y	Y
Credit Score Buckets	N	N	Y	Y	Y	Y
CLTV Buckets	N	N	N	Y	Y	Y
Other Controls	N	N	N	N	Y	Y
Lender FE	N	N	N	N	N	Y
# Observations	12,638,969	12,638,969	12,638,969	12,638,969	12,638,969	12,638,969
Adjusted R^2	0.020	0.047	0.240	0.259	0.316	0.380
Mean Denial Rate	0.26	0.26	0.26	0.26	0.26	0.26

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The sample includes MEW products (cash-out refis, HELoans, HELOCs) for which a credit decision was made. Dichotomous variables are signified by (d). Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Table 3. Applicant Race and Likelihood of Denial by Product Type

	(1)	(2)
Panel A: Cash-Out Refinances		
Black	0.168***	0.040***
	(0.023)	(0.004)
Hispanic	0.045**	0.016***
	(0.014)	(0.004)
Asian	0.017*	0.026***
	(0.007)	(0.003)
# Observations	7,030,943	7,030,943
Adjusted R^2	0.015	0.289
Mean Denial Rate	0.18	0.18
Panel B: Home Equity Loans (HELoans)		
Black	0.259***	0.050***
	(0.026)	(0.005)
Hispanic	0.112***	0.032***
	(0.017)	(0.004)
Asian	0.085***	0.045***
	(0.024)	(0.006)
# Observations	1,479,900	1,479,900
Adjusted R^2	0.027	0.445
Mean Denial Rate	0.33	0.33
Panel C: Home Equity Lines of Credit (HELOCs)		
Black	0.301***	0.044***
	(0.012)	(0.004)
Hispanic	0.213***	0.046***
	(0.021)	(0.006)
Asian	0.133***	0.051***
	(0.018)	(0.008)
# Observations	4,128,076	4,128,076
Adjusted R^2	0.039	0.469
Mean Denial Rate	0.37	0.37
Year FE	N	Y
State FE	N	Y
DTI Buckets	N	Y
Credit Score Buckets	N	Y
CLTV Buckets	N	Y
Other Controls	N	Y
Lender FE	N	Y

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The sample in Panels A, B, and C are cash-out-refinances, HELoans, and HELOCs, respectively, for which a credit decision was made. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Table 4. Likelihood of Denial by Year

	2018 (1)	2019 (2)	2020 (3)	2021 (4)
Black	0.044***	0.042***	0.039***	0.043***
	(0.005)	(0.004)	(0.004)	(0.004)
Hispanic	0.035***	0.032***	0.023***	0.021***
	(0.006)	(0.005)	(0.005)	(0.005)
Asian	0.055***	0.047***	0.040***	0.032***
	(0.007)	(0.005)	(0.005)	(0.005)
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
DTI Buckets	Y	Y	Y	Y
Credit Score Buckets	Y	Y	Y	Y
CLTV Buckets	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y
# Observations	2,764,965	2,915,279	3,065,300	3,893,569
Adjusted R^2	0.379	0.403	0.381	0.361
Mean Denial Rate	0.34	0.30	0.22	0.20

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The saturated model is estimated separately for each application year. Standard errors, clustered at the state and lender levels, are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

Table 5. Likelihood of Denial by Type of Financial Institution

	Cash-Out Refinances			HELoans			HELOCs		
	Banks	Nonbanks	Credit Unions	Banks	Nonbanks	Credit Unions	Banks	Nonbanks	Credit Unions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Black	0.045***	0.038***	0.047***	0.044***	0.047***	0.061***	0.038***	0.017**	0.062***
	(0.004)	(0.004)	(0.005)	(0.006)	(0.010)	(0.007)	(0.004)	(0.006)	(0.005)
Hispanic	0.025***	0.012**	0.028***	0.037***	0.023***	0.030***	0.049***	0.005	0.032***
	(0.004)	(0.004)	(0.003)	(0.005)	(0.003)	(0.005)	(0.007)	(0.011)	(0.004)
Asian	0.034***	0.022***	0.029***	0.056***	0.022**	0.040***	0.053***	0.016*	0.039***
	(0.005)	(0.002)	(0.004)	(0.006)	(0.008)	(0.003)	(0.008)	(0.006)	(0.005)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
DTI Buckets	Y	Y	Y	Y	Y	Y	Y	Y	Y
Credit Score Buckets	Y	Y	Y	Y	Y	Y	Y	Y	Y
CLTV Buckets	Y	Y	Y	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
# Observations	2,152,332	4,258,328	620,279	723,378	237,960	518,558	3,169,720	56,414	901,942
Adjusted R-^{2}	0.329	0.281	0.346	0.469	0.388	0.403	0.487	0.147	0.363
Mean Denial Rate	0.17	0.18	0.13	0.41	0.27	0.23	0.42	0.30	0.21

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The saturated model is estimated separately for each lender type / MEW product combination. Standard errors, clustered at the state and lender levels, are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

Table 6. Likelihood of Denial by Lender Minority Ownership Status

	(1)	(2)	(3)
Black Applicant	0.060***	0.060***	0.060***
	(0.006)	(0.006)	(0.006)
x Minority Bank		-0.021	
		(0.029)	
x Hispanic Bank			0.023
			(0.083)
x Asian Bank			-0.013
			(0.036)
x Other Minority Bank			-0.042
			(0.036)
Hispanic Applicant	0.035***	0.036***	0.036***
	(0.008)	(0.008)	(0.008)
x Minority Bank		-0.075***	
		(0.019)	
x Hispanic Bank			-0.079**
			(0.025)
x Asian Bank			-0.088**
			(0.028)
x Other Minority Bank			-0.054*
			(0.026)
Asian Applicant	0.056***	0.061***	0.061***
	(0.010)	(0.010)	(0.010)
x Minority Bank		-0.128**	
		(0.046)	
x Hispanic Bank			0.089
			(0.053)
x Asian Bank			-0.140**
			(0.041)
x Other Minority Bank			-0.023
			(0.024)
Minority Bank		-0.069***	
		(0.015)	
Hispanic Bank			-0.072*
			(0.031)
Asian Bank			-0.065***
			(0.012)
Other Minority Bank			-0.072**
			(0.024)
Year FE	Y	Y	Y
State FE	Y	Y	Y
DTI Buckets	Y	Y	Y
Credit Score Buckets	Y	Y	Y
CLTV Buckets	Y	Y	Y
Other Controls	Y	Y	Y
Lender FE	N	N	N
Lender Size	Y	Y	Y
# Observations	2,875,830	2,875,830	2,875,830
Adjusted R^2	0.35	0.35	0.35
Mean Denial Rate	0.23	0.23	0.23

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The estimation sample is restricted to applications for cash-out refinances and HELoans reported by bank lenders. Minority ownership status is provided in Bob Avery's HMDA Lender File, using National Information Center data. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Table 7. Applicant Race and Mortgage Pricing by Product Type

	Cash-Out Refis		HELoans		HELOCs	
	(1)	(2)	(3)	(4)	(5)	(6)
Black	0.136***	0.009**	0.476***	0.005	0.529***	0.100***
	(0.017)	(0.003)	(0.098)	(0.018)	(0.078)	(0.028)
Hispanic	0.111***	0.004	0.202***	-0.004	0.200***	0.012
	(0.014)	(0.004)	(0.030)	(0.007)	(0.029)	(0.008)
Asian	-0.063***	-0.048***	-0.097	-0.073***	-0.087*	-0.056**
	(0.013)	(0.009)	(0.060)	(0.017)	(0.033)	(0.016)
Year–Month FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y
DTI Buckets	N	Y	N	Y	N	Y
Credit Score Buckets	N	Y	N	Y	N	Y
CLTV Buckets	N	Y	N	Y	N	Y
Other Controls	N	Y	N	Y	N	Y
Lender FE	N	Y	N	Y	N	Y
Observations	5,324,103	5,324,103	862,169	862,169	2,333,437	2,333,437
Adjusted R-squared	0.086	0.505	0.047	0.685	0.069	0.610
Mean Rate Spread	0.43	0.43	1.39	1.39	0.85	0.85

Note: This table reports coefficient estimates from regressions where the dependent variable is interest rate spread. The sample includes originated loans. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Can Everyone Tap into the Housing Piggy Bank? Racial Disparities in Access to Home Equity

Appendix

This appendix supplements the empirical analysis in Conklin, Gerardi, and Lambie-Hanson (2022). Below is a list of the sections contained in this appendix.

Table of Contents

A.1 Additional Summary Statistics **2**

A.2 Observations without Underwriting Characteristics **3**

A.3 Primary Regressions with All Coefficients Reported **4**

A.4 Logit Models **7**

A.5 Denial Rate Regressions with Alternative Fixed Effects **8**

A.6 Applicant Race and Likelihood of Denial on MEW Products **9**

A.7 Bank Size Regressions **10**

A.8 Back-of-the-Envelope "Excess" Dollars Denied Calculations **11**

A.1 Additional Summary Statistics

Table A.1. Application Outcomes by Race

	(1) White	(2) Black	(3) Hispanic	(4) Asian
Purchase				
Loan originated	77.6	66.5	72.6	72.1
Application approved but not accepted	2.0	2.3	2.2	2.3
Application denied	5.0	10.8	8.0	6.3
Application withdrawn by applicant	13.7	17.7	15.1	16.6
File closed for incompleteness	1.6	2.6	2.1	2.7
Denied (among loans with decisions)	5.9	13.6	9.6	7.8
Rate/Term				
Loan originated	66.9	52.1	58.8	65.4
Application approved but not accepted	2.7	4.0	3.5	2.6
Application denied	8.7	15.7	12.2	8.5
Application withdrawn by applicant	15.2	18.1	17.2	16.1
File closed for incompleteness	6.5	10.2	8.3	7.4
Denied (among loans with decisions)	11.2	21.9	16.4	11.1
Cash-out Refi (MEW)				
Loan originated	63.8	46.5	58.0	59.5
Application approved but not accepted	2.1	2.3	2.6	2.6
Application denied	12.2	23.4	15.3	13.0
Application withdrawn by applicant	16.0	19.1	17.2	17.5
File closed for incompleteness	5.9	8.7	6.9	7.5
Denied (among loans with decisions)	15.6	32.4	20.1	17.3
HELoan (MEW)				
Loan originated	54.5	33.7	44.4	43.0
Application approved but not accepted	3.0	2.5	3.4	3.2
Application denied	23.3	44.0	32.0	27.6
Application withdrawn by applicant	13.6	13.8	13.7	17.1
File closed for incompleteness	5.7	6.0	6.5	9.1
Denied (among loans with decisions)	28.9	54.8	40.1	37.4
HELOC (MEW)				
Loan originated	57.5	31.2	38.9	44.3
Application approved but not accepted	3.2	2.8	2.7	3.0
Application denied	29.0	56.5	48.0	39.7
Application withdrawn by applicant	6.7	6.0	6.2	7.5
File closed for incompleteness	3.6	3.4	4.2	5.5
Denied (among loans with decisions)	32.3	62.4	53.5	45.6
Observations	35,618,574	4,531,154	5,364,350	4,653,681

Note: This table reports mortgage application outcomes by applicant race. The first two panels include product types (purchase and rate/term refis) that are not mortgage equity withdrawals. The third, fourth, and fifth panels include mortgage equity withdraw (MEW) products.

A.2 Observations without Underwriting Characteristics

Table A.2. Proportion of Observations without Underwriting Characteristics

	(1) White	(2) Black	(3) Hispanic	(4) Asian
Cash-out Refi (MEW)				
Income	0.01	0.01	0.01	0.02
DTI	0.02	0.03	0.03	0.03
Credit Score	0.02	0.02	0.03	0.03
CLTV	0.02	0.03	0.03	0.02
HELoan (MEW)				
Income	0.02	0.03	0.02	0.03
DTI	0.03	0.06	0.04	0.03
Credit Score	0.04	0.06	0.04	0.04
CLTV	0.05	0.09	0.06	0.04
HELOC (MEW)				
Income	0.02	0.03	0.03	0.03
DTI	0.02	0.05	0.03	0.03
Credit Score	0.02	0.03	0.02	0.02
CLTV	0.03	0.07	0.04	0.03

Note: This table reports the proportion of observations in the estimation sample that are reported as "not applicable" on control variables.

A.3 Primary Regressions with All Coefficients Reported

Table A.3. Likelihood of Denial for MEW Products

	(1)	(2)	(3)	(4)	(5)	(6)
Race and Ethnicity (d) (omitted: Non-Hispanic White)						
Black	0.212***	0.192***	0.068***	0.065***	0.056***	0.042***
	(0.022)	(0.019)	(0.008)	(0.008)	(0.005)	(0.004)
Hispanic	0.095***	0.092***	0.034**	0.034**	0.027**	0.028***
	(0.025)	(0.015)	(0.011)	(0.011)	(0.008)	(0.005)
Asian	0.076***	0.087***	0.073***	0.075***	0.058***	0.043***
	(0.018)	(0.013)	(0.012)	(0.012)	(0.008)	(0.005)
Year (d) (omitted: 2018)						
2019		-0.036***	-0.015*	-0.014*	0.002	0.007
		(0.007)	(0.006)	(0.006)	(0.007)	(0.005)
2020		-0.111***	-0.039***	-0.030**	0.014	0.036***
		(0.011)	(0.010)	(0.010)	(0.008)	(0.008)
2021		-0.141***	-0.071***	-0.060***	-0.007	0.013
		(0.015)	(0.014)	(0.014)	(0.008)	(0.009)
DTI (d) (omitted: < 25)						
[25, 35)			-0.045***	-0.045***	-0.044***	-0.047***
			(0.007)	(0.007)	(0.005)	(0.005)
[35, 45)			-0.055***	-0.054***	-0.062***	-0.069***
			(0.011)	(0.011)	(0.008)	(0.008)
[45, 101)			0.224***	0.215***	0.184***	0.164***
			(0.015)	(0.015)	(0.016)	(0.014)
NA			0.208***	0.063	0.055	0.100*
			(0.059)	(0.053)	(0.046)	(0.038)
Credit Score (d) (omitted: ≥ 740)						
[300, 620)			0.563***	0.538***	0.560***	0.532***
			(0.021)	(0.020)	(0.019)	(0.016)
[620, 640)			0.286***	0.272***	0.313***	0.306***
			(0.027)	(0.025)	(0.024)	(0.023)
[640, 660)			0.242***	0.228***	0.262***	0.256***
			(0.024)	(0.022)	(0.022)	(0.021)
[660, 680)			0.178***	0.168***	0.192***	0.187***
			(0.017)	(0.016)	(0.016)	(0.016)
[680, 700)			0.118***	0.110***	0.128***	0.126***
			(0.011)	(0.010)	(0.011)	(0.011)
[700, 720)			0.077***	0.071***	0.084***	0.083***
			(0.008)	(0.008)	(0.009)	(0.009)
[720, 740)			0.044***	0.040***	0.050***	0.050***
			(0.005)	(0.005)	(0.006)	(0.006)
NA			0.299***	0.255***	0.259***	0.342***
			(0.053)	(0.051)	(0.052)	(0.045)

Table A.3. (cont.) Likelihood of Denial for MEW Products

	(1)	(2)	(3)	(4)	(5)	(6)
CLTV (d) (omitted: ≤ 60)						
(60, 70]				-0.033***	-0.011**	-0.006*
				(0.005)	(0.003)	(0.002)
(70, 75]				-0.028***	-0.004	0.006
				(0.007)	(0.005)	(0.003)
(75, 80]				-0.025**	0.006	0.018**
				(0.008)	(0.008)	(0.006)
(80, 85]				0.048**	0.082***	0.085***
				(0.014)	(0.013)	(0.012)
(85, 90]				0.053**	0.072***	0.094***
				(0.016)	(0.018)	(0.017)
(90, 95]				0.260***	0.269***	0.287***
				(0.029)	(0.027)	(0.027)
(95, 98]				0.240***	0.272***	0.300***
				(0.030)	(0.028)	(0.026)
(98, 100]				0.031	0.128***	0.141***
				(0.025)	(0.023)	(0.020)
NA				0.246***	0.252***	0.301***
				(0.054)	(0.040)	(0.047)
Income (d) (omitted: $\geq \$500,000$)						
[0, $30k)					0.113***	0.148***
					(0.020)	(0.014)
[$30k, $60k)					0.023	0.054***
					(0.013)	(0.010)
[$60k, $90k)					-0.013	0.017
					(0.011)	(0.009)
[$90k, $150k)					-0.027**	-0.002
					(0.010)	(0.008)
[$150k, $500k)					-0.026***	-0.012
					(0.007)	(0.006)
NA					-0.069**	-0.075***
					(0.021)	(0.020)
Loan Amount (d) (omitted: $\geq \$750,000$)						
[$5,000, $50,000)					-0.035*	-0.040**
					(0.015)	(0.012)
[$50,000, $100,000)					-0.043**	-0.061***
					(0.014)	(0.010)
[$100,000, $250,000)					-0.053***	-0.069***
					(0.013)	(0.010)
[$250,000, $500,000)					-0.057***	-0.055***
					(0.010)	(0.009)
[$500,000, $750,000)					-0.034***	-0.027***
					(0.007)	(0.006)

Table A.3. (cont.) Likelihood of Denial for MEW Products

	(1)	(2)	(3)	(4)	(5)	(6)
Loan Term (d) (omitted: (20-30] years)						
$\leq$ 5 years					-0.060	-0.020
					(0.041)	(0.015)
(5, 15] years					-0.046***	-0.013*
					(0.010)	(0.005)
(15, 20] years					-0.017	-0.004
					(0.012)	(0.007)
(30, 40] years (HELOCs only)					-0.033	-0.123
					(0.117)	(0.152)
FHA (d) (cash-out only)					-0.131***	-0.108***
					(0.024)	(0.017)
VA (d) (cash-out only)					-0.098**	-0.137***
					(0.028)	(0.015)
HELoan (d)					0.075**	0.045***
					(0.024)	(0.012)
HELOC (d)					0.147***	0.140***
					(0.027)	(0.032)
Second Lien (d)					0.013	0.008
					(0.009)	(0.006)
Home Improvement (d)					0.005	0.007
					(0.006)	(0.005)
Prepayment Penalty (d)					0.097**	0.033
					(0.030)	(0.028)
Interest Only (d)					-0.097**	-0.110***
					(0.030)	(0.028)
Other Nonamortizing Features (d)					0.159**	0.218**
					(0.057)	(0.070)
Second Residence (d)					0.105***	0.107***
					(0.010)	(0.008)
Investment Property (d)					0.049***	0.081***
					(0.012)	(0.010)
No Co-applicant (d)					0.043***	0.034***
					(0.003)	(0.002)
Total Units (d) (omitted: 1)						
2					0.043***	0.045***
					(0.006)	(0.006)
3					0.047***	0.056***
					(0.011)	(0.009)
4					0.048***	0.051***
					(0.012)	(0.011)
# Observations	12,638,969	12,638,969	12,638,969	12,638,969	12,638,969	12,638,969
Adjusted R^2	0.020	0.047	0.240	0.259	0.316	0.380
Mean Denial Rate	.26	.26	.26	.26	.26	.26
Year FE	N	Y	Y	Y	Y	Y
State FE	N	Y	Y	Y	Y	Y
DTI Buckets	N	N	Y	Y	Y	Y
Credit Score Buckets	N	N	Y	Y	Y	Y
CLTV Buckets	N	N	N	Y	Y	Y
Other Controls	N	N	N	N	Y	Y
Lender FE	N	N	N	N	N	Y

Note: This table reports expanded coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The sample includes MEW products (cash-out refis, HELoans, HELOCs) for which a credit decision was made. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

A.4 Logit Models

Table A.4. Logit Models of Denial for MEW Products

	(1)	(2)	(3)	(4)	(5)
Black	0.212***	0.186***	0.059***	0.056***	0.046***
	(0.007)	(0.010)	(0.005)	(0.005)	(0.003)
Hispanic	0.095***	0.091***	0.031***	0.032***	0.024***
	(0.010)	(0.010)	(0.009)	(0.008)	(0.006)
Asian	0.076***	0.088***	0.073***	0.075***	0.054***
	(0.006)	(0.004)	(0.005)	(0.005)	(0.006)
# Observations	12,639,272	12,639,272	12,639,272	12,639,272	12,639,272
Mean Denial Rate	.26	.26	.26	.26	.26
Year FE	N	Y	Y	Y	Y
State FE	N	Y	Y	Y	Y
DTI Buckets	N	N	Y	Y	Y
Credit Score Buckets	N	N	Y	Y	Y
CLTV Buckets	N	N	N	Y	Y
Other Controls	N	N	N	N	Y
Lender FE	N	N	N	N	N

Note: This table reports average marginal effect estimates from logit models where the dependent variable is an indicator for whether the application was denied. The sample includes MEW products (cash-out refis, HELoans, HELOCs) for which a credit decision was made. Standard errors, clustered at the state level, are in parentheses. *** p<0.001, ** p<0.01, * p<0.05.

A.5 Denial Rate Regressions with Alternative Fixed Effects

Table A.5. Likelihood of Denial–Robustness to Alternative Geographic Controls

	(1)	(2)	(3)	(4)
Black	0.042***	0.035***	0.035***	0.041***
	(0.004)	(0.003)	(0.003)	(0.003)
Hispanic	0.028***	0.025***	0.027***	0.026***
	(0.005)	(0.004)	(0.004)	(0.004)
Asian	0.043***	0.045***	0.047***	0.045***
	(0.005)	(0.005)	(0.005)	(0.005)
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
DTI Buckets	Y	Y	Y	Y
Credit Score Buckets	Y	Y	Y	Y
CLTV Buckets	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y
Lender FE	Y	Y	N	Y
Census Tract FE	N	Y	N	N
Lender x Tract FE	N	N	Y	N
County x Year FE	N	N	N	Y
Observations	12,639,272	12,638,969	10,864,102	12,505,642
Adjusted R-squared	0.380	0.383	0.399	0.387
Mean Denial Rate	.26	.26	.26	.26

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. Model 1 is the main model (Model 6 from Table 2). Model 2 adds tract fixed effects. Model 3 substitutes lender-by-tract fixed effects for the separate lender and tract fixed effects in Model 2. Model 4 substitutes county-by-year fixed effects for the tract fixed effects in Model 2. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

A.6 Applicant Race and Likelihood of Denial on MEW Products

Table A.6. Applicant Race and Likelihood of Denial on MEW Products

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Cash-Out Refinances						
Black	0.168***	0.153***	0.064***	0.060***	0.054***	0.040***
	(0.023)	(0.019)	(0.007)	(0.007)	(0.006)	(0.004)
Hispanic	0.045**	0.049***	0.011	0.012	0.010	0.016***
	(0.014)	(0.009)	(0.007)	(0.007)	(0.006)	(0.004)
Asian	0.017*	0.033***	0.030***	0.031***	0.030***	0.026***
	(0.007)	(0.005)	(0.006)	(0.006)	(0.006)	(0.003)
Observations	7,030,943	7,030,943	7,030,943	7,030,943	7,030,943	7,030,943
Adjusted R-squared	0.015	0.037	0.198	0.203	0.220	0.289
Mean Denial Rate	0.18	0.18	0.18	0.18	0.18	0.18
Panel B: Home Equity Loans (HELoans)						
Black	0.259***	0.237***	0.079***	0.076***	0.063***	0.050***
	(0.026)	(0.022)	(0.009)	(0.010)	(0.009)	(0.005)
Hispanic	0.112***	0.111***	0.034***	0.034***	0.031**	0.032***
	(0.017)	(0.012)	(0.009)	(0.009)	(0.009)	(0.004)
Asian	0.085***	0.094***	0.075***	0.079***	0.084***	0.045***
	(0.024)	(0.021)	(0.016)	(0.016)	(0.016)	(0.006)
Observations	1,479,900	1,479,900	1,479,900	1,479,900	1,479,900	1,479,900
Adjusted R-squared	0.027	0.041	0.289	0.309	0.330	0.445
Mean Denial Rate	0.33	0.33	0.33	0.33	0.33	0.33
Panel C: Home Equity Lines of Credit (HELOCs)						
Black	0.301***	0.272***	0.088***	0.085***	0.055***	0.044***
	(0.012)	(0.010)	(0.008)	(0.008)	(0.008)	(0.004)
Hispanic	0.213***	0.170***	0.072***	0.070***	0.057***	0.046***
	(0.021)	(0.012)	(0.008)	(0.009)	(0.007)	(0.006)
Asian	0.133***	0.115***	0.082***	0.084***	0.066***	0.051***
	(0.018)	(0.013)	(0.014)	(0.013)	(0.009)	(0.008)
Observations	4,128,076	4,128,076	4,128,076	4,128,076	4,128,076	4,128,076
Adjusted R-squared	0.039	0.066	0.329	0.358	0.402	0.469
Mean Denial Rate	0.37	0.37	0.37	0.37	0.37	0.37
Year FE	N	Y	Y	Y	Y	Y
State FE	N	Y	Y	Y	Y	Y
DTI Buckets	N	Y	Y	Y	Y	Y
Credit Score Buckets	N	Y	Y	Y	Y	Y
CLTV Buckets	N	N	Y	Y	Y	Y
Other Controls	N	N	N	Y	Y	Y
Lender FE	N	N	N	N	Y	Y

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. The sample in Panel A, B, and C are cash-out-refinances, HELoans, and HELOCs, respectively, for which a credit decision was made. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

A.7 Bank Size Regressions

Table A.7. Likelihood of Denial by Bank Size

	(1) All Banks	(2) Large Banks	(3) Intermediate Banks	(4) Small Banks
Black	0.040***	0.039***	0.031***	0.045***
	(0.005)	(0.005)	(0.004)	(0.004)
Hispanic	0.040***	0.040***	0.015***	0.026***
	(0.006)	(0.006)	(0.003)	(0.006)
Asian	0.053***	0.054***	0.027***	0.022**
	(0.006)	(0.006)	(0.004)	(0.007)
Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
DTI Buckets	Y	Y	Y	Y
Credit Score Buckets	Y	Y	Y	Y
CLTV Buckets	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y
Lender Size	N	N	N	N
# Observations	6,045,550	5,551,570	296,170	197,810
Adjusted R^2	0.446	0.448	0.335	0.390
Mean Denial Rate	.33	.35	.12	.22

Note: This table reports coefficient estimates from linear probability models where the dependent variable is an indicator for whether the application was denied. Models are restricted to applications made to bank lenders. Lenders are classified by asset size as of the end of the year prior to the HMDA reporting year, according to the Call Report, with data accessed through Bob Avery's HMDA Lender File. Standard errors, clustered at the state and lender levels, are in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

A.8 Back-of-the-Envelope "Excess" Dollars Denied Calculations

Table A.8. Estimated Aggregate Dollars of Loan Proceeds to Borrowers Denied

		White	Black	Hispanic	Asian
	Cash-out				
[1]	Average estimated cash to borrower per application	$34,197	$28,807	$35,649	$50,755
	Estimated aggregate loan proceeds (in billions)				
[2]	All applications with credit decision	$180.9	$17.1	$24.9	$22.7
[3]	Denial Rate	15.6%	32.4%	20.1%	17.3%
[4]	Denied $, [2] * [3]	$28.2	$5.5	$5.0	$3.9
[5]	Denied $, given White denial rate [2] * [3, White]	$28.2	$2.7	$3.9	$3.5
[6]	Unconditional "excess" denied $, [4] - [5]		$2.9	$1.1	$0.4
[7]	Table 3, model 2 coefficient		0.040	0.016	0.026
[8]	Conditional "excess" denied $, [2] * [7]		$0.7	$0.4	$0.6
	HELoan				
[9]	Average estimated cash to borrower per application	$111,257	$86,718	$106,033	$181,452
	Estimated aggregate loan proceeds (in billions)				
[10]	All applications with credit decision	$124.9	$10.9	$15.3	$15.9
[11]	Denial Rate	28.9%	54.8%	40.1%	37.4%
[12]	Denied $, [10] * [11]	$36.1	$6.0	$6.1	$5.9
[13]	Denied $, given White denial rate [10] * [11, White]	$36.1	$3.2	$4.4	$4.6
[14]	Unconditional "excess" denied $, [12] - [13]		$2.8	$1.7	$1.3
[15]	Table 3, model 2 coefficient		0.050	0.032	0.045
[16]	Conditional "excess" denied $, [10] * [15]		$0.5	$0.5	$0.7
	HELOC				
[17]	Average estimated cash to borrower per application	$92,870	$62,865	$82,600	$150,726
	Estimated aggregate loan proceeds (in billions)				
[18]	All applications with credit decision	$293.3	$18.4	$28.2	$50.6
[19]	Denial Rate	32.3%	62.4%	53.5%	45.6%
[20]	Denied $, [18] * [19]	94.7	$11.5	$15.1	$23.1
[21]	Denied $, given White denial rate [18] * [19, White]	$94.7	$5.9	$9.1	$16.4
[22]	Unconditional "excess" denied $, [20] - [21]		$5.5	$6.0	$6.7
[23]	Table 3, model 2 coefficient		0.044	0.046	0.051
[24]	Conditional "excess" denied $, [18] * [23]		$0.8	$1.3	$2.6
	Total MEW				
	Estimated aggregate loan proceeds (in billions)				
[25]	All applications with credit decision	$599.1	$46.4	$68.4	$89.2
[26]	Denied $, [4] + [12] + [20]	$159.0	$23.0	$26.2	$32.9
[27]	Unconditional "excess" denied $, [6] + [14] + [22]		$11.2	$8.8	$8.5
[28]	Conditional "excess" denied $, [8] + [16] + [24]		$2.0	$2.2	$3.9